DGH

DIRECTORATE GENERAL OF HYDROCARBONS

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HYDROCARBON EXPLORATION AND PRODUCTION ACTIVITES — INDIA 2013-14

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HYDROCARBON EXPLORATION AND PRODUCTION ACTIVITIES

INDIA 2013-14

DGH

DIRECTORATE GENERAL OF HYDROCARBONS

Under Ministry of Petroleum and Natural Gas

DISCLAIMER

- All boundaries shown in the maps are not authenticated.
- The statistics given in the report are collated from different E&P Companies operating in India and also from available published data in public domain. The correctness of information given herein, is therefor, subjective to that extent.
- Facts and figures given in the report are provisional / indicative and cannot be used for any commercial or legal purpose.
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INDIA

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DIRECTORATE GENERAL OF HYDROCARBONS

Under Ministry of Petroleum and Natural Gas
Govt. of India

हाइड्रोकार्बन खोज तथा उत्पादन प्रक्रियाएँ

भारत

२०१३-१४

DGH

हाइड्रोकार्बन महानिदेशालय

पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय
भारत सरकार

सत्यमेव जयते
धर्मेन्द्र प्रधान
ଧର୍ମେନ୍ଦ୍ର ପ୍ରଧାନ
Dharmendra Pradhan

राज्यमंत्री (स्वतंत्र प्रभार)
पेट्रोलियम और प्राकृतिक गैस
भारत सरकार
नई दिल्ली -110 001
MINISTER OF STATE (I/C)
PETROLEUM & NATURAL GAS
GOVERNMENT OF INDIA
NEW DELHI - 110 001

MESSAGE

India faces formidable challenges in meeting its energy requirements. Energy security is our primary concern. Being a developing country, our energy requirements are rapidly increasing year after year. Growth of the economy automatically leads to growth in energy consumption. Oil and gas plays a vital role in the overall energy mix in our country.

We need to adopt multipronged strategies to meet the challenge. There is an urgent need to rapidly explore our areas extensively to discover more Oil & Gas and also explore and develop other unconventional hydrocarbon energy resources like Shale Gas / Oil, Coal Bed Methane, Gas hydrates etc.

Our Government is working on multiple fronts including policy reforms to accelerate the pace of activities of Oil & Gas Exploration and Production Sector. We are in the process of modifying the contractual regime to facilitate investors to avoid micro-level management and reduce regulatory requirements. We are also evolving a Uniform Licensing Policy which will allow the operators to explore and produce all types of hydrocarbon resources including Shale Gas/ Oil in an awarded area. With these measures and few other reforms, we are in the process to provide necessary fillip to E&P activities in near future. Special focus is also being given to development of marginal fields/ un-monetized discoveries of National Oil Companies.

This report "Hydrocarbon Exploration and Production Activities 2013-14" by DGH is a detailed structured document which encapsulates the gist of the E&P activities in Indian hydrocarbon sector. I am confident that this annual publication by DGH will be ready referral to all the stakeholders of hydrocarbon industry of India. I compliment Directorate General of Hydrocarbons (DGH) for effectively and efficiently playing a vital role in the country's E&P sector and for this useful annual publication.

(Dharmendra Pradhan)

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सौरभ चन्द्र
SAURABH CHANDRA
सचिव
Secretary

RIGHT TO INFORMATION

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MESSAGE

Energy drives the economic growth of a country. Crude Oil and Natural Gas is a vital source of primary energy in India. It is more efficient, convenient and a cleaner source as compared to other fossil fuels like Coal. This has led to a rapid increase in the demand for Crude Oil and Natural Gas in the country creating a demand supply gap. Domestic availability of Crude Oil and Gas has not keep pace with the demand resulting in increased dependence on imports affecting the energy security of India.

Large scale capital investment and state-of-art technology are necessary to expand domestic exploration and production. It is imperative to attract more private and foreign companies to invest in Exploration and Production (E&P) sector of India. This is being achieved by creating an investor friendly climate through policy decisions, fast and efficient decision making process and removal of the roadblocks. It is equally important to monitor the fields/blocks which are on production or under various phases of exploration/ appraisal/ development for higher and early monetization.

A National Data Repository (NDR) to house all the available E&P data of the country is being set up. This will enable all the E&P companies to view the country's data from anywhere in the world and make their own assessment regarding the sedimentary areas of India.

The Directorate General of Hydrocarbons (DGH) plays pivotal role in achieving the aforementioned objectives. As the technical arm of the ministry, DGH advises the ministry on various issues to accelerate exploration and production activities in the country.

This publication by DGH 'Hydrocarbon Exploration and Production Activities 2013-14' is a valuable source of information and would serve as a reference book for the investors and all other stakeholders. I extend best wishes to all personnel in DGH for giving a greater impetus to the upstream activities in the country.

S. Chandra

(Saurabh Chandra)

सत्यमेव जयते
बी.एन. तालुकदार
महानिदेशक
B. N. TALUKDAR
Director General

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From the Director General's Desk

Because of the continued increasing demand for crude oil products and natural gas combined with the fact that our country has so far established a limited amount of hydrocarbons resources, challenges have emerged in front of the upstream oil and gas sector in the country to make available more and more indigenous hydrocarbons. The country immediately needs to enhance the hydrocarbon resource kitty and their production from both the existing and to-be-discovered hydrocarbon resources. Since most of our country's old and mature fields are on decline, there is obviously an urgent need to have a quantum jump in the exploration efforts. At the same time, considering the fact that there is a time lag between the discovery and commercial production there from, utmost attention has to be paid to enhance the production and recovery from the existing resources with application of advanced and appropriate technologies (IOR/EOR etc.) so that the country's overall production level does not go down because of the decline in the mature oil/gas fields.

Out of the total currently estimated resources of about 28 Billion Tonnes of oil & oil equivalent of gas, only little over 10 billion tones have been established so far during the last 70 years of active exploration in the country. As of today, a recent study has shown that only half of the Indian Sedimentary basinal area has been appraised and remaining half is yet to be explored. This calls for huge supplemental efforts by the private and multinational companies who could be attracted for making investments in this sector in the country in addition to the NOCs viz. Oil and Natural Gas Corporation Limited (ONGC) and Oil India Ltd. (OIL).

Policy reforms during the last two decades with the introduction of NELP and CBM rounds of bidding, led to considerable amount of investment by the multinational, Indian Private and NOCs in this sector. The efforts however, need to be further accelerated on much higher scale to narrow the huge gap between the hydrocarbon demand and availability in the country.

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The Directorate General of Hydrocarbons has been assigned several added responsibilities from time to time in addition to its mandated responsibilities under the Government Resolution dated 8th April, 1993. Monitoring and regulating the Production Sharing Contracts for Pre-NELP discovered fields, Pre-NELP Exploration blocks, NELP blocks and the CBM contracts along with monitoring of the exploration and production aspects of the National Oil Companies viz. ONGC & OIL have become a big challenge for DGH. While carrying out these added responsibilities, the original mandate of promoting sound management of the Indian petroleum and natural gas resources almost got a back seat in the recent past. Lot of efforts are now being made to restore the technological environment in DGH.

While the major initiatives that have been taken in the recent past by the Government with due inputs from DGH are covered in this report, the initiatives that have been taken primarily by DGH are highlighted below:

- Coverage of the un-appraised sedimentary area by 2D Seismic Survey along with drilling of a limited number of parametric wells.
- Multi-client non-exclusive seismic survey by internationally reputed firms at their own cost.
- Oil and gas resources estimation of the entire 26 sedimentary basins of the country by engaging internationally reputed firms. The last estimation was done for only 15 sedimentary basins 16 years ago.
- Formation of a National Data Repository (NDR) for the entire exploration and production data of the country. The mechanical completion of this project, which is being set up at DGH premises, is already over.
- Identification of the exploration blocks for the next round of NELP bidding is complete.
- Policy for development of marginal oil/gas fields of the country is in its advanced stage of formulation.
- Formulation of Good International Petroleum Industry Practices (GIPIP) and Site Restoration Policy which have been pending since the implementation of the PSC regime are being rigorously pursued.
- Development of a robust "Management Information System" for DGH which was missing in the past causing problems for continuous monitoring of exploration and production activities of the country is being prepared; an interim MIS has already been prepared in-house. This has assumed utmost importance because of the fact that the DGH officers are on tenure posting deputed by the Oil PSUs.
- Implementation of the Shale Oil and Shale Gas policy in the nominated blocks of the NOCs viz. ONGCL and OIL is being monitored.
- Planning for second expedition for exploration of Gas Hydrates in the potential offshore areas of the country is in its advanced stage.

DGH brings out an annual publication in the form of a report on the "Hydrocarbon Exploration and Production Activities" every year. This particular publication gives an account of exploration/development and production activities carried out during 2013-14 and also a summary status of these activities carried out so far in the country. This report also provides a pan India outlook of the E&P sector for the future.

The exemplary work put in by the DGH team in compiling and publishing this report is appreciated. DGH will always welcome suggestions from our stakeholders for improvement in the content of the future report or any other suggestions which could be incorporated in the future reports to encourage overall growth of the upstream oil and gas sector of the country.

(B.N. Talukdar)
Director General

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महानिदेशक की ओर से

कच्चे तेल के उत्पादों और प्राकृतिक गैस की बढ़ती मांग के साथ ही हमारे देश में हाइड्रोकार्बन संसाधनों के बेहद सीमित होने से, देश के तेल और गैस क्षेत्र के नेतृत्व के सामने, अधिक से अधिक स्वदेशी हाइड्रोकार्बन उपलब्ध कराने की चुनौतियां उठ खड़ी हुई हैं। देश को तुरंत हाइड्रोकार्बन संसाधन कोष और उनके उत्पादन को बढ़ाने की जरुरत है। ऐसे हाइड्रोकार्बन संसाधनों को भी जो कि पहले से मौजूद हैं और साथ ही उन नए हाइड्रोकार्बन संसाधन को भी जिन्हें अभी तलाशा जाना है। जब से हमारे देश के पुराने और परिपक्व क्षेत्रें में ह्रास हुआ है, तो ऐसे में यह स्वाभाविक आवश्यकता आन पड़ी है कि तलाशने के प्रयासों में एक लम्बी छलांग लगाई जाए। ठीक इसी समय, इस तथ्य को ध्यान रखते हुए कि अन्वेषण और उत्पादन शुरू करने के बीच में एक समय अंतराल होता है, यहाँ मौजूदा संसाधनों में उन्नत और उचित तकनीक (IOR, EOR आदि) के इस्तेमाल से उत्पादन को बढ़ाने की तरफ सर्वाधिक ध्यान दिए जाने की जरुरत है। इससे, तेल, गैस के परिपक्व क्षेत्र में ह्रास होने के कारण देश का कुल उत्पादन स्तर नहीं गिरेगा।

तेल और तेल की समकक्ष गैसों के तकरीबन 28 अरब टन के वर्तमान अनुमानित संसाधन में से, देश में सक्रिय तौर से खोजे जाने के पिछले 70 सालों में, केवल 10 अरब टन से कुछ ही अधिक संसाधन स्थापित किए जा सके हैं। एक ताजा अध्ययन दर्शाता है कि अब तक भारतीय अवसादीय क्षेत्र (सेडीमेंट्री बेसिनल एरिया) के केवल आधे हिस्से का ही मूल्यांकन किया गया है शेष आधा अब भी खोजा जाना बाकी है। यह उन निजी तथा बहुराष्ट्रीय कम्पनियों के लिये आमन्त्रण है जो कि ओएनजीसी तथा ओआईएल जैसी कम्पनियों के साथ जुड़कर देश के इन क्षेत्रें में निवेश कर सकें।

पिछले दो दशकों के दौरान हुए नीतिगत सुधारों, मसलन नीलामी में एन.ई.एल.पी. और सी.बी.एम. प्रणालियों के लागू होने से इस क्षेत्र में बहुराष्ट्रीय कम्पनियों, भारतीय निजी क्षेत्र और नेशनल ऑयल कॉर्पोरेशनों द्वारा काफी निवेश किया गया है। देश में उपलब्ध हाइड्रोकार्बन की मांग तथा पूर्ति के बीच के इस बड़े फासले को कम करने के लिये, इन प्रयासों को तेजी से और अधिक ऊँचे स्तर पर ले जाना होगा।

8 अप्रैल 1993 के सरकारी प्रस्ताव में निर्धारित की गई जिम्मेदारियों के अलावा भी हाइड्रोकार्बन महानिदेशालय को समय–समय पर अतिरिक्त जिम्मेदारियां दी जाती हैं। एनईएलपी से पहले तलाश लिए गये क्षेत्रों, एनईएलपी से पहले विस्तारित किए गये ब्लॉक्स, एनईएलपी ब्लॉक्स के उत्पादन विभाजन से जुड़े अनुबंध और सीबीएम के अनुबंधों का नियन्त्रण तथा संचालन,

हाइड्रोकार्बन के महानिदेशालय के लिए एक बड़ी चुनौती बन गया है। इसके साथ ही ओएनजीसी और ओआईएल जैसी राष्ट्रीय तेल कम्पनियों को विस्तार देने और उनके उत्पादन का नियन्त्रण भी महानिदेशालय के लिए बड़ी चुनौती है। इन सभी अतिरिक्त कार्यों के कारण भारतीय तेल तथा प्राकृतिक गैस संसाधनों के सहज नियन्त्रण का मूल लक्ष्य, हाल के समय में प्राथमिकता से हटकर कहीं पीछे जा चुका है। इससे निपटने के लिए हाइड्रोकार्बन के महानिदेशालय को तकनीकी तौर पर समृद्ध करने के कई प्रयास किए जा रहें हैं।

हाल के समय में, महानिदेशालय के सहयोग के साथ सरकार द्वारा लिये गये मुख्य कदमों को इस रिपोर्ट में शामिल किया गया है। महानिदेशालय द्वारा लिये गये प्राथमिक कदम निम्नलिखित हैं:

- अनअवलोकित अवसादी क्षेत्रों (सेडीमेंट्री एरिया) को, २डी सिस्मिक सर्वेक्षण के साथ ही कुछ सीमित मानक कुओं की खुदाई कर शामिल करना।
- अन्तर्राष्ट्रीय ख्याति की कम्पनियों द्वारा उनके अपने खर्चे पर एक से अधिक कम्पनियों को शामिल कर सिस्मिक सर्वेक्षण।
- अन्तर्राष्ट्रीय ख्याति की कम्पनियों द्वारा देश के सभी 26 अवसादी बेसिन्स के तेल तथा प्राक तिक गैस का आकलन। अन्तिम आंकलन 16 वर्ष पहले सिर्फ 15 अवसादी बेसिन्स का किया गया था।
- समग्र अन्वेषण प्रक्रिया तथा उत्पादन के आँकड़ों के लिये एक राष्ट्रीय तथ्य आधान (NDR) का निर्माण। डीजीएच परिसर में बनाई गई इस परियोजना का यांत्रिक पक्ष पहले ही पूरा हो चुका है।
- एन.ई.एल.पी. (NELP) नीलामी के अगले सत्र के लिये ब्लॉक की खोज तथा पहचान प्रक्रिया पूर्ण की जा चुकी है।
- देश के उपेक्षित तेल/गैस क्षेत्रों के विकास की नीति अपने निर्माण की उन्नत स्थिति में है।
- पीएससी के दौर से लटकी हुई, अंतर्राष्ट्रीय पैट्रोलियम उद्योगकी बेहतर प्रथाओं के निर्माण और स्थल पुनर्निर्माण की नीति अब सख्ती से अपनाई जा रही है।
- हाइड्रोकार्बन महानिदेशालय के लिए एक ठोस ''प्रबंधन संचार प्रणाली'' (MIS) बनाई जा रही है, जो कि अब तक उत्पादन और अन्वेषण की निरंतर निगरानी के अभाव के चलते उपलब्ध नहीं थी। एक अंदरुनी एम.आई.एस. पहले ही बना लिया गया है। इसे इस तथ्य की वजह से बेहद महत्वपूर्ण माना जा रहा है क्योंकि डीजीएच के अधिकारी सार्वजनिक क्षेत्र के तेल उपक्रमों से प्रतिनियुक्त पर आते हैं।
- राष्ट्रीय तेल कम्पनी जैसे कि ओएनजीसीएल तथा ओआईएल के नामित ब्लॉक्स के लिये शेल तेल तथा शेल गैस नीति को लागू करने का कार्य प्रगति पर है।
- देश में तटों से दूर के सम्भावित क्षेत्रें में उपलब्ध गैस हाइड्रेट्स की खोज के अभियान की योजना अपने उच्च स्तर पर है।

महानिदेशालय द्वारा प्रत्येक वर्ष ''हाइड्रोकार्बन खोज तथा उत्पादन प्रक्रियाओं'' पर एक रिपोर्ट प्रकाशित की जाती है। इस प्रकाशन में वर्ष २०१३–१४ के अन्तर्गत की गई खोज/विकास तथा उत्पादन गतिविधियों की जानकारी है तथा इस देश में अभी तक की गई ऐसी गतिविधियों का साराँश भी दिया गया है। इस रिपोर्ट में भविष्य के अन्वेषण और उत्पादन (E&P) क्षेत्र की सम्पूर्ण भारतीय स्थिति का एक दृष्टिकोण भी दिया गया है।

महानिदेशालय टीम द्वारा इस रिपोर्ट के निर्माण तथा प्रकाशन के लिये किया गया अनुकरणीय कार्य सराहा गया है। महानिदेशालय, हमारे हितधारकों (Stakeholders) द्वारा इस रिपोर्ट के सुधार के लिये दिये जाने वाले सुझावों का स्वागत करता है, जिसे देश के तेल तथा गैस क्षेत्र के समग्र विकास के लिये भविष्य की रिपोर्ट्स में शामिल किया जा सके।

बी.एन. तालुकदार

(बी. एन. तालुकदार)
महानिदेशक

HIGHLIGHTS OF E&P SECTOR DURING 2013-2014

28 Hydrocarbon Discoveries

13 Oil & 15 Gas discoveries notified by the Contractors

37.78 MMT

Crude oil production in 2013-14

35.41 BCM

Natural gas production in 2013-14

313.32 MMT (O+OEG)

Inplace Accretion in 2013-14

99.79 MMT (O+OEG)

Accretion of Reserves in 2013-14

12 Field Development Plans

Approved by Management Committee in 2013-14 under PSC regime

178 active PSCs

12 Pre-NELP, 139 NELP & 27 Small & Medium size field PSCs

386 active Nomination acreages

17 PEL and 369 PML acreages

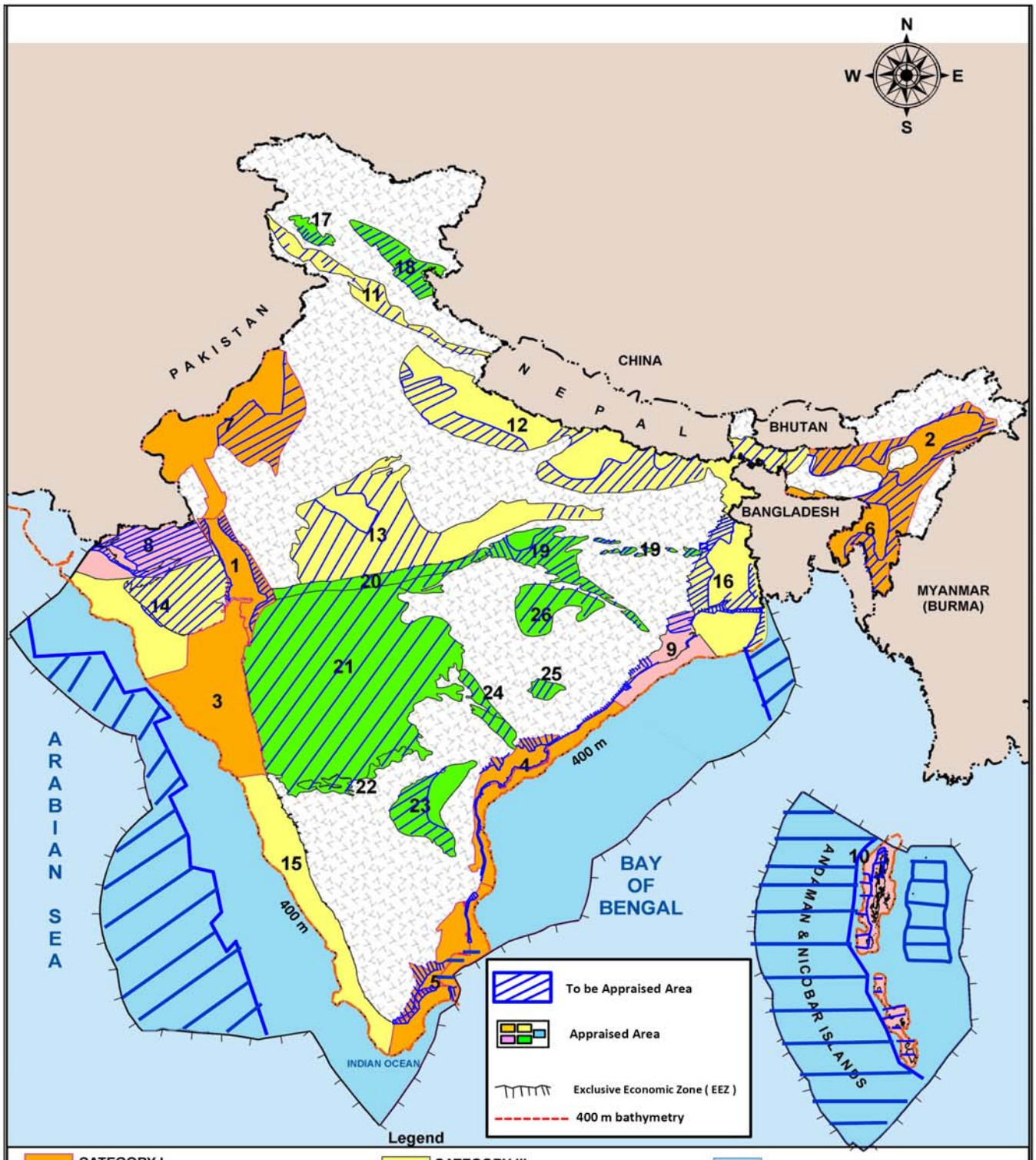
3802 GLKM & 12414 SQKM

2D and 3D seismic data acquired in 2013-14

652 wells

Exploratory & Development wells drilled in 2013-14

MAP OF INDIAN SEDIMENTARY BASINS SHOWING APPRAISED & UN-APPRAISED AREAS

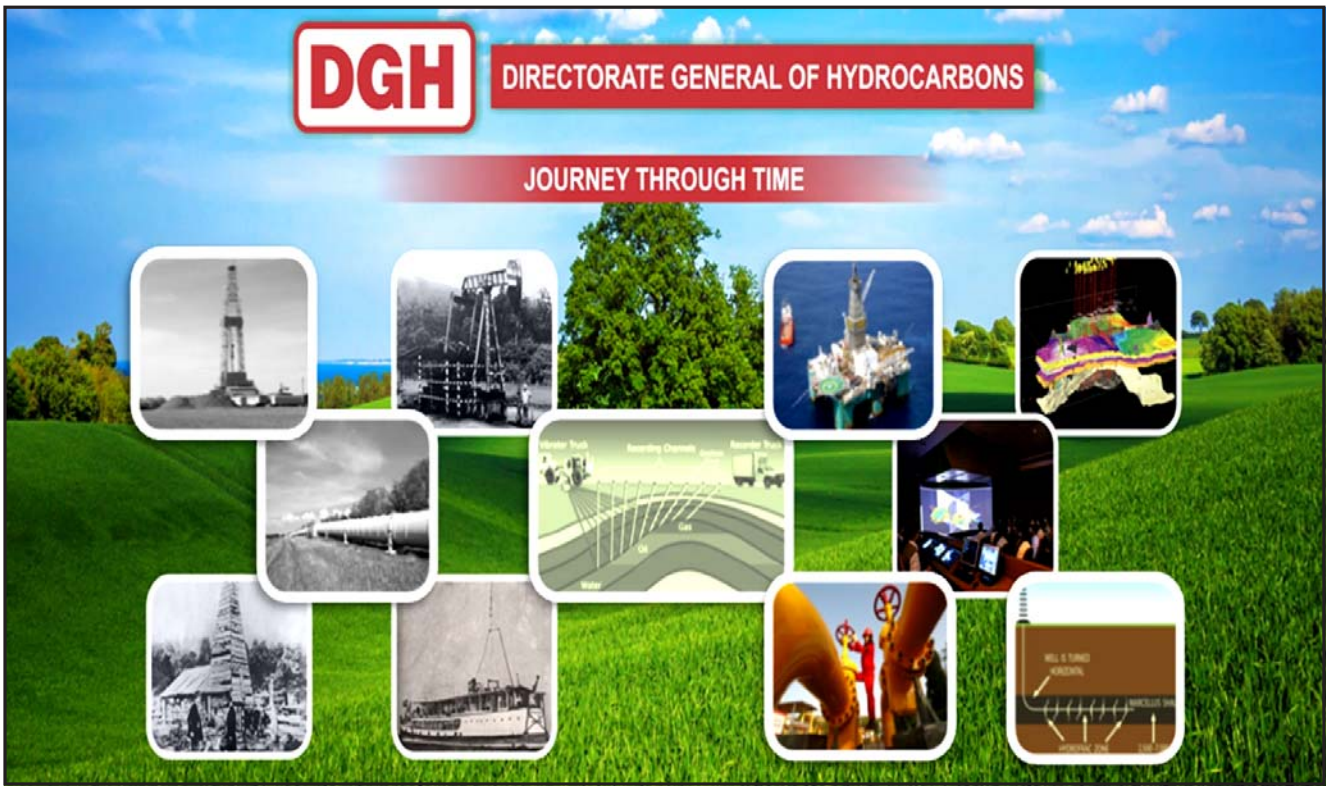


Category I	Category II	Category III	Category IV
1. Cambay Basin	8. Kutch Basin	11. Himalayan Foreland	17. Karewa Basin
2. Assam Shelf Basin	9. Mahanadi Basin	12. Ganga Basin	18. Spiti -Zanskar Basin
3. Mumbai Offshore Basin	10. Andaman-Nicobar Basin	13. Vindhyan Basin	19. Satpura-South Rewa-Damodar Basin
4. Krishna -Godavari Basin		14. Saurashtra Basin	20. Narmada Basin
5. Cauvery Basin		15. Kerala -Konkan -Lakshadweep Basin	21. Deccan Syneclise Basin
6. Assam-Arakan Fold Belt		16. Bengal Basin	22. Bhima -Kaladgi Basin
7. Rajasthan Basin			23. Cuddapah Basin
			24. Pranhita- Godavari Basin
			25. Bastar Basin
			26. Chhattisgarh Basin

CONTENT


DGH

DGH
At a Glance



DGH- Journey through time

Lighting of Lamp on DGH Foundation Day

DGH - AT A GLANCE

In view of the need to establish an agency that could effectively supervise the activities of all E&P companies from the private & joint sectors in the national interest, Directorate General of Hydrocarbons was set up through GoI resolution No. O-20013/2/92/ONG-III, on 8th of April, 1993 under the administrative control of the Ministry of Petroleum and Natural Gas.

1.1 OBJECTIVE

The objective of DGH is to promote sound management of the Indian Petroleum and Natural Gas resources having a balanced regard for the environment, safety, technological and economic aspects of the petroleum activity.

1.2 ROLE & FUNCTIONS

- A nodal agency for implementation of NELP and CBM policy on behalf of Ministry of Petroleum & Natural Gas.
- To advise Ministry of Petroleum & Natural Gas on Exploration strategies & Production Policies.
- To provide technical advice to the Ministry of Petroleum and Natural Gas on issues relevant to the exploration and optimal exploitation of hydrocarbons in the country.
- To review the exploration programmes of companies operating under Petroleum Exploration Licences granted under the Oilfields (Regulation and Development) Act, 1948 and the Petroleum and Natural Gas Rules, 1959 with a view to advising Government on the adequacy of these programmes.
- To evaluate the hydrocarbon reserves discovered and estimated by the operating companies.
- To advise the Government on the offering of acreages for exploration to companies as well as matters relating to relinquishment of acreage by companies.
- To review the development plans for commercial discoveries of hydrocarbon reserves proposed by the operating companies and advise Government on the adequacy of such plans and the exploitation rates proposed and matters relating thereto.
- To review and audit concurrently the management of petroleum reservoirs by operating companies and advise on any mid course correction required to ensure sound reservoir management practices in line with the optimal exploitation of reserves and the conservation of petroleum resources.
- To regulate the preservation, upkeep and storage of data and samples pertaining to petroleum exploration, drilling, production of reservoirs etc. and to cause the preparation of data packages for acreage on offer to companies.
- All other matters incidental thereto and such other functions as may be assigned by Government from time to time.
- Assist Government in Contract management functions.
- Exploration & Development of unconventional hydrocarbon resources like Gas Hydrate, Shale gas/oil and oil shale.
- Issue Essentiality Certificate for importing goods and services used in E&P sector to avail custom duty concessions.

1.3 ADVISORY & ADMINISTRATIVE COUNCIL OF DGH

Advisory Council

Directorate General of Hydrocarbons has an Advisory Council, which is appointed by the Government comprising of Chairman and members, who are eminent persons in the field of hydrocarbon exploration and production. The Advisory Council is serviced by the Directorate which is headed by a Director General who is also the Member Secretary to the Council.

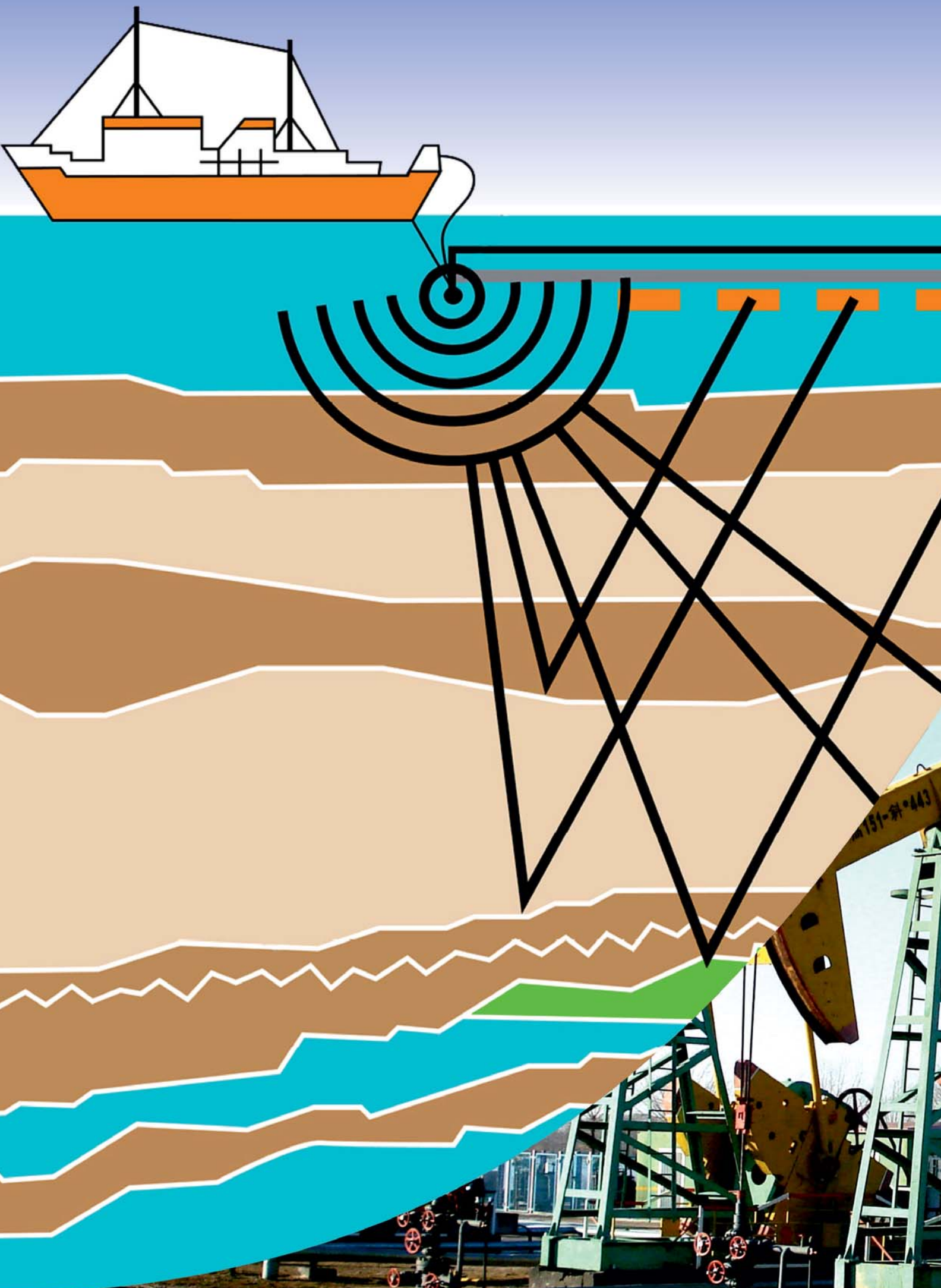
Administrative Council

Govt. of India set up an Administrative Council on 02.02.2001 to guide and take care of all administrative aspects of the functioning of DGH, through Office Memorandum No. O-32012/1/95-ONG-III dated 2.2.2001. The Administrative Council, in particular, takes decisions on various matters concerning establishment, budget and also undertakes periodical review of the functioning of DGH. It is headed by Secretary (P&NG) and has the following composition :

Name	Designation
Secretary, MOPNG	Chairman
Additional Secretary, MOPNG	Member
AS&FA, MOPNG	Member
JS(E), MOPNG	Member
Secretary, OIDB	Member
DG, Directorate General of Hydrocarbons	Member-Convener

NDR Progress Review

Onland Seismic Data Acquisition



Exploration and Production Scenario

Oil and Gas Operations

EXPLORATION AND PRODUCTION SCENARIO

2.1 PREAMBLE

India is one of the fastest growing economies in the world. Strong GDP growth rate have resulted in a surging demand for energy including oil & gas. India is the fourth largest primary energy consumer, after China, USA and Russia. The Government has taken number of measures to bring in healthy competition and public participation by the way of New Exploration and Licensing policy (NELP) for exploration & production of oil & gas in the country. NELP has not only accelerated the quest for hydrocarbon exploration, but has also brought the state of the art technology and efficiency of operations / management to the country. Brief of India's Exploration & Production sector are as follows :

2.1.1 There have been four different regimes in the matter of Petroleum Exploration License (PEL) and Petroleum Mining Lease (PML) respectively for exploration & production of oil and gas namely:

i) PEL and PML granted to National Oil Companies viz. Oil and Natural Gas Corporation Ltd (ONGC) and Oil India Ltd. (OIL), on Nomination basis before 1991

ii) PML granted under small/medium size discovered field Production Sharing Contract (PSCs) during 1991 to 1993, through International Competitive Bidding

iii) PEL granted through Pre-NELP PSCs during 1993 to 2003 and PMLs granted subsequently

iv) PELs and PMLs granted under the New Exploration Licensing Policy (NELP) from 1999 onwards

2.1.2 ONGC and OIL, the two National Oil Companies as well as private and joint-venture companies are engaged in the Exploration and Production (E&P) activities of oil and natural gas in India.

2.1.3 Consequent upon liberalization in petroleum sector, Govt. of India is encouraging participation of foreign and Indian companies in hydrocarbon exploration and development activities to supplement the efforts of national oil companies to narrow the gap between supply and demand.

2.1.4 Government of India has signed contracts for 29 discovered fields, 28 exploration blocks under pre-NELP regime and 254 blocks under NELP regime with National Oil Companies and private (Both Indian and foreign)/ Joint Venture companies. At present, out of 311 exploration blocks/fields awarded so far under various bidding rounds (Discovered Field, Pre-NELP & NELP), 178 blocks/fields are operational.

2.1.5 The pace of exploration for oil and gas has accelerated after the introduction of NELP regime. The awarded 254 blocks are located in onland (111), offshore shallow water (62) and deepwater (81) areas. As a result of exploratory activities, several unexplored and poorly explored areas, in particular offshore and deepwater areas have been appraised through geophysical surveys and exploratory drilling.

2.1.6 NELP bidding rounds have attracted many Private and Foreign Companies in addition to PSUs. Before the NELP, a total 35 E&P Companies (5 PSUs, 15 Private and 15 Foreign) were working in Nomination and Pre-NELP regime. After the conclusion of nine rounds of NELP bidding, the total number of companies has increased to 117 (11 PSUs, 58 Private and 48 Foreign Companies as Operators

and Non-operators/Consortium Partners). Major Private Companies are RIL, Jubilant, Essar and Foreign Companies are British Gas, British Petroleum, Cairn Energy, ENI, Santos and BHP Billiton.

2.1.7 Public Sector Undertakings (PSU) IOCL, GAIL, BPCL working under MOP&NG and their subsidiaries like Bharat Petro Resources Ltd (Subsidiary of BPCL), Prize Petroleum Company Limited (Subsidiary of HPCL), have participated in various NELP bidding rounds and have been awarded exploration blocks in India. In addition to central PSU, state PSU like GSPC have participated in various NELP bidding rounds and have been awarded exploration blocks in India.

2.1.8 The domestic crude oil/gas production in the country consists of oil production from Nomination Blocks/Fields under ONGC and OIL and from the discovered fields and producing Pre-NELP and NELP blocks under the Production Sharing Contract (PSC) regime. The average oil and gas production under the NELP regime during the current year (April, 2013 - March, 2014) is to the tune of 7311 barrels/day (BOPD) and 13.84 Million Standard Cubic Meters per day (MMSCMD) respectively.

2.1.9 In order to harness Coal Bed Methane (CBM) potential in the country, in May 2001 for the first time in the country CBM blocks were offered through International Competitive Bidding for exploration and production of CBM. So far, Government has awarded 30 CBM blocks under four rounds of CBM bidding to National, Private & Joint Venture Companies. In addition, 3 CBM blocks were awarded on Nomination basis earlier. These blocks are in the states of Jharkhand, West Bengal, Chhattisgarh, Madhya Pradesh, Maharashtra, Rajasthan, Gujarat, Andhra Pradesh, Tamil Nadu, Odisha & Assam. At present out of 33 CBM blocks awarded so far, 29 CBM blocks are operational.

2.2 SEDIMENTARY BASINS OF INDIA

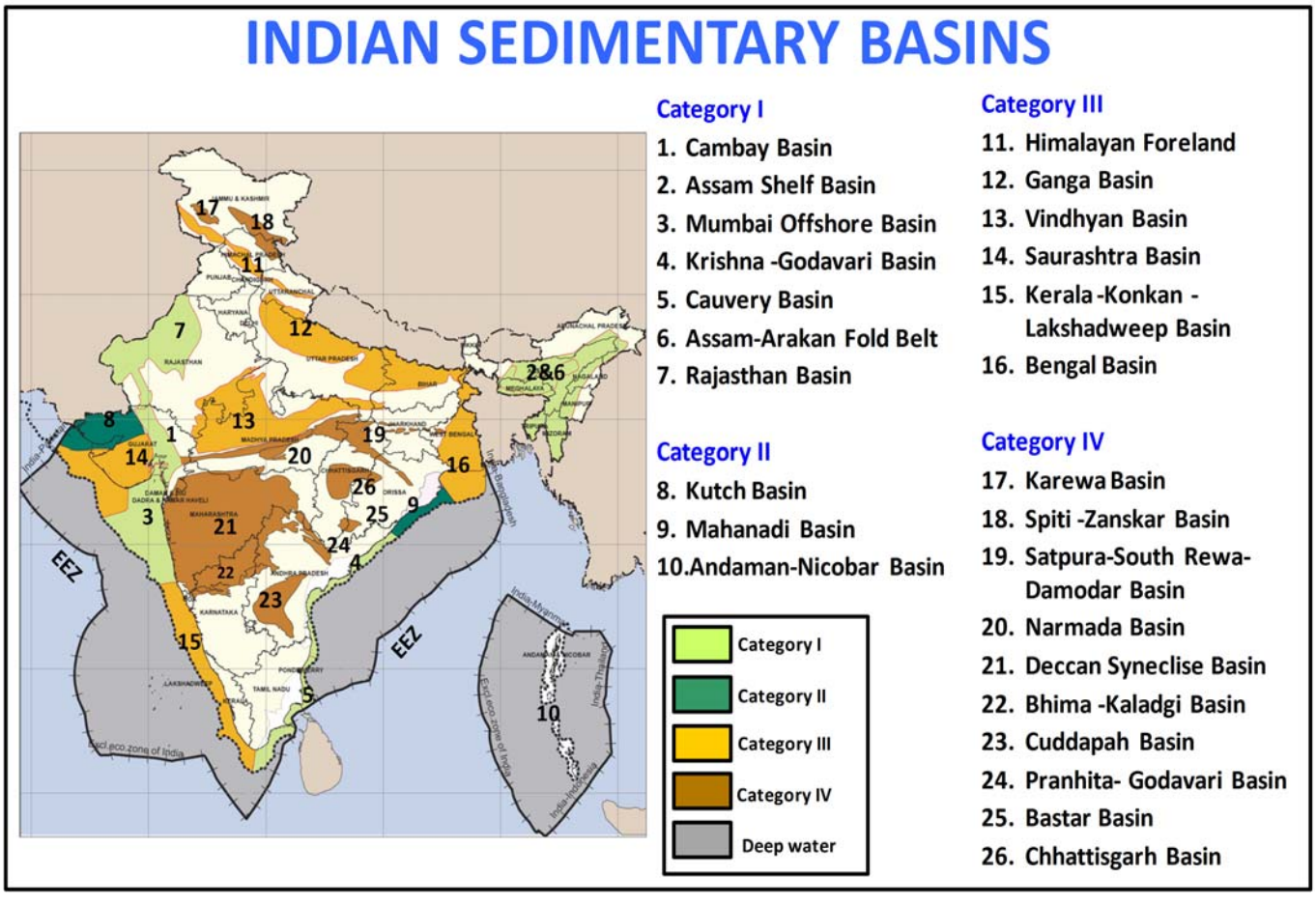
2.2.1 India has an estimated sedimentary area of 3.14 million sq km. comprising 26 sedimentary basins, out of which, 1.30 million sq km. area is in deepwater and 1.84 million sq km. area is in onland and shallow offshore. As on 31.03.2014, 0.38 million sq km. area is held under Petroleum Exploration Licenses (PELs) in 17 basins by National Oil Companies viz. Oil and Natural Gas Corporation Limited (ONGC), OIL India Limited (OIL) and Private/Joint Venture companies and 0.068 million sq km. area is held under Petroleum Mining Licenses (PMLs) in 7 basins by National Oil Companies (ONGC & OIL) and Private/ Joint Venture companies.

The basin-wise exploration activities are continuing in the country for more than 100 years. National Oil companies – Oil & Natural gas Corporation (ONGC) and Oil India Limited (OIL) are carrying out exploration and production activities since late 1950's and discovered many new fields in different basins. To invite state of the art technology in the field of exploration and production of hydrocarbon in the country, Government of India has opened up to tap the country's hydrocarbon resources by accelerating domestic exploration through Pre-NELP and NELP policy initiative.

There have been significant forward steps in exploring the hydrocarbon potential of the sedimentary basins of India, mainly due to surveys carried out by DGH in unexplored/poorly explored areas of the country including deep waters of the west coast, east coast and in Andaman Sea and acreages awarded for exploration under various NELP rounds. Concerted efforts are continuously being done to reduce the unexplored area further.

Before implementing the New Exploration Licensing Policy (NELP) in 1999, 11% (area) of Indian sedimentary basins was under exploration, which has now increased significantly.

The areas of all the 26 Sedimentary basins are given at table 2.2.2. Sedimentary basinal areas (Historical Data) are given at para 2.2.3 and Appraisal of sedimentary basins are given at para 2.2.4.



2.2.2 : Category & Area of Sedimentary Basins

Category*	Basin (Up to 400m Isobath)	Basinal Area (Sq. Km.)		
		Onland	Offshore	Total
I	Cambay	51,000	2,500	53,500
	Assam Shelf	56,000	----	56,000
	Mumbai offshore	----	118,000	118,000
	Krishna Godavari	28,000	30,000	58,000
	Cauvery	25,000	36,000	61,000
	Assam-Arakan Fold Belt	60,000	----	60,000
	Rajasthan	126,000	----	126,000
	SUB. TOTAL	**346,000**	**186,500**	**532,500**
II	Kutch	35,000	13,000	48,000
	Mahanadi-NEC	55,000	21,000	76,000
	Andaman-Nicobar	6,000	52,000	58,000
	SUB. TOTAL	**96,000**	**86,000**	**182,000**
III	Himalayan Foreland	30,000	----	30,000
	Ganga	186,000	----	186,000
	Vindhyan	162,000	----	162,000
	Saurashtra	52,000	44,000	96,000
	Kerala-Konkan-Lakshadweep	----	94,000	94,000
	Bengal	57,000	35,000	92,000
	SUB. TOTAL	**487,000**	**173,000**	**660,000**
IV	Karewa	3,700	----	3,700
	Spiti-Zanskar	22,000	----	22,000
	Satpura-South Rewa-Damodar	46,000	----	46,000
	Narmada	17,000	----	17,000
	Decan Syneclise	273,000	----	273,000
	Bhima-Kaladgi	8,500	----	8,500
	Cuddapah	39,000	----	39,000
	Pranhita-Godavari	15,000	----	15,000
	Bastar	5,000	----	5,000
	Chhattisgarh	32,000	----	32,000
	SUB. TOTAL	**461,200**	----	**461,200**
	TOTAL	**1,390,200**	**445,500**	**1,835,700**
V	**DEEP WATERS**			
	The Deepwater Areas bounded by Kori-Comorin Ridge, 85^0 E Ridge & Narcodam Island in West Coast , East Coast and in Andaman Islands respectively	----	----	1,299,000
	GRAND TOTAL	----	----	**3,134,700**

* Categorization based on the prospectivity of the basin as presently known. The four recognized categories are basins which have :

I Established commercial production

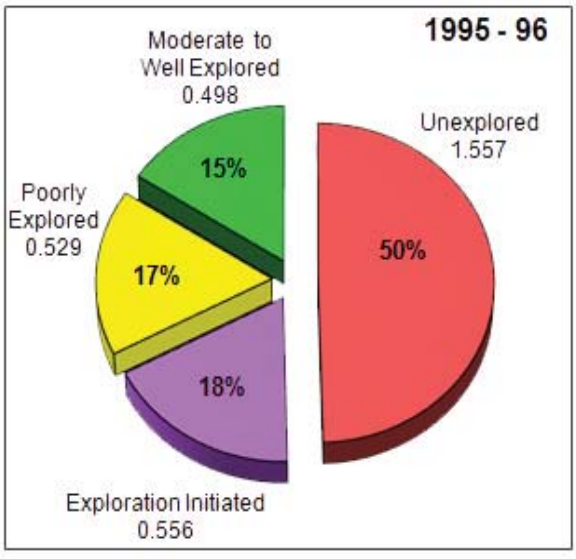
II Known accumulation of hydrocarbons but no commercial production as yet

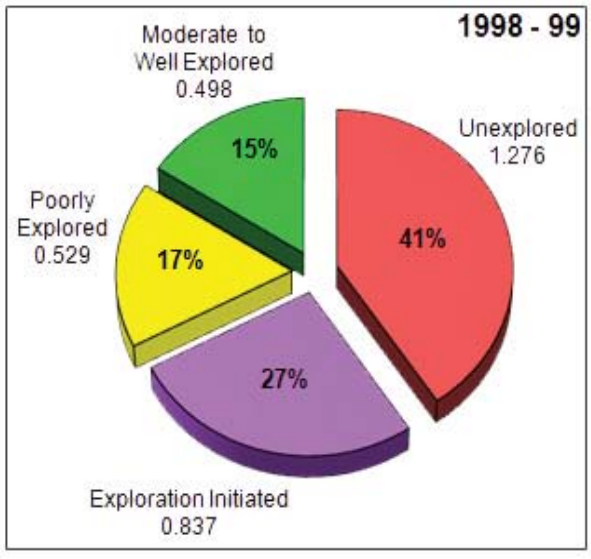
III Indicated hydrocarbon shows that are considered geologically prospective

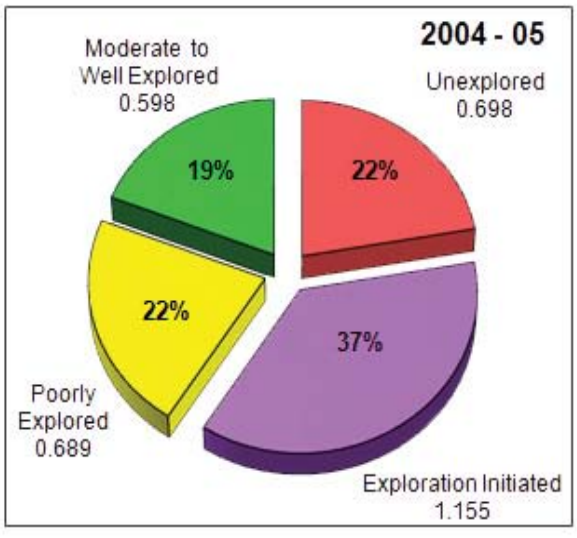
IV Uncertain potential which may be prospective by analogy with similar basins in the world.

This categorization will necessarily change with the results of further exploration.

2.2.3 : Sedimentary Basinal Areas (Historical Data)



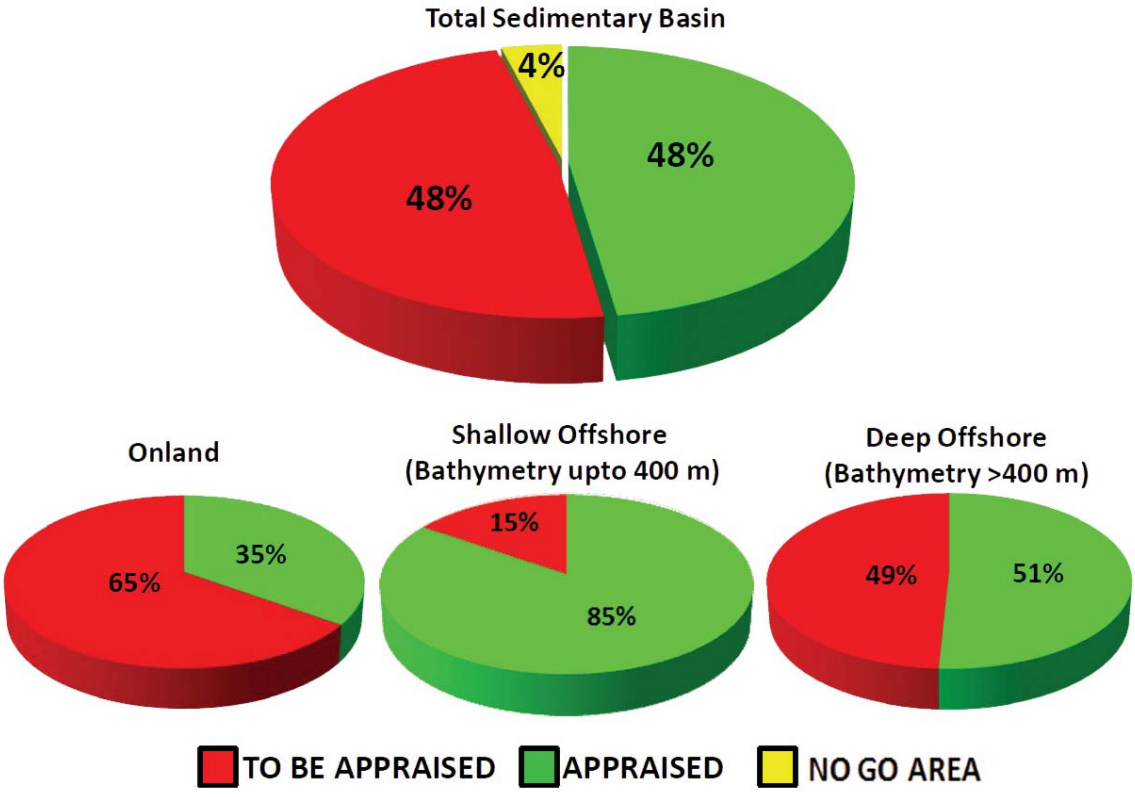




Total Sedimentary Area : 3.14 Million Sq. Km.

LEVEL OF EXPLORATION	AREA (Million Sq.Km.)		
	1995-96	1998-99	2004-05
UNEXPLORED	1.557	1.276	0.698
EXPLORATION INITIATED	0.556	0.837	1.155
POORLY EXPLORED	0.529	0.529	0.689
MODERATE TO WELL EXPLORED	0.498	0.498	0.598

2.2.4 : Appraisal of Indian Sedimentary Basins (As on 31.03.2014)



a) Definition

Appraisal of a sedimentary basin has been defined as the status of knowledge building efforts for evaluating hydrocarbon prospectivity of the basin through Geological studies, Geophysical surveys and exploratory drilling.

Criterion Adopted:

(i) A standard grid pattern of 10'X10' (approx. 310 Sq Kms) has been used for evaluation purpose for the existing 26 sedimentary basins for the onland and shallow offshore (bathymetry <400 m.) areas.

(ii) For the deep water areas (bathymetry > 400m), a grid pattern of 20'X20' (approx. 1243 Sq Kms) has been used due to its large spatial extent.

The following criteria have been used for determining the appraisal status for every 10'X10' grid area of onland and shallow offshore areas.

- ✓ Minimum 50 LKM 2D seismic lines, in combination with or without available 3D data
- ✓ One exploratory well, or
- ✓ Geological knowledge developed through data integration with adjacent blocks.

For the Deep Water areas, the following criteria has been considered for every 20'X20' grid area

- ✓ Minimum 200 LKM 2D seismic lines, or
- ✓ One exploratory well, or in combination with or without available 3D data
- ✓ Geological knowledge developed through data integration with adjacent blocks.

b) Sedimentary basin areas are considered ***Appraised*** where data as indicated above is available.

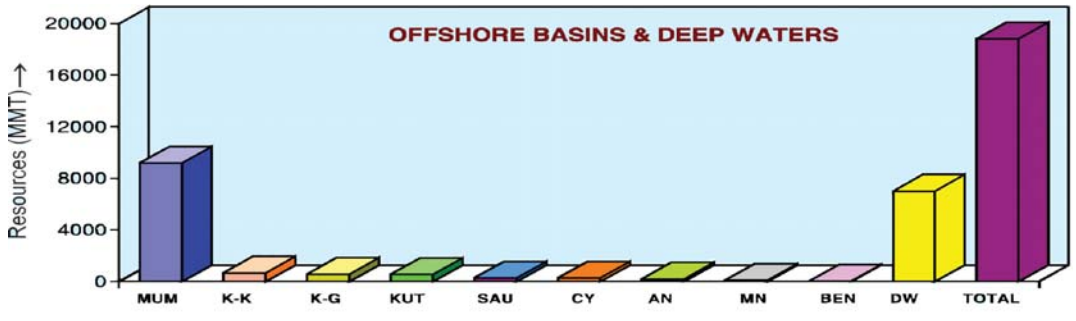
Areas which do not have the above required data are considered as yet ***To be appraised***. However, areas where exploration activities cannot be carried out in view of our present knowledge about regulations/ directives and restrictions and are considered as ***Not to be appraised (No Go Area)***.

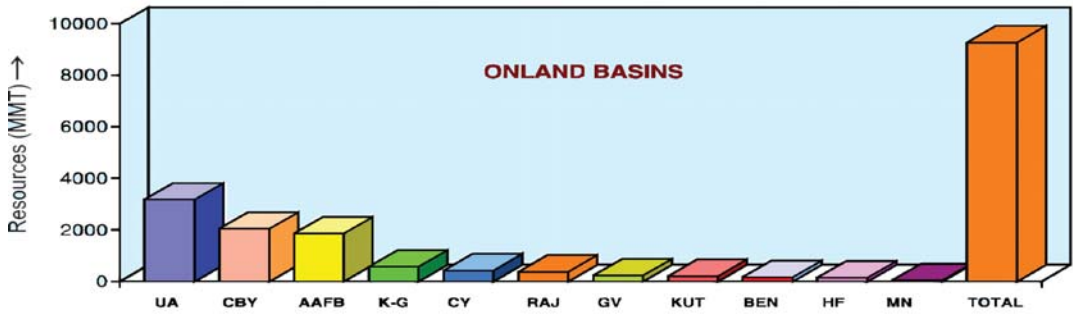
2.3 HYDROCARBON RESOURCES IN INDIA

2.3.1 Conventional Hydrocarbon Resources

The conventional hydrocarbon prognosticated resources in 15 sedimentary basins along with deep water areas of the country are of the order of 28.1 Billion Tonnes of Oil and Oil Equivalent of Gas. Until now, only in-place hydrocarbon volume of 10,947 MMT of Oil and Oil Equivalent Gas could be established through exploration by ONGC, OIL and Private/JV companies as on 31.03.2014. So, approximately 17 Billion Tonnes i.e. 61 % of resources (oil and oil equivalent of gas) is under "yet to find category". Basin-wise details of prognosticated hydrocarbon resources in the country are given as below:

BASIN	OFFSHORE (MMT)	ONLAND (MMT)	TOTAL (MMT)
MUMBAI	9190	-	9190
ASSAM-ARAKAN FOLD BELT	-	1860	1860
CAMBAY	-	2050	2050
UPPER ASSAM	-	3180	3180
KRISHNA-GODAVARI	555	575	1130
CAUVERY	270	430	700
RAJASTHAN	-	380	380
KUTCH	550	210	760
ANDAMAN-NICOBAR	180	-	180
KERALA-KONKAN	660	-	660
SAURASHTRA OFFSHORE	280	-	280
GANGA VALLEY	-	230	230
BENGAL	30	160	190
HIMALAYAN FORELAND	-	150	150
MAHANADI	100	45	145
DEEP WATER	7000	-	7000
GRAND TOTAL	**18815**	**9270**	**28085**





The Minister of Petroleum & Natural Gas has recently approved the constitution of a Multi Organization Team (MOT) to carry out re-assessment of Hydrocarbon Resources of India. The exercise will cover all the 26 sedimentary basins of India. Resource assessment is required to be completed within 30 months.

Out of 10,947 MMT of Oil and Oil Equivalent Gas of In-place volumes, the ultimate reserves which can be produced are about 4098 MMT of oil and oil equivalent gas. The balance recoverable reserves are of the order of 2190 MMT of oil and oil equivalent gas.

The details of reserves of the country as on 31.03.2014 are as under :

	Initial In-Place (MMT)			Ultimate Reserves (MMT)			Balance Recoverable Reserves(MMT)		
	Oil	Gas	O+OEG	Oil	Gas	O+OEG	Oil	Gas	O+OEG
ONGC*	5185	2325	7510	1462	1270	2732	567	764	1331
OIL*	803	344	1147	247	190	436	86	109	195
Pvt/JV	972	1318	2290	215	716	930	109	554	663
Total	**6961**	**3987**	**10947**	**1923**	**2176**	**4098**	**763**	**1427**	**2190**

O+OEG- Oil and Oil Equivalent of Gas. * As provided by ONGC & OIL

2.3.2 Unconventional Hydrocarbon Resources

2.3.2.1 CBM Resources

Prognosticated CBM resources are 2600 Billion Cubic Meters of CBM in 11 states of India out of which initial-in-place reserves of 280 Billion Cubic Meters of CBM have been established in 3 states of India.

Sl. No.	STATE	Prognosticated CBM Resources (BCM)	Prognosticated CBM Resources (TCF)
1	JHARKHAND	722.08	25.5
2	RAJASTHAN	359.62	12.7
3	GUJARAT	351.13	12.4
4	ORISSA	243.52	8.6
5	CHATTISGARH	240.69	8.5
6	MADHYA PRADESH	218.04	7.7
7	WEST BENGAL	218.04	7.7
8	TAMILNADU	104.77	3.7
9	ANDHRA PRADESH	99.11	3.5
10	MAHARASHTRA	33.98	1.2
11	NORTH EAST	8.50	0.3
Total CBM Resources		**2599.48**	**91.8**

*Conversion factor: 1 cubic meter = 35.3147 cubic feet
BCM - Billion Cubic Meters
TCF - Trillion Cubic Feet

In-place CBM Resources

In-place CBM resources of 9.90 TCF (Trillion Cubic Feet)/280.34 Billion Cubic Meters have been established by different operators as on 31.03.2014. Block wise reserves are given below:

S. No.	Block Name	Operator	In-place CBM Resources		State
			(BCM)	(TCF)	
1	SP (East)-CBM-2001/I	RIL	47.86	1.69	Madhya Pradesh
2	SP (WEST)-CBM-2001/I	RIL	55.50	1.96	Madhya Pradesh
3	Raniganj (South)	GEECL	54.37	1.92	West Bengal
4	RG (East)-CBM-2001/I	ESSAR	60.88	2.15	West Bengal
5	Raniganj (North)	ONGC	7.36	0.26	West Bengal
6	NK-CBM-2001/I	ONGC	9.63	0.34	Jharkhand
7	BK-CBM-2001/1	ONGC	30.02	1.06	Jharkhand
8	Jharia	ONGC	14.72	0.52	Jharkhand
Total			**280.34**	**9.9**	

2.3.2.2 Shale Gas/Shale Oil Resources

It is estimated that a number of onland sedimentary areas in Gangetic plain, Gujarat, Rajasthan, Andhra Pradesh & Assam in India, including the hydrocarbon bearing basins – Cambay, Cauvery, Krishna Godavari, Assam-Arakan & Damodar (Gondwana) have large shale deposits.

Various agencies have estimated the shale gas/oil resource potential in selected sedimentary basins/ sub-basins in India. The details are as under:

I. M/s Schlumberger : 300 to 2100 TCF of shale gas resource for the country (as available in public domain in January 2011)

II. Energy Information Administration (EIA), USA in 2011: 290 TCF of shale gas resource in 4 basins (Cambay Onland, Damodar, Krishna Godavari Onland & Cauvery Onland)

III. Energy Information Administration (EIA), USA in 2013: 584 TCF of shale gas resource and 87 billion Barrels of shale oil resource in 4 basins (Cambay Onland, Damodar, Krishna Godavari Onland & Cauvery Onland)

IV. ONGC: 187.5 TCF of shale gas resource in 5 basins (Cambay Onland, Ganga Valley, Assam & Assam Arakan , Krishna Godavari Onland & Cauvery Onland)

V. Central Mine Planning and Design Institute (CMPDI): 45 TCF of shale gas resource in 6 sub basins (Jharia¸ Bokaro, North Karanpura, South Karanpura, Raniganj & Sohagpur)

VI. United States Geological Survey (USGS) in January 2012 has also estimated technically recoverable shale gas resources of 6.1 TCF in 3 basins (Cambay Onland, , Krishna Godavari Onland & Cauvery Onland).

VII. USGS in Apr'14 has also estimated 62 million barrels of shale oil in Cambay basin and more than 3.7 TCF of gas in tight sandstone gas reservoirs in Cambay & Krishna Godavari.

The Government has issued "Policy Guidelines for Exploration and Exploitation of Shale Gas and Oil by National Oil Companies under Nomination regime" on 14th October, 2013. Under this Policy, the right to exploration and exploitation of Shale Gas & Oil will lie with the NOCs holding Petroleum Exploration License (PEL)/Petroleum Mining Lease (PML) granted under the nomination regime.

ONGC has drilled one well in Cambay basin in Gujarat for shale gas/Shale Oil exploration. Currently, there is no commercial production of shale gas/shale oil in the country.

2.3.2.3 Gas Hydrate

The presence of gas hydrate was established in the year 2006 in Krishna Godavari, Mahanadi and Andaman deep waters in numerous complex geologic settings. In accordance with the roadmap for the National Gas Hydrate Programme (NGHP), India has already acquired core samples under NGHP-01 Expedition in 2006. The cooperation between the Directorate General of Hydrocarbons (DGH) and U.S. Geological Survey(USGS), USA on exchange of scientific knowledge and technical personnel in the field of Gas Hydrate and research with the view to exploit the potential of Gas Hydrate as an alternate source of energy is in progress.

Based on the findings of NGHP Expedition-01, the Krishna Godavari deepwater basin and the Mahanadi deep waters have been considered potential areas for Gas Hydrate. Geo-scientific studies have been carried out in Krishna Godavari and Mahanadi offshore deepwater out to identity potential sand channel systems. Based on critical review of over 79 potential sites, the NGHP scientists along with international scientists have prioritized 20 sites for drilling and coring during NGHP Expedition-02. Depending on the results NGHP Expedition-02, the NGHP geoscientists plan to identify a suitable site for carrying out pilot production testing during NGHP Expedition-03. The NGHP Expedition-02 is currently under the planning stage.

Earlier studies have prognosticated gas hydrate resources of 1894 TCM for India and USDOE in Feb 2012 published that around 933 TCF is the concentration of gas hydrate in sands within the gas hydrate stability zone.

2.4 EXPLORATION ACTIVITIES AT A GLANCE

2.4.1 Exploration activities by Public Sector Undertakings (PSUs)

PSUs in E&P sector have carried out 1,159,253 line kilometre (LKM) of 2D seismic survey, 3D seismic survey of 270,321 Sq. Km and drilled 6268 exploratory wells since inception as on 31.3.2014. The company-wise details are as under:

S. No.	Company (Operator)	2D Seismic (LKM)	3D Seismic (SQ.KM)	Exploratory Wells (Nos.)
1	ONGC- Nomination	881604	98948	5650
2	Oil India Ltd. -Nomination	73181	12478	339
3	ONGC - PSC regime	196089	139592	184
4	Gujarat State Petroleum Corporation Ltd.	1958	6653	76
5	Oil India Ltd. - PSC regime	6421	11371	16
6	Indian Oil Corporation Ltd.	-	277	3
7	GAIL (India) Limited.	-	577	-
8	National Thermal Power Corporation	-	425	-
Grand Total		**1159253**	**270321**	**6268**

2.4.2 Exploration activities by Private Companies (Pre-NELP / NELP)

Indian Private Companies have carried out 101,995 line kilometre (LKM) of 2D seismic survey 104,466 Sq. Km of 3D seismic survey and drilled 265 exploratory wells since inception as on 31.3.2014. The company-wise details are as under:

S. No.	Company (Operator)	2D Seismic (LKM)	3D Seismic (SQ.KM)	Exploratory Wells (Nos.)
1	Adani Welspun Exploration Ltd.	-	3586	-
2	Essar Oil Ltd.	4425	1619	17
3	Esveegee Steel (Gujarat) Pvt. Ltd.	-	135	-
4	Focus Energy Ltd.	6763	5255	78
5	Geo Enpro	52	114	2
6	Hindustan Oil Exploration Company Ltd	626	1860	15
7	Interlink Petroleum Ltd.	-	64	2
8	Jay Polychem (India) Ltd.	-	268	2
9	Jubilant Oil & Gas Private Limited.	665	638	14
10	Mercator Petroleum Private Limited.	773	175	-
11	Prize Petroleum Company Ltd.	2050	304	2
12	Reliance Industries Ltd.	86475	90316	132
13	Selan Expl. Tech. Ltd.	166	132	1
	Private Total	**101995**	**104466**	**265**

2.4.3 Exploration activities by Foreign Companies (Pre-NELP / NELP)

Foreign Companies have carried out 63,209 line kilometre (LKM) of 2D seismic survey, 21,709 Sq. Km of 3D seismic survey and drilled 249 exploratory wells since inception as on 31.3.2014. The company-wise details are as under:

S. No.	Company (Operator)	2D Seismic (LKM)	3D Seismic (SQ.KM)	Exploratory Wells (Nos.)
1	BHP Billiton Pty. Ltd.	12806	-	-
2	British Gas Exploration and Production (India) Ltd.	2006	5187	15
3	Cairn Energy India Pty Ltd.	18344	6250	180
4	Canoro Resources Ltd.	346	104	4
5	ENI (India) Ltd.	5141	3170	1
6	Geo-Global Resources Inc.	476	-	-
7	Geo-Petrol International Inc.	206	-	-
8	Hardy E&P India Inc.	518	718	4
9	Heramac Ltd.	-	9	2
10	Naftogaz	319	537	8
11	Niko Resources Limited.	161	1304	26
12	OAO Gazprom	4932	530	3
13	Oilex-NL Holdings Ltd	-	178	1
14	Okland Offshore Holdings Ltd.	-	-	1
15	Petrogas	440	1120	3
16	Premier Oil North East India.	261	-	1
17	Santos International Operations Pty. Ltd.	17253	2602	-
	Grand Total	**63209**	**21709**	**249**

2.4.4 Hydrocarbon Discoveries

2.4.4.1 Basin-wise hydrocarbon discoveries since inception as on 31.03.2014

In India, so far 810 discoveries (Gas: 260, Oil: 550) have been made, of which 610 discoveries by NOCs and 200 discoveries by Private/Joint Venture Companies. Details as follows:

Basin Name	ONGC (Nomination Regime)			OIL (Nomination Regime)			PSC Regime			Grand Total		
	Gas	Oil	Total	Gas	Oil	Total	Gas	Oil	Total	Gas	Oil	Total
Cambay	13	188	201	0	0	0	13	52	65	26	240	**266**
Krishna Godavari	59	28	87	0	0	0	49	16	65	108	44	**152**
Rajasthan	11	0	11	0	0	0	8	28	36	19	28	**47**
Mahanadi-NEC	0	0	0	0	0	0	9	0	9	9	0	**9**
Assam-Arakan	17	43	60	12	94	106	7	0	7	36	137	**173**
Cauvery	10	24	34	0	0	0	3	3	6	13	27	**40**
Mahanadi	0	0	0	0	0	0	4	0	4	4	0	**4**
Mumbai	27	71	98	0	0	0	2	1	3	29	72	**101**
Saurashtra	0	0	0	0	0	0	3	0	3	3	0	**3**
Andaman-Nicobar	1	0	1	0	0	0	1	0	1	2	0	**2**
Cauvery-Palar		0	0	0	0	0	1	0	1	1	0	**1**
Kutch	8	2	10	0	0	0	0	0	0	8	2	**10**
Vindhyan	2	0	2	0	0	0	0	0	0	2	0	**2**
Grand Total	**148**	**356**	**504**	**12**	**94**	**106**	**100**	**100**	**200**	**260**	**550**	**810**

2.4.4.2 Pre-NELP and NELP blocks Hydrocarbon Discoveries

So far a total of 200 hydrocarbon discoveries (100 oil and 100 gas) have been made under the Pre-NELP & NELP regime in 54 blocks/fields. Breakup of the discoveries are as follows :

Area	Oil Discovery		Gas Discovery		Total Discoveries
	Pre-NELP	NELP	Pre-NELP	NELP	
Deep Water	0	8	0	38	46
Shallow Water	8	3	6	34	51
Onland	45	36	11	11	103
Grand Total	**53**	**47**	**17**	**83**	**200**

2.4.4.3 Details of oil & gas discoveries under NELP/Pre-NELP as on 31.03.2014

Sl. No.	Company Name	Block Name / Field	Round	OIL	GAS	TOTAL
1	**RIL**	KG-DWN-98/3	NELP I	1	19	20
2		KG-OSN-2001/2	NELP III	2	-	2
3		KG-OSN-2001/1	NELP III	-	3	3
4		NEC-OSN-97/2	NELP I	-	8	8
5		KG-DWN-98/1	NELP I	1	-	1
6		CY-DWN-2001/2	NELP III	1	1	2
7		KG-DWN-2003/1	NELP V	1	3	4
8		CB-ONN-2003/1	NELP V	8	-	8
9		CY-PR-DWN-2001/3	NELP III	-	1	1
10		KG-DWN-2001/1	NELP III	-	1	1
11		GS-OSN-2000/1	NELP-II	-	1	1
12	**ONGC**	KG-DWN-98/2	NELP I	2	7	9
13		MN-DWN-98/3	NELP I	-	2	2
14		MN-OSN-2000/2	NELP II	-	2	2
15		CB-OSN-2003/1	NELP V	-	3	3
16		CB-ONN-2002/1	NELP IV	1	-	1
17		AA-ONN-2001/1	NELP III	-	2	2
18		CB-ONN-2001/1	NELP III	1	-	1
19		CB-ONN-2004/1	NELP VI	1	-	1
20		CB-ONN-2004/2	NELP VI	3	-	3
21		AN-DWN-2002/1	NELP IV	-	1	1
22		KG-OSN-2004/1	NELP VI	-	5	5
23		NEC-DWN-2002/2	NELP IV	-	1	1
24		AA-ONN-2001/2	NELP III	-	1	1
25		CB-ONN-2004/3	NELP VI	-	1	1
26		GS-OSN-2004/1	NELP VI	-	1	1
27		MB-OSN-2005/1	NELP VII	-	2	2
28		CY-ONN-2002/2	NELP IV	1	-	1
29		CY-ONN-2004/2	NELP VI	1	-	1
30		KG-DWN-2005/1	NELP VII	-	1	1
31	**OIL**	RJ-ONN-2004/2	NELP VI	1	-	1
32	**CEIL**	KG-ONN-2003/1	NELP V	2	-	2
33		KG-DWN-98/2	NELP I	2	1	3
34	**NIKO**	CB-ONN-2000/2	NELP II	-	2	2
35	**GSPC**	CB-ONN-2000/1	NELP II	4	-	4
36		KG-OSN-2001/3	NELP III	1	8	9
37		CB-ONN-2002/3	NELP IV	8	-	8
38		CB-ONN-2003/2	NELP V	2	1	3
39	**JUBILANT**	AA-ONN-2002/1	NELP IV	-	3	3
40		CB-ONN-2002/2	NELP IV	2	-	2
41		CY-ONN-2002/1	NELP IV	-	1	1
42	**NAFTOGAS**	CB-ONN-2004/5	NELP VI	1	0	1
43	**FOCUS**	CB-OSN-2004/1	NELP VI	-	1	1
	NELP Total			**47**	**83**	**130**
1	CAIRN	RJ-ON-90/1	Pre-NELP	27	4	31
2		CB-OS/2	Pre-NELP	2	3	5
3		Ravva	Pre-NELP	4	1	5
4	ESSAR OIL	CB-ON/3	Pre-NELP	5	-	5
5	FOCUS	RJ-ON/6	Pre-NELP	-	4	4
6	GSPC	CB-ON/2	Pre-NELP	10	2	12
7	HARDY	CY-OS/2	Pre-NELP	-	1	1
8	HOEC	CB-ON/7	Pre-NELP	2	-	2
9		AAP-ON-94/1	Pre-NELP	-	1	1
10	ONGC	CB-OS/1	Pre-NELP	1	-	1
11	RIL	SR-OS-94/1	Pre-NELP	-	1	1
12	BGEPIL	Panna-Mukta	Pre-NELP	1	-	1
13	Interlink	Baola	Pre-NELP	1	-	1
	Pre-NELP/Field Total			**53**	**17**	**70**

2.4.4.4 Development of hydrocarbon discoveries - NELP blocks

Currently, under the PSC regime a total of 19 discoveries are under development of which following are the major discoveries:

(i) Deendayal West Gas Field Development in the block KG-OSN-2001/3 in Krishna-Godavari shallow offshore, operated by GSPCL: The first gas is estimated by the contractor in 2014-15. The approved FDP envisages a peak gas production rate of 5.23 MMSCMD.

(ii) Four Satellite Gas Fields (D-2, 6, 19 & 22) Development in the block KG-DWN-98/3 (KG-D6) in Krishna-Godavari deepwater area, operated by RIL: The first gas is estimated by the contractor in 2016-17 with a peak production rate of 10.3 MMSCMD.

(iii) D-34 Gas Field Development in the block KG-DWN-98/3 (KG-D6) in Krishna-Godavari deepwater area, operated by RIL: The first gas is estimated by the contractor in 2018-19 with a peak production rate of 12 .9 MMSCMD.

2.5 GEOSCIENTIFIC STUDIES BY DGH

- DGH has carried out either of its own or in collaboration with reputed companies, geoscientific surveys in several unexplored/poorly-explored areas. Covering about 2 Million Sq.km both Offshore and Onland using 2D Seismic, Gravity, Magnetic, Magneto Telluric, Aerial Analysis etc.

- Of this total, Under Reconnaissance Survey, 1.642 Million Sq.Km. of reconnaissance Gravity survey over the Eastern and Western Offshore of India has been carried out by DGH through Petroscan during the period of 1995-98. This Survey had given valuable indications to structure, tectonics and sedimentary thickness. It provided inputs for modeling studies and for the preparation of hydrocarbon prospect map of the area.

- Under Reconnaissance Survey, 23730 LKM of Aero-Magnetic survey over Kutch Offshore & Onland and 24723 LKM of Aero-Magnetic survey over Himalayan Foreland, Punjab and Foot hills of Himalayas were carried out by DGH through MoU with NRSA during the period of 1995-96, 2003-05 and 2005-06.

- Under Joint Venture Speculative Geophysical Survey, where 50% of project cost was borne by GoI, the following surveys were carried out by DGH.

  (i) API of 11035.06 LKM of 2D Seismic & GM data was carried out through Western Geophysical, USA in Andaman-Nicobar and East coast of India during the period 1996-97. Also Re-Interpretation of 5320 LKM of old seismic data was carried out in the same area.

  (ii) API of 1200 GLK of 2D Seismic data has been carried out through Alpha Geo, Hyderabad in Ganga Valley and Vindhyan basin during the period of 1997-98. These surveys were carried out to assess the hydrocarbon potential of Vindhyan and Ganga basins. A new lower Vindhyan paleo-embayment comprising of a number of highs and lows basement features has been mapped for the first time. These studies have led to the demarcation of certain prospective areas and with new data, 3 blocks were offered and awarded in Ganga basin under second, fourth and fifth rounds of NELP.

- The following Seismic surveys were carried out by DGH, where total project cost was borne by GoI.

  (i) API of 24,948 LKM of 2D Seismic data has been carried out over Andaman Offshore, East & Western Offshore of India including Southern Tip during the period of 1999-2003.

(ii) API of 1940.05 GLK of 2D Seismic data has been carried out over Ganga Valley and Chambal Valley during the period of 2002-04.

(iii) The Acquisition of 690.6 GLK of 2D Seismic data has been carried out through NGRI in unexplored Kutch onland basin during the year 2006-09.

- Under Non-exclusive Speculative Geophysical Survey, where no expenditure on project cost was borne by GoI, the following surveys were carried out by DGH.

(i) API of 16174 LKM of 2D Seismic data has been carried out through M/s GX Tech., USA, India Span project in Eastern & Western Offshore of India during the period of 2005-07. Based on this data a good number of blocks were offered and awarded in NELP-VI and subsequent NELP rounds.

(ii) Re-Processing of 12000 LKM of 2D Seismic data has been carried out through M/s GGS-Spectrum, Norway in Western Offshore of India during the period of 2007-08.

(iii) API of 7240.725 LKM of 2D Seismic data has been carried out through M/s PGS Asia Pacific Pty Ltd., Singapore in Andaman Offshore during the period of 2007-09.

(iv) API of 2146.5 sq.km of Controlled Source Electromagnetic (CSEM) data has been carried out through M/s EMGS, Norway in Eastern Offshore during the period of 2007-08.

(v) API of 1498.35 LKM of 2D Seismic data has been carried out through M/s Fugro Data Services, Switzerland in Western Offshore of India during the period of 2009-10.

(vi) API of 2109.113 LKM of 2D seismic data has been carried out through M/s Fugro Multiclient services Pty Ltd., Australia in Western Offshore of India during the period of 2009-10.

(vii) API of 9632.5 LKM of 2D seismic data has been carried out through M/s GXT, Span-II project, USA in East & West coast of India during the period of 2008-10.

(viii) Re-Processing of 10638 LKM of 2D seismic data has been carried out through M/s Spectrum Geo Ltd., U.K. in Andaman Islands of India during the period of 2009-10.

(ix) Under Speculative Geophysical Survey, 55,668.3 LKM of High Resolution Aeromagnetic (HRAM) and 13,994.66 LKM of Airborne Gravity Magnetic (AGM) data have been acquired through M/s McPhar, Canada in Kutch, Gujarat during 2007-09 and 2009-10 respectively.

- The Processing and Interpretation of 690.6 GLK of 2D Seismic data acquired in 2006-09 by DGH through NGRI in Kutch Onland was completed during the year 2010-12 by GEOPIC, ONGC.

- Integrated geophysical surveys (Gravity, MT, DRS and 2D Seismic) were carried out by NGRI in the northwestern part of the Deccan Syneclise and Narmada-Tapti area, revealed sub-trappean Mesozoic-Gondwana sediments with a maximum thickness of 3 Km during the year 2003-04 by GEOPIC, ONGC.

- DGH has acquired a total of 102 stations (60 stations along Sihore-Akola & 42 station along Indore-Jalagaon) of Land Magneto Telluric in Central India through MoU with NGRI during the period of 2006-09.

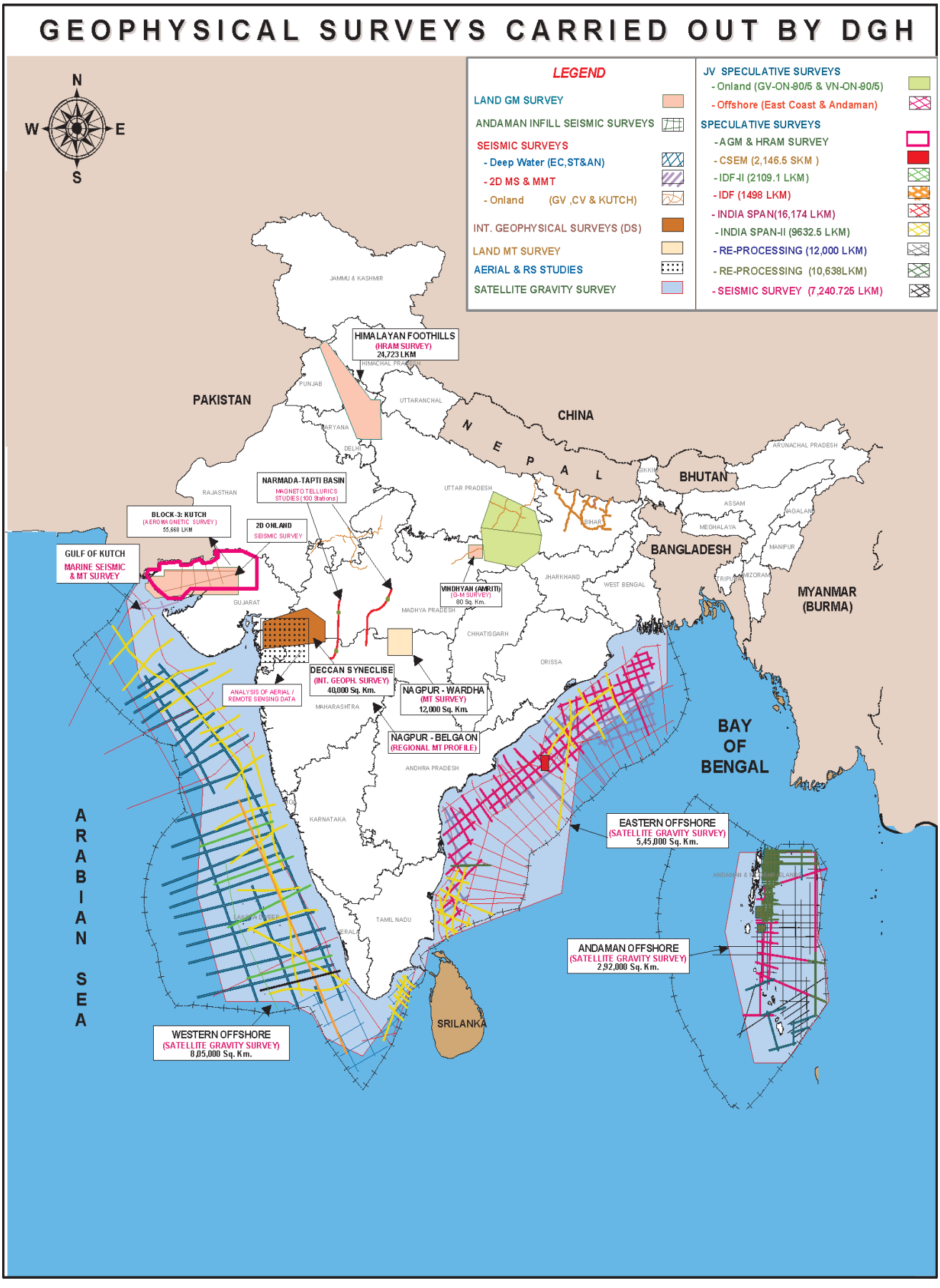
- DGH has completed analysis of Aerial images/Remote sensing data for 302,500 sq. Km area in Narmada-Cambay basin through MoU with NGRI during the period of 2006-08.

- DGH has completed the Archival job from lower density media to higher density media of Raw and Processed 2D/3D seismic data for 11246 Cartridges with 100 TB data through M/s Kestrel IDM Ltd., U.K during the year 2011.
- Geochemical surveys in Spiti-Zanskar and Karewa basins completed in 2012-13. 805 soil sample from Spiti-Zanskar and 209 soil samples from Ladakh were collected and analyzed for light hydrocarbon gases.
- Petroleum system modeling studies: DGH has taken up the petroleum system modeling of two basins namely (i) Bengal Onland basin and (ii) Kerala- Konkan offshore basin. The study has been carried out by Beicip-Franlab, France. Contract was signed between DGH & Beicip-Franlab in January 2008.
- Over 5000 Sq.Km area has been studied by consortium members of National Gas Hydrate Programme (NGHP). DGH, ONGC, NIO and NGRI scientists together with international experts on Gas Hydrates have identified 20 locations out of 73 locations for probing during the NGHP expedition-02. These 20 locations are expected to have a high probability of sand content.

SUMMARY OF GEOSCIENTIFIC STUDIES BY DGH

Sl. No.	Area/Block	Survey Type	Area	Achievement (API)	Year	Agreement/ MOU signed with
I. RECONNAISSANCE SURVEYS						
1	Western & Eastern Offshore	Satellite Gravity	Offshore	1.642 Million Sq. Km.	1995-98	Petroscan, Sweden
2	Kutch Offshore & Onland	Aero-Magnetic	Onland	23,730 LKM	1995-96	NRSA, Hyderabad
3	Nagpur-Wardha-Belgaum	MT	Onland	352 Stations	1996-98	NGRI, Hyderabad
4	Himalayan Foreland	Aero-Magnetic	Onland	11,958 LKM	2003-05	NRSA, Hyderabad
5	Punjab and Foot Hills of Himalayas	Aero-Magnetic	Onland	12,765 LKM	2005-06	NRSA, Hyderabad
II. JOINT VENTURE SPECULATIVE SURVEYS						
	OFFSHORE					
6	East Coast	2D seismic & GM	Offshore	7428.685 LKM & RI of 4625 LKM of old data	1996-97	Western Geophysical, USA
7	Andaman-Nicobar	2D seismic & GM	Offshore	3606.375 LKM & RI of 695 LKM of old data	1996-97	Western Geophysical, USA
	ONLAND					
8	Ganga Valley (GV-ON-90/5)	2D seismic	Onland	634 GLK	1997-98	Alpha Geo, Hyderabad
9	Vindhyan (VN-ON-90/5)	2D seismic	Onland	566 GLK	1997-98	Alpha Geo, Hyderabad
III. SPECULATIVE SURVEYS						
10	Western & Eastern Offshore	2D seismic	Offshore	16,174 LKM	2005-07	GXT, USA
11	Western Offshore	2D seismic (Re-processing)	Offshore	Reprocessing (12,000 LKM)	2007-08	GGS Spectrum, Norway
12	Andaman Ofshore	2D seismic	Offshore	7240.725 LKM	2007-09	PGS, Singapore
13	Eastern Offshore	CSEM	Offshore	2146.5 sq. km.	2007-08	EMGS, Norway
14	Western Offshore	2D seismic	Offshore	1498.35 LKM	2009-10	Fugro Data Services, Switzerland
15	Western Offshore	2D seismic	Offshore	2109.113 LKM	2009-10	Fugro Multiclient Services Pty Ltd Australia
16	West and East coast	2D seismic	Offshore	9632.5 LKM	2008-10	GXT, USA
17	Andaman Islands of India	2D seismic (Re-processing)	Offshore	Reprocessing (10,638 LKM)	2009-10	Spectrum Geo Ltd., UK
18	Kutch	Airborne HRAM	Onland	55,668.3 LKM	2007-09	Mcphar, Canada
		Airborne GM	Onland	13,994.64 LKM	2009-10	Mcphar, Canada
IV. SEISMIC SURVEYS						
	OFFSHORE					
19	Andaman Infill	2D Seismic	Offshore	1484.75 LKM	1999	Western Geophysical, USA
20	Southern Tip (ST)	2D Seismic	Offshore	2835.925 LKM	2001-02	Large, Russia
21	East Coast (EC)	2D Seismic	Offshore	4319.45 LKM	2001-02	Large, Russia
22	Andaman-Nicobar (AN)	2D Seismic	Offshore	4307.275 LKM	2001-02	Large, Russia
23	West Coast (WC)	2D Seismic	Offshore	12,000.65 LKM	2002-03	Large, Russia
	ONLAND					
24	Ganga Valley (GV)	2D Seismic	Onland	1135.05 LKM	2002-03	Alpha Geo, Hyderabad
25	Chambal Valley (CV)	2D Seismic	Onland	805.00 GLK	2003-04	Alpha Geo, Hyderabad
26	Kutch	2D Seismic (Acq.)	Onland	690.6 GLK	2006-09	NGRI, Hyderabad
27	Kutch	2D Seismic (P&I)	Onland	690.6 GLK	2010-12	GEOPIC, ONGC, Dehradun
V. INTEGRATED GEOPHYSICAL SURVEYS						
28	Deccan Syneclise (DS) Narmada-Tapti Area	Gravity, MT, DRS, 2D seismic	Onland	6000 Stations, 600 & 50 stations, 700 LKM	2003-04	NGRI, Hyderabad
VI. GRAVITY -MAGNETIC SURVEYS & OTHER GEOPHYSICAL SURVEYS						
29	Vindhyan (Amriti)	GM	Onland	303 Stations (80 sq.km.)	2003-04	NGRI, Hyderabad
30	Gulf of Kutch	MS & MMT	Offshore	133.984 LKM &13Stn.	2006-08	NGRI
31	Central India	Land MT	Onland	102 Stations	2006-09	NGRI
32	Narmada-Cambay/ Deccan Syneclise	Analysis of Aerial Images/ Remote sensing data	Onland	302,500 sq. km	2006-08	NGRI

GEOPHYSICAL SURVEYS CARRIED OUT BY DGH

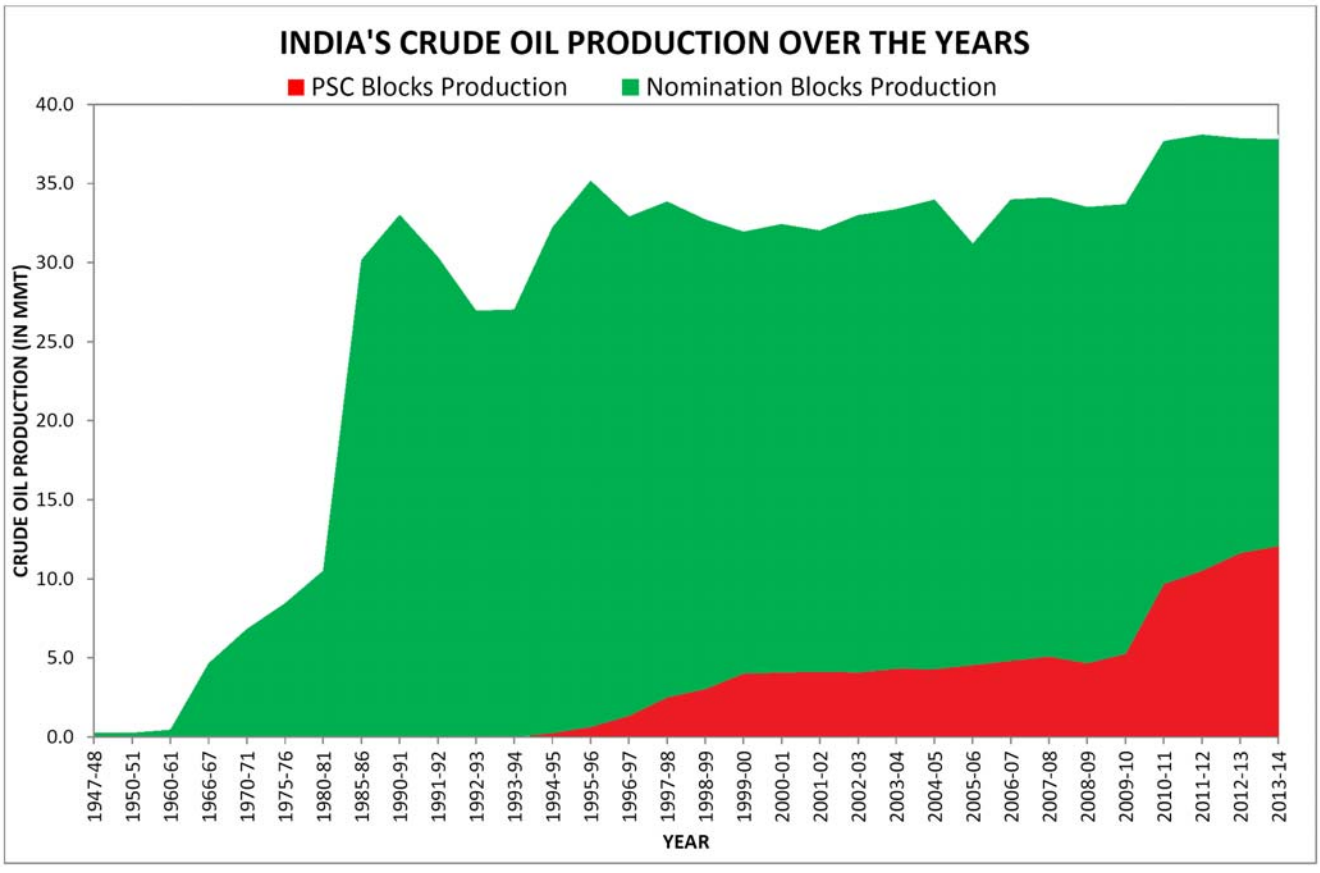


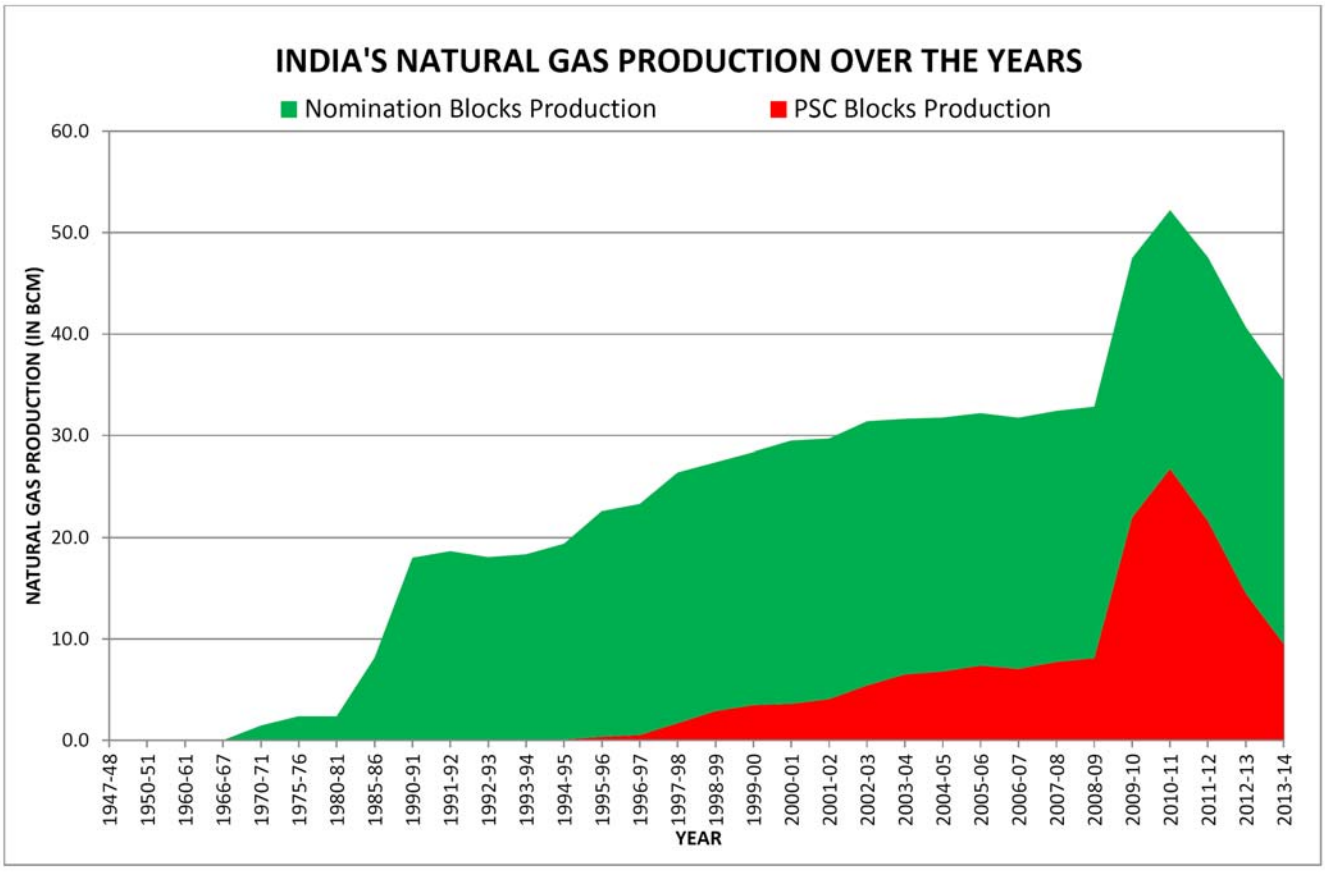
2.6 PRODUCTION OF OIL & GAS

At present 7 sedimentary basins of the country are on production namely Rajasthan, Assam-Arakan & Assam Shelf Basin, Cambay, Cauvery, Krishna-Godavari and Mumbai.

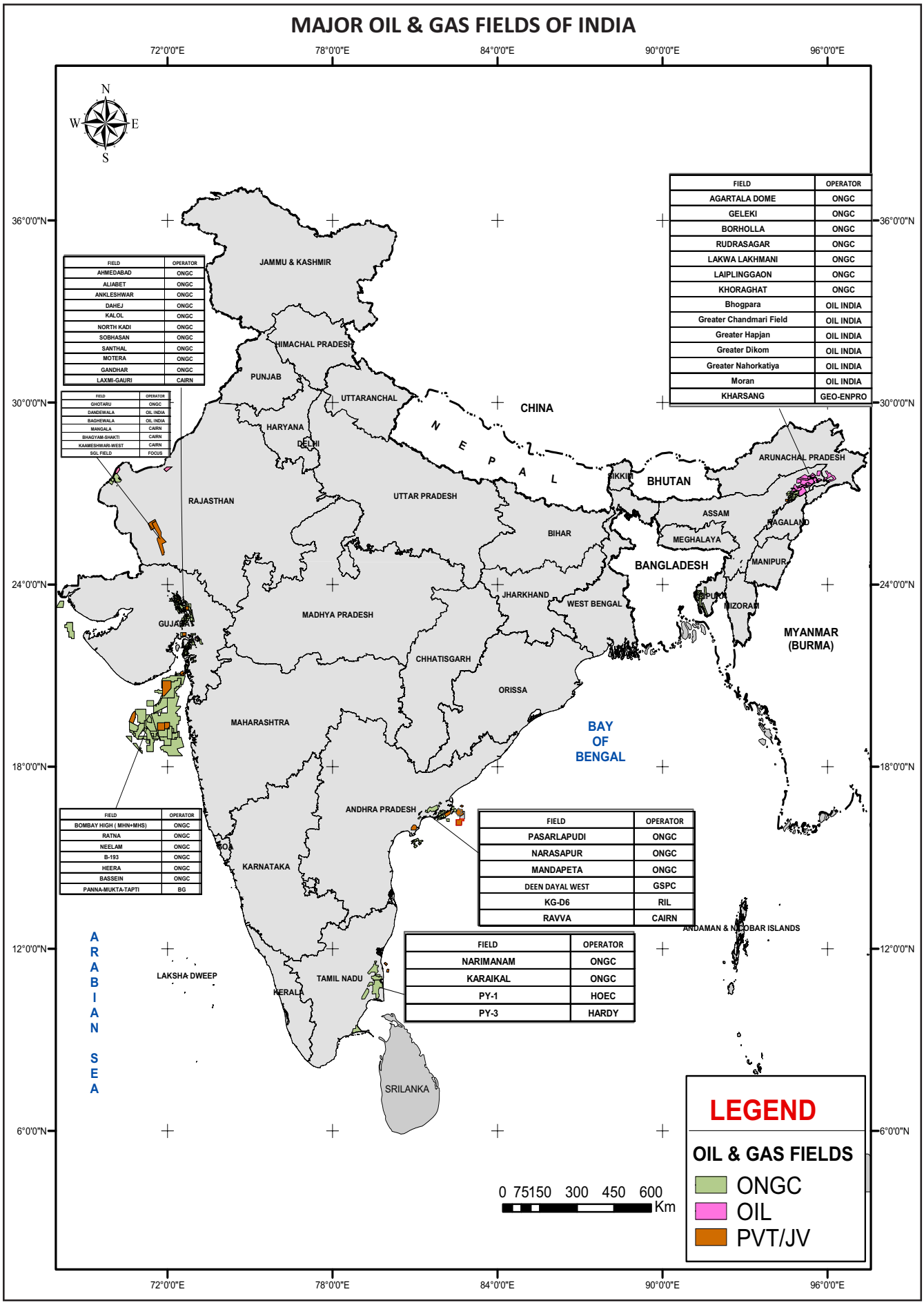
Basin-wise Oil (including condensate) and gas production (including CBM) for the year 2013-14

Basins	Oil production (MMT) for 2013-14				Gas production (BCM) for 2013-14			
	ONGC	OIL	PSC	Total	ONGC	OIL	PSC	Total
Rajasthan	-	-	9.18	9.18	0.015	0.198	0.768	0.981
Assam-Arakan & Assam Shelf	1.264	3.466	0.089	4.819	1.282	2.428	0.022	3.732
Cambay	4.917	-	0.504	5.421	1.544	-	0.224	1.768
Cauvery	0.226	-	0.002	0.228	1.304	-	-	1.304
Krishna-Godavari	0.323	-	1.31	1.633	1.276	-	5.549	6.825
Mumbai	15.515	-	0.991	16.506	17.863	-	2.767	20.63
Total	**22.245**	**3.466**	**12.076**	**37.787**	**23.284**	**2.626**	**9.330**	**35.240**
Coal-Bed Methane	-	-	-	-	-	-	0.166	0.166
Grand Total	**22.245**	**3.466**	**12.076**	**37.787**	**23.284**	**2.626**	**9.496**	**35.406**


INDIA'S CRUDE OIL PRODUCTION OVER THE YEARS
PSC Blocks Production
Nomination Blocks Production
CRUDE OIL PRODUCTION (IN MMT)
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
1947-48
1950-51
1960-61
1966-67
1970-71
1975-76
1980-81
1985-86
1990-91
1991-92
1992-93
1993-94
1994-95
1995-96
1996-97
1997-98
1998-99
1999-00
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
YEAR


INDIA'S NATURAL GAS PRODUCTION OVER THE YEARS
Nomination Blocks Production
PSC Blocks Production
NATURAL GAS PRODUCTION (IN BCM)
60.0
50.0
40.0
30.0
20.0
10.0
0.0
1947-48
1950-51
1960-61
1966-67
1970-71
1975-76
1980-81
1985-86
1990-91
1991-92
1992-93
1993-94
1994-95
1995-96
1996-97
1997-98
1998-99
1999-00
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
YEAR

MAJOR OIL & GAS FIELDS OF INDIA



FIELD	OPERATOR
AHMEDABAD	ONGC
ALIABET	ONGC
ANKLESHWAR	ONGC
DAHEJ	ONGC
KALOL	ONGC
NORTH KADI	ONGC
SOBHASAN	ONGC
SANTHAL	ONGC
MOTERA	ONGC
GANDHAR	ONGC
LAXMI-GAURI	CAIRN

FIELD	OPERATOR
GHOTARU	ONGC
DANDEWALA	OIL INDIA
BAGHEWALA	OIL INDIA
MANGALA	CAIRN
BHAGYAM-SHAKTI	CAIRN
KAAMESHWARI-WEST	CAIRN
SGL FIELD	FOCUS

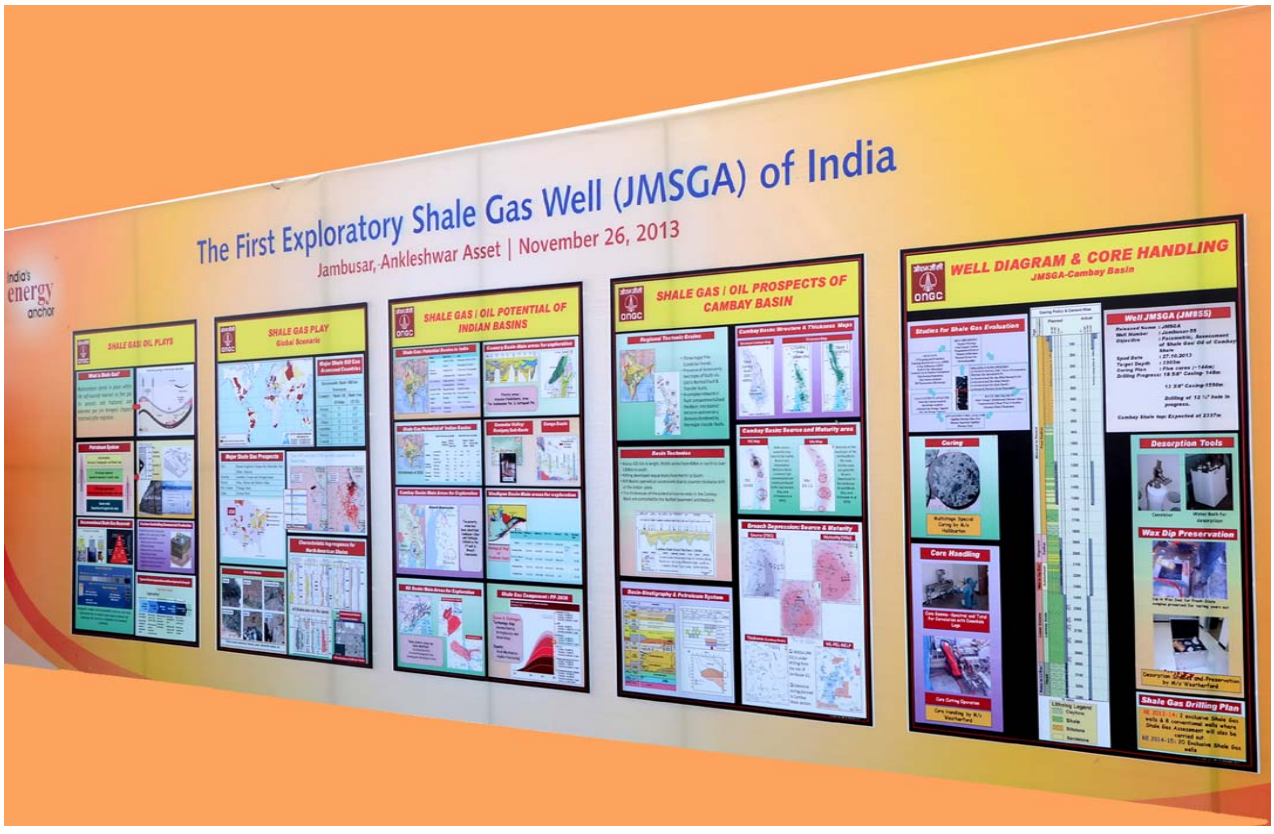
FIELD	OPERATOR
AGARTALA DOME	ONGC
GELEKI	ONGC
BORHOLLA	ONGC
RUDRASAGAR	ONGC
LAKWA LAKHMANI	ONGC
LAIPLINGGAON	ONGC
KHORAGHAT	ONGC
Bhogpara	OIL INDIA
Greater Chandmari Field	OIL INDIA
Greater Hapjan	OIL INDIA
Greater Dikom	OIL INDIA
Greater Nahorkatiya	OIL INDIA
Moran	OIL INDIA
KHARSANG	GEO-ENPRO

FIELD	OPERATOR
BOMBAY HIGH (MHN+MHS)	ONGC
RATNA	ONGC
NEELAM	ONGC
B-193	ONGC
HEERA	ONGC
BASSEIN	ONGC
PANNA-MUKTA-TAPTI	BG

FIELD	OPERATOR
PASARLAPUDI	ONGC
NARASAPUR	ONGC
MANDAPETA	ONGC
DEEN DAYAL WEST	GSPC
KG-D6	RIL
RAVVA	CAIRN

FIELD	OPERATOR
NARIMANAM	ONGC
KARAIKAL	ONGC
PY-1	HOEC
PY-3	HARDY

Activities during the year 2013-14


The First Exploratory Shale Gas Well (JMSGA) of India
Jambusar, Ankleshwar Asset | November 26, 2013
SHALE GAS/ OIL PLAYS
SHALE GAS PLAY
SHALE GAS / OIL POTENTIAL OF INDIAN BASINS
SHALE GAS / OIL PROSPECTS OF CAMBAY BASIN
WELL DIAGRAM & CORE HANDLING
JMSGA-Cambay Basin
Well JMSGA (JM855)
Desorption Tools
Wax Dip Preservation
Shale Gas Drilling Plan

ACTIVITIES DURING THE YEAR 2013-14

3.1 E&P ACTIVITIES 2013-14

S. No.	Subject	Parameter	ONGC (Nomination)	OIL (Nomination)	Pvt/JVs	Total
1	2D seismic data acquired	Onland (GLKM)	176.490	17.28	481.54	675.31
		Offshore (GLKM)	0	0.0	3127.575	3127.575
		TOTAL	**176.490**	**17.28**	**3609.115**	**3802.885**
2	3D seismic data acquired	Onland (SKM)	967.04	151.21	1866.1	2984.35
		Offshore (SKM)	0	0.00	9429.656	9429.656
		TOTAL	**967.04**	**151.21**	**11295.756**	**12414.006**
3	Exploratory wells drilled	Onland	57	15	53	125
		Offshore	15	0	32	47
		TOTAL	**72**	**15**	**85**	**172**
4	Exploratory meterage drilled	Onland ('000 M)	155.098	35.7	140.679	331.477
		Offshore ('000 M)	69.091	0	104.815	173.906
		TOTAL	**224.189**	**35.7**	**245.494**	**505.383**
5	Development wells drilled	Onland	216	23	157	396
		Offshore	67	0	17	84
		TOTAL	**283**	**23**	**174**	**480**
6	Development meterage drilled	Onland ('000 M)	432.363	60.110	55.981	548.454
		Offshore ('000 M)	164.431	0	199.33	363.761
		TOTAL	**596.794**	**60.110**	**255.311**	**912.215**
7	Initial In-place reserves (as on 01.04.2014)	Gas (BCM)	2324.71	344.32	1317.819	3986.849
		Oil (MMT)	5185.38	802.76	972.364	6960.504
		O+OEG (MMT)	**7510.09**	**1147.08**	**2290.183**	**10947.353**
8	Accretion of In-place reserves	Gas (BCM)	69.78	2.8734	26.123	98.7764
		Oil (MMT)	66.64	5.4643	142.441	214.5453
		O+OEG (MMT)	**136.43**	**8.3377**	**168.564**	**313.3217**
9	Ultimate Reserves (as on 01.04.2014)	Gas (BCM)	1270.42	189.55	715.564	2175.534
		Oil (MMT)	1461.67	246.30	214.58	1922.55
		O+OEG (MMT)	**2732.09**	**435.85**	**930.144**	**4098.084**
10	Accretion of Ultimate Reserves	Gas (BCM)	29.95	2.2307	35.502	67.6827
		Oil (MMT)	10.50	4.2397	17.373	32.1127
		O+OEG (MMT)	**40.45**	**6.4704**	**52.876**	**99.7954**
11	Oil & Gas production (2013-14)	Gas (BCM)	23.284	2.6258	9.497	35.4068
		Oil (MMT)	22.246	3.4664	12.076	37.7884
		O+OEG (MMT)	**45.530**	**6.0922**	**21.573**	**73.1952**
		CBM (BCM)	**-**	**-**	**-**	**0.165**

*** Note : Conversion factor 1 MMT = 1 BCM**

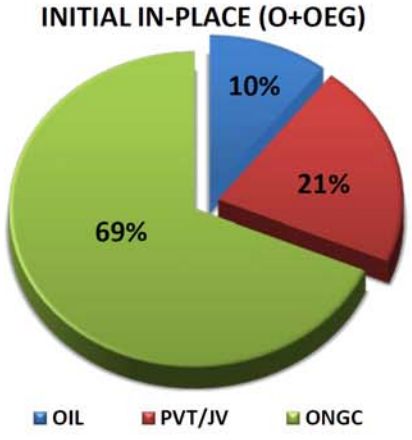
3.2 OIL & GAS PRODUCTION

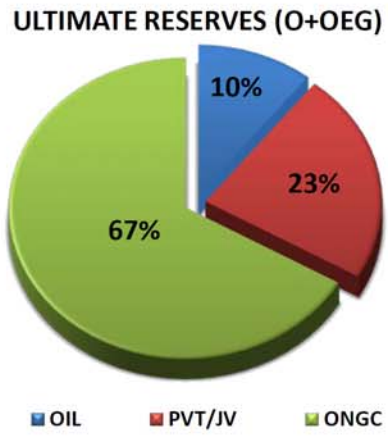
3.2.1 Company/Basin wise Oil & Gas Production (01.04.2013 to 31.03.2014)

Sl. No.	COMPANY / OPERATOR	BASIN	PRODUCTION		
			OIL (MMT)*	GAS (MMSCM)	O+OEG (MMT)
NATIONAL OIL COMPANIES (NOC)					
1	**ONGC**	Rajasthan	—	15	0.015
2		Cambay	4.917	1544	6.461
3		Cauvery Onland	0.226	1304	1.530
4		KG (Onland & Offshore)	0.323	1276	1.599
5		Assam-Arakan	1.264	1282	2.546
6		Mumbai Offshore	15.515	17863	33.378
		TOTAL ONGC	**22.245**	**23284**	**45.529**
7	**OIL**	Rajasthan	—	198	0.198
8		Assam-Arakan	3.466	2428	5.894
		TOTAL OIL	**3.466**	**2626**	**6.092**
		TOTAL NOCs	**25.711**	**25910**	**51.621**
PVT/JV COMPANIES (PSC)					
9	CAIRN	KG Offshore	1.036	449.526	1.485
10		Gulf of Cambay	0.360	110.957	0.471
11		Rajasthan	9.177	539.529	9.717
12	RIL	KG Offshore	0.274	5050.036	5.324
13	BG-RIL-ONGC	Mumbai Offshore	0.991	2767.372	3.758
14	GEO-ENPRO	Assam-Arakan	0.089	22.453	0.112
15	GOI - ACL	Assam-Arakan	—	—	—
16	HOEC	Cambay	0.007	9.317	0.017
17		Cauvery Offshore	0.002	49.772	0.052
18	JTI	Cambay	0.046	14.077	0.060
19	NIKO	Cambay	0.007	70.834	0.078
20	SELAN	Cambay	0.023	7.136	0.030
21	HERAMAC	Cambay	0.006	3.539	0.010
22	HRDCL - PPCL	Cambay	—	0.073	0.000
23	GSPCL	Cambay	0.053	7.944	0.061
24	HARDY	Cauvery Offshore	—	—	—
25	OILEX	Cambay	0.001	—	0.001
26	ESSAR	Cambay	0.002	—	0.002
27	FOCUS	Rajasthan	0.003	228.925	0.232
		TOTAL PVT./JV	**12.077**	**9331.490**	**21.410**
		TOTAL	**37.788**	**35241.49**	**73.031**
COAL BED METHANE (CBM)					
1	GEECL	Raniganj South	—	121.130	0.121
2	ESSAR	Raniganj East	—	35.359	0.035
3	ONGC	Jharia	—	3.378	0.003
4	RIL	Sohagpur East / West	—	5.651	0.006
		TOTAL	—	**165.518**	**0.165**
		INDIA GRAND TOTAL	**37.788**	**35407.008**	**73.196**

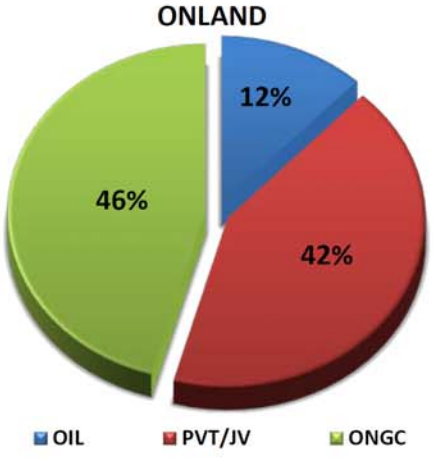
* NOTE : FIGURES INCLUSIVE OF CONDENSATE (MMT) ; 1MMT ~ 1 BCM

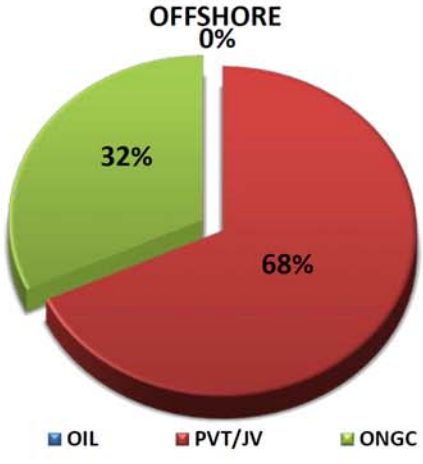
INITIAL IN-PLACE AND ULTIMATE RESERVES OF HYDROCARBONS
(AS ON 01-04-2014)



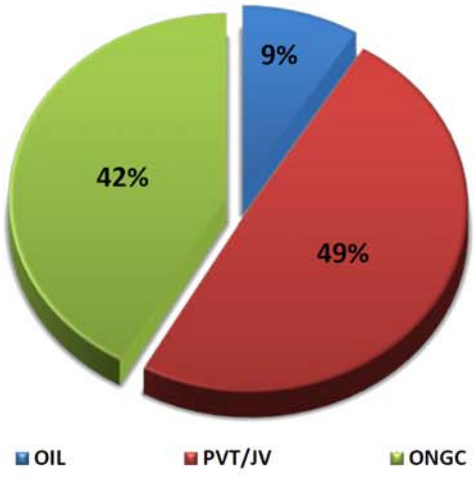


EXPLORATORY WELLS DRILLED (2013-14)

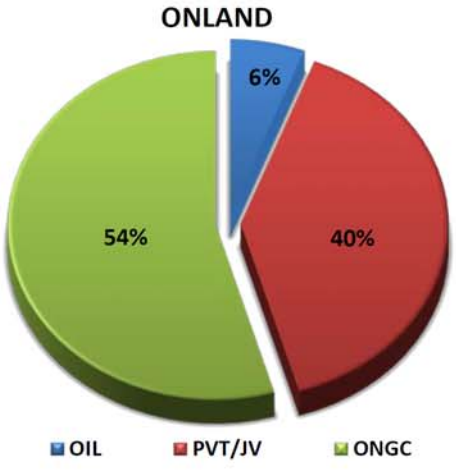


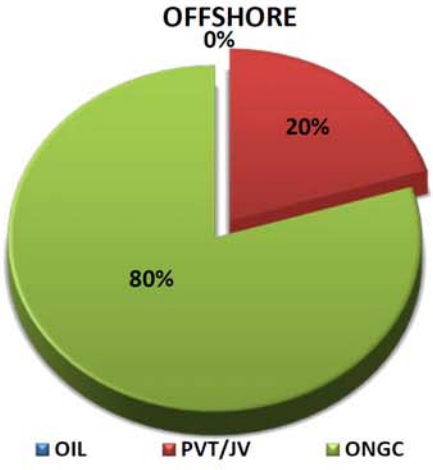


TOTAL EXPLORATORY WELLS

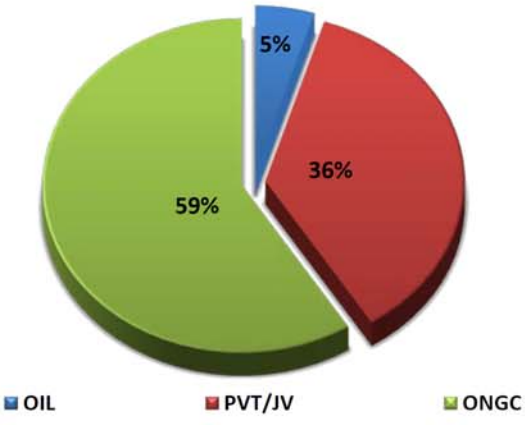


3.2.2 DEVELOPMENT WELLS DRILLED (2013-14)

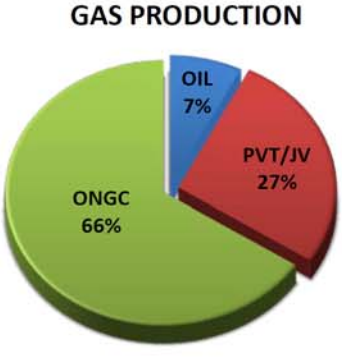


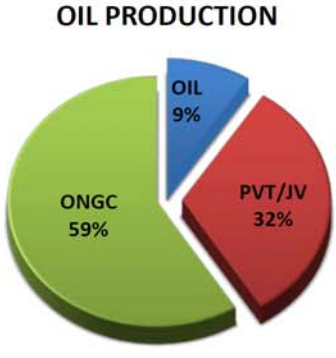


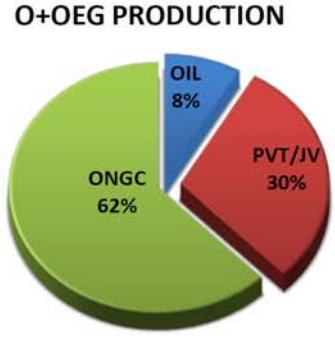
3.2.3 TOTAL DEVELOPMENT WELLS



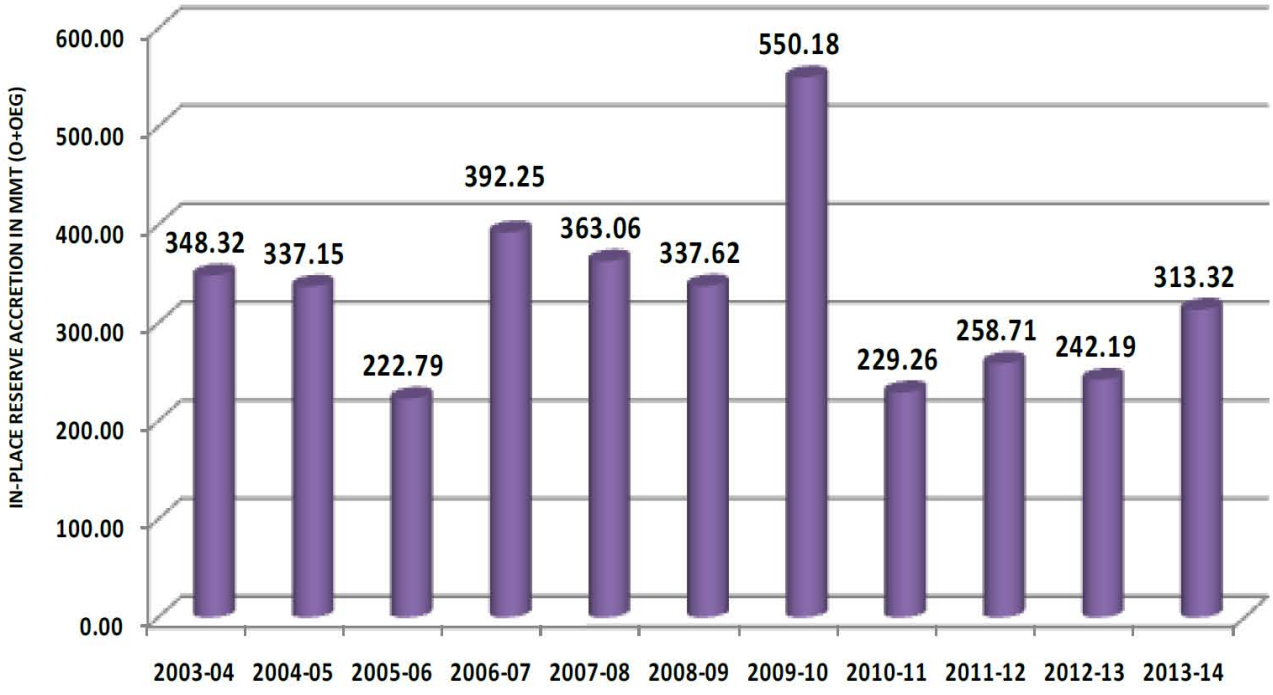
3.2.4 OIL & GAS PRODUCTION (2013-14)



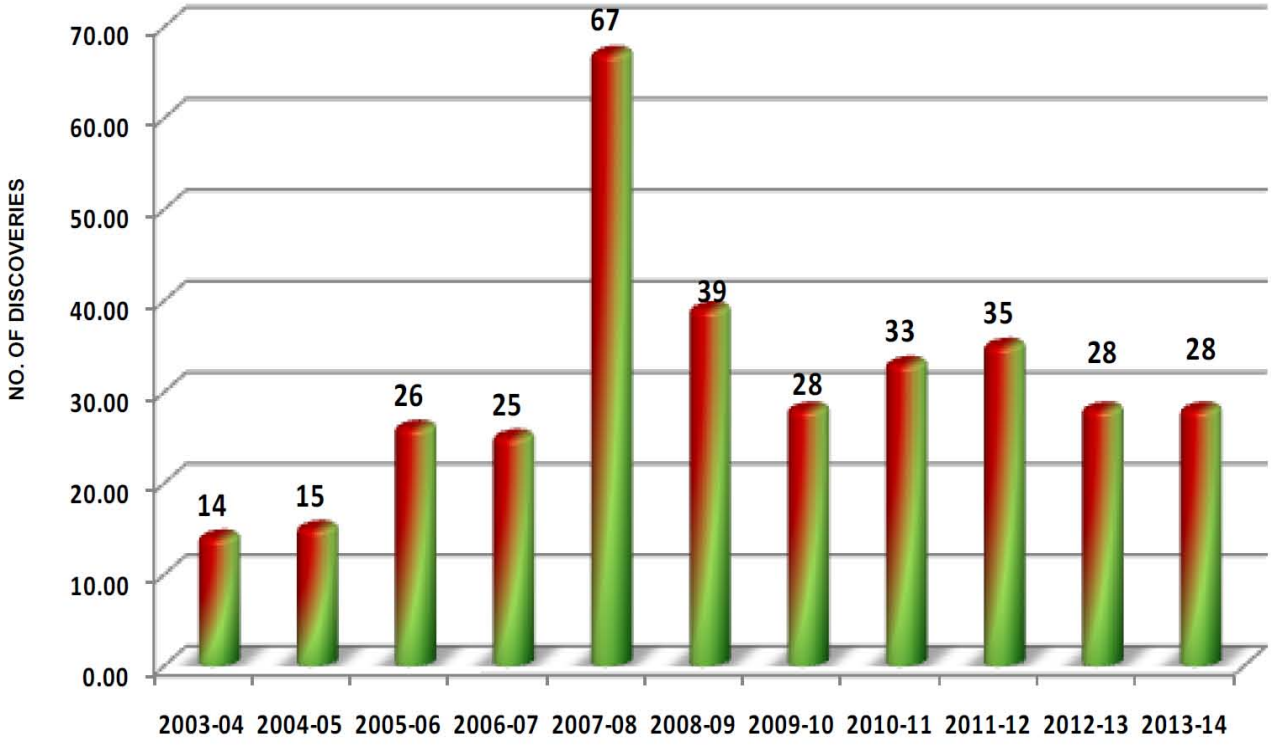




3.2.5 INPLACE RESERVE ACCRETION TREND



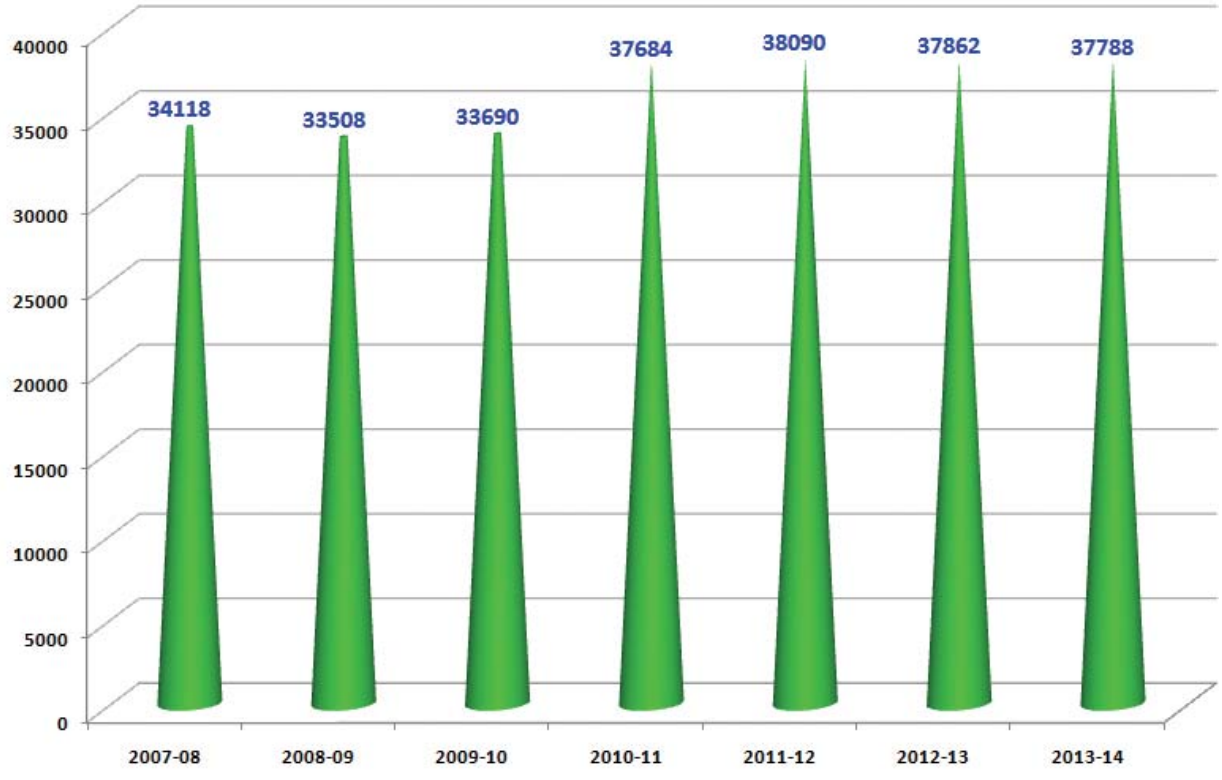
3.2.6 OIL & GAS DISCOVERY TREND



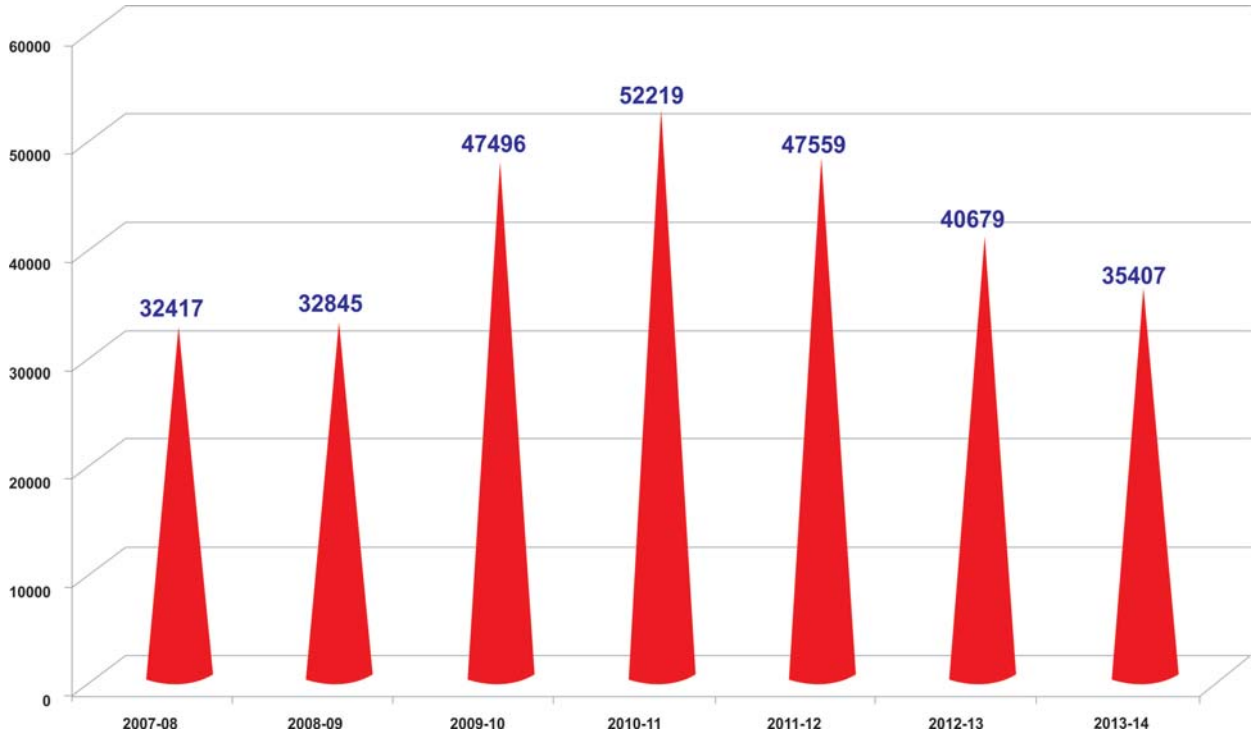
Note : Trends include Nomination and PSC regime

3.2.7 OIL & GAS PRODUCTION TREND

Oil Production Yearwise in '000 Tonnes



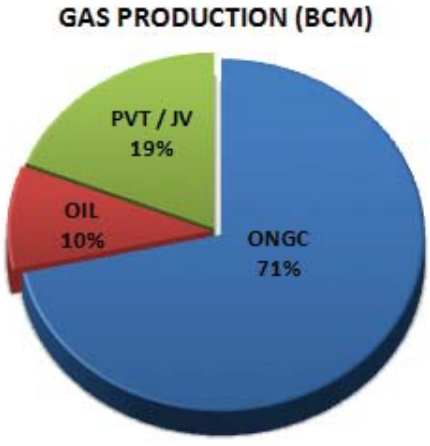
Gas Production Yearwise in MMSCM

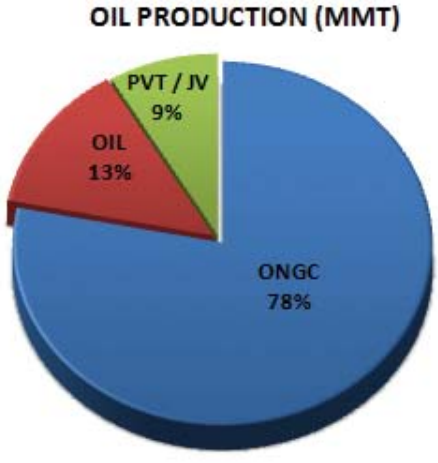


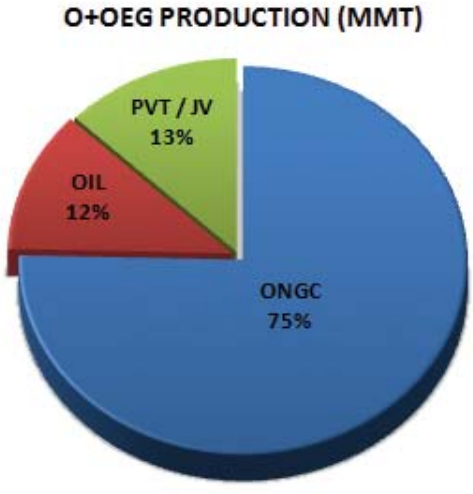
Note : Trends include Nomination and PSC regime

Source : DGH, ONGC & OIL

3.2.8 OIL & GAS PRODUCTION (SINCE INCEPTION TILL 31.03.2014)







COMPANY	GAS (BCM)	OIL (MMT)	O+OEG (MMT)
ONGC (Nomination)	601.904	931.246	1533.150
OIL (Nomination)	80.366	160.126	240.492
PVT/JV (PSC)	159.563	101.071	260.634
GRAND TOTAL	**841.833**	**1192.443**	**2034.276**

3.3 HYDROCARBON DISCOVERIES

A total of 28 hydrocarbon discoveries have been made by ONGC (14), OIL (7), CAIRN (3), RIL (2), JOGPL (1) & FOCUS (1) in Nomination, NELP and Pre-NELP blocks and fields during 2013-14.

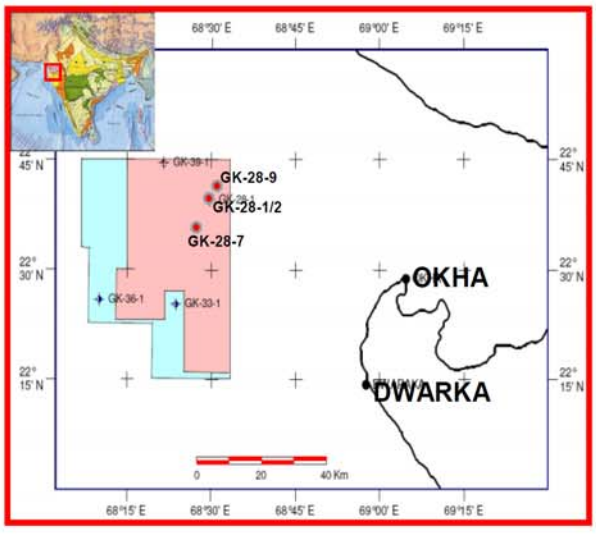
Sl. No.	Basin/State	Prospect Name	Discovery Well	Name of PEL / ML / NELP	Type of Discovery
NOMINATION REGIME					
ONGC					
1	Western Off.	GK-28-9	GK-28-G (New Pool)	GK-28 ML	Gas
2		GK-42-3	GK-42-F (New Pool)	GK-28 ML	Gas
3		NW of B-173A-8	B-173A-H	South & East Bassein ML	Oil & Gas
4	Western On.	Gandhar-686	GGAE (New Pool)	Gandhar Extn. VI ML	Oil & Gas
5		SB-300	SBCG (New Pool)	Geratpur ML	Gas
6		Nandasan-111	NNBC (New Pool)	Nandasan Ext.-I	Oil
7	KG Onland	Seripalem-1	SRM-AA	Godavari Onland ML	Gas
8		Mandapeta South-1	MDS-AA	Godavari Onland ML	Gas
9		Geddanapalli-3	GLAC (New Pool)	Godavari Onland ML	Oil
OIL					
10	A&AA / Assam	Sologuri Structure	Sologuri-1 (Loc.DIBC)	Dibrugarh PEL	Oil
11		South Kathaloni Str.	South Kathaloni-3 (HVX)	Hugrijan ML	Oil
12		East Deohal Structure	NHK-610 (Loc. HVJ)	Hugrijan ML	Gas
13		Nagajan Structure	NHK-405 (Loc. HDL-II)	Hugrijan ML	Gas
14		Jaipur Structure	NHK-614 (Loc.NLE)	NHK Extn. ML	Oil
15		Baruanagar Structure	Baruanagar-3 (Loc. BE)	Borhat PEL	Oil
16		Singhibil Structure	Singhibil-1 (Loc. HVT)	Hugrijan ML	Gas

Sl. No.	Operator	Block / Field	Name of Discovery	Discovery Well	Type of Discovery
PSC REGIME					
17	ONGC	KG-OSN-2004/1	NL-1	KGOSN041NANL-1	Gas
18		KG-OSN-2004/1	NL-2	KGOSN041NANL-2	Gas
19		KG-DWN-98/2	KGD982NA-M-3	KGD982NA-M-3	Oil & Gas
20		AA-ONN-2001/1	Khubal-07	KH-07	Gas
21		MB-OSN-2005/1	AA-1	MBS051NAA-1	Gas
22	FOCUS	CB-OSN-2004/1	Swally-1612	Swally-1612	Gas
23	RIL	KG-DWN-98/3	KG-D6-MJ-1	D-55 (KG-D6-MJ-1)	Gas & Cond.
24		CY-DWN-2001/2	D-56	D-56	Gas
25	CAIRN	RJ-ON-90/1	V2Y Channel	V2Y Channel	Oil
26		RJ-ON-90/1	Aishwariya-4	Aishwariya-4	Oil & Gas
27		RJ-ON-90/1	Raageshwari South-1	Raageshwari South-1	Oil
28	JOGPL	AA-ONN-2002/1	North Atharamura	N. Atharamura-1	Gas

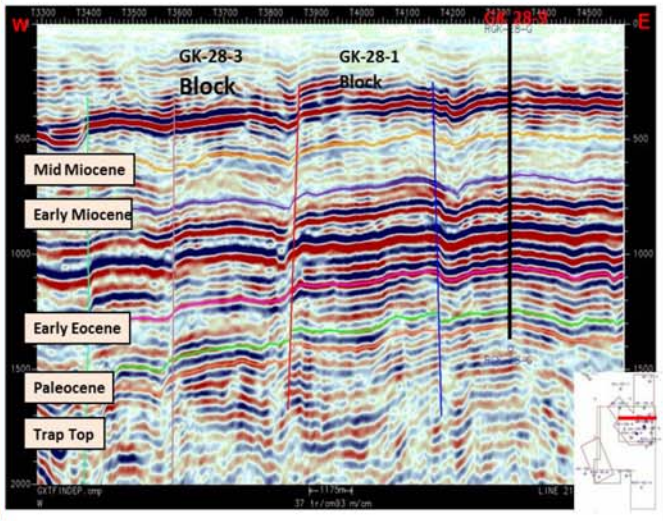
NEW DISCOVERIES IN NOMINATION REGIME

GK-28-9 (GK-28 ML) — OPERATOR : ONGC

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
GK-28-9 (GK-28-G)	**Obj-I:** 1249-1251 m. Flowed gas @ 221950m^3/d at FTHP of 1430 psi through 1/2" choke	GK-28 area in Kutch offshore has been identified for fast track development and nine wells in GK-28 have been drilled. The discovery will help in fast track development of the area.



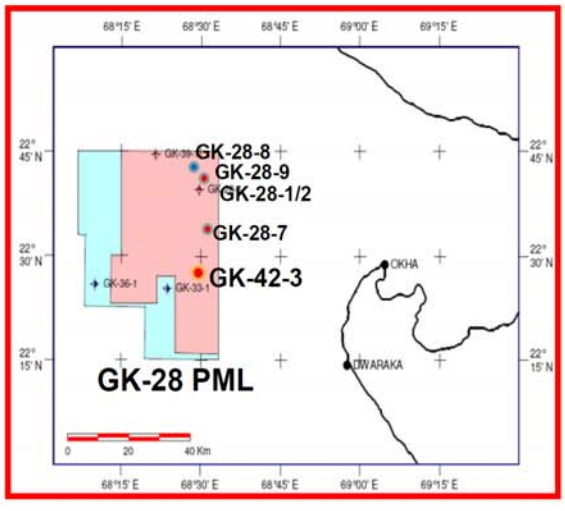
Location Map



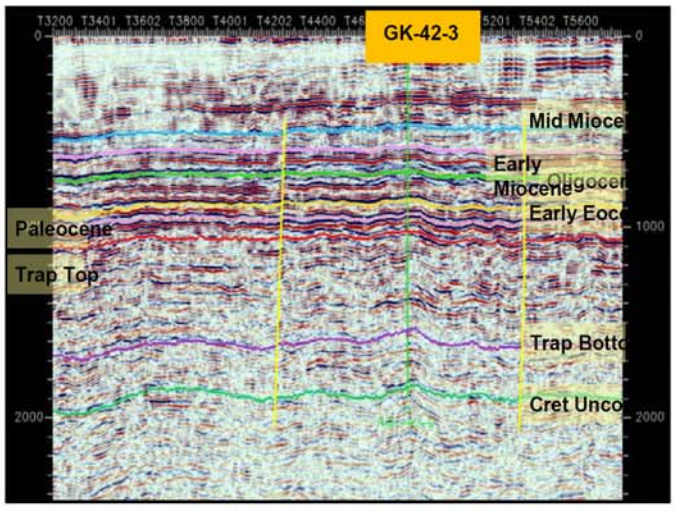
Inline 2160 (GK-28 & GK-3 PSDM) Through Well GK-28-9

GK-42-3 (GK-28 ML) — OPERATOR : ONGC

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
GK-42-3 (GK-42-F)	**Obj-II**: 1274.5 – 1276.5 m. Flowed gas @224544m^3/d at FTHP of 1680 psi through 1/2" choke	GK-42 area in Kutch offshore has been identified for fast track development and three wells in GK-42 have been drilled. Two wells still remain to be drilled on the structure. The discoveries in GK-28 & GK-42 will help in fast track development of the area.



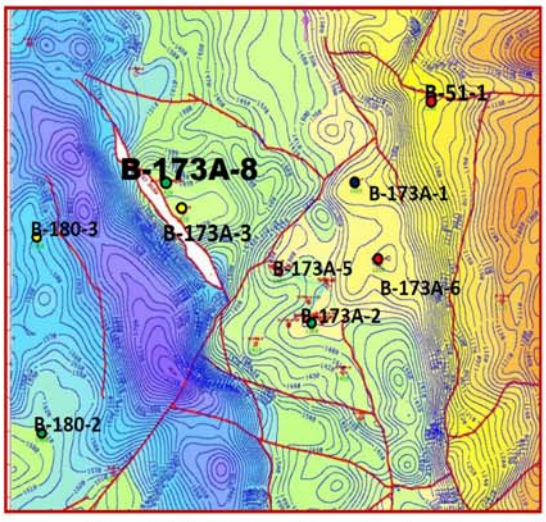
Location Map



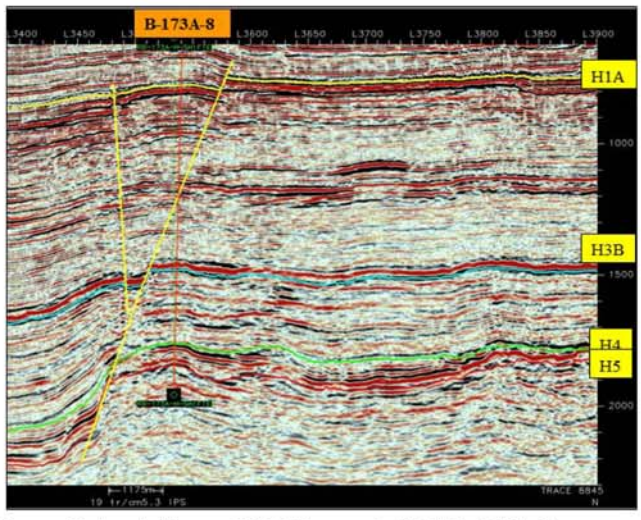
Inline 2050 Passing Through well GK-42-3

NW of B-173A-8 (South & East Bassein ML) — OPERATOR : ONGC

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
NW B-173A / B-173A-H B-173A-8	**Obj-II:** 1490-81.5, 1480-75 m, flowed oil @ 2246 bopd & gas @ 70,997 m^3/d through ½" choke.	Discovery of oil & gas in Mukta Formation in NW of B-173A Field will provide fresh impetus to exploration efforts for establishing more hydrocarbons in & around the area. Being adjacent to B-173A Field, available production facilities will help in early monetization of this discovery.



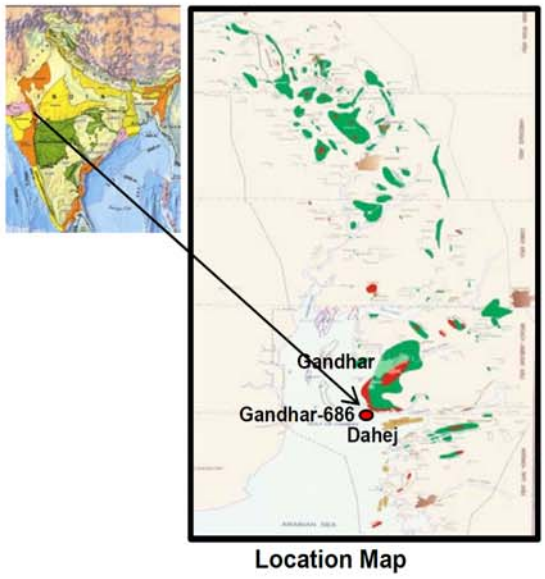
Structure Map At Mukta Top Showing Well, B-173A-8



Seismic Trace 8845 Through Well B-173A-8

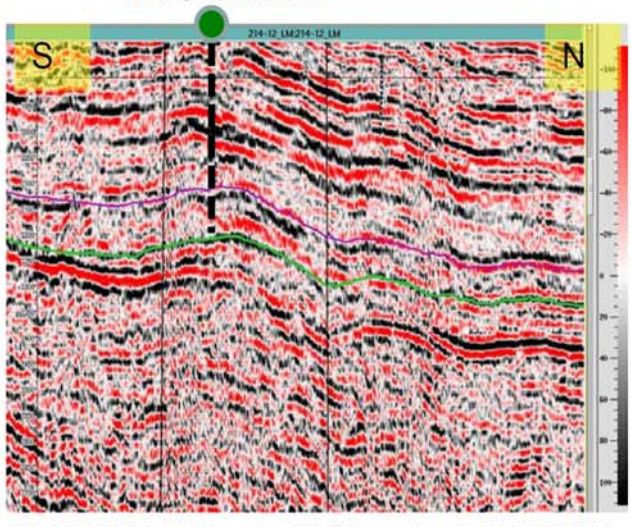
Gandhar-686 (Gandhar Extn. VI ML) — OPERATOR : ONGC

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Gandhar-686 (GGAE)	**Obj-III:** 2659.5 – 2656.5m. Flowed Oil @75.24 m3/d, & Gas @ 6433 m^3/d at FTHP of 1000 psi through 6mm bean.	Discovery in the SW of Gandhar Field has opened large area for further exploration. The well is put on production and presently producing oil @79.3m^3/d



Location Map

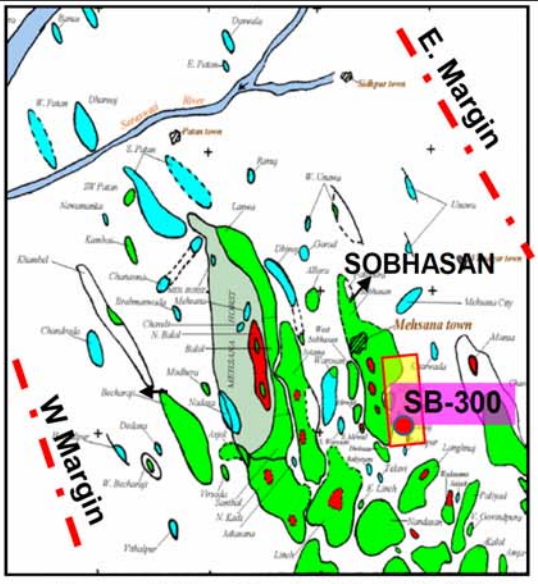
Well Gandhar-686



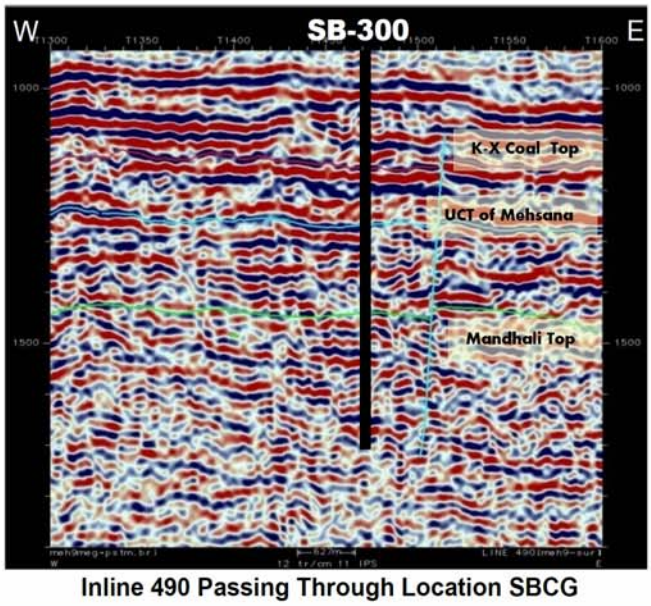
2D LINE 214-12 Showing Well Location G-686 (GGAE)

SB-300 (Geratpur ML) — OPERATOR : ONGC

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Sobhasan / SBCG / SB-300	**Obj-IV:** 1252-1249 m (additional perforation at 1249-1242 m), flowed gas @ 93,572 m3/d through 8 mm bean.	This gas find in K-IV Sub-sand has opened up more area for further exploration towards south of Sobhasan Field.



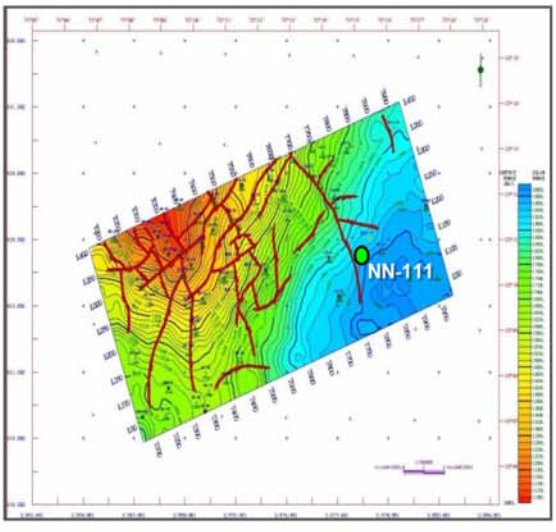
Prospect Map Showing Well SB-300



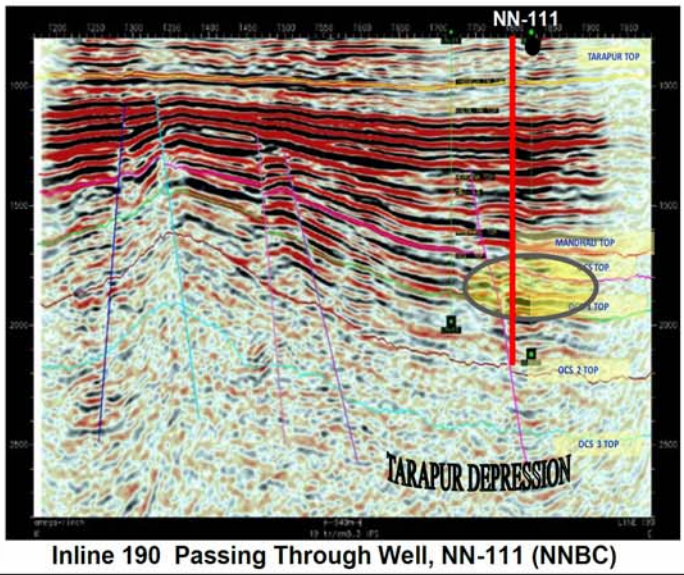
Inline 490 Passing Through Location SBCG

Nandasan-111 (Nandasan Extn.-I ML) — OPERATOR : ONGC

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Nandasan / NNBC / Nandasan-111	**Obj-IV:** 2094.5-93, 2090.5-88 & 2086-81 m: oil influx of ~6 m^3 on activation (well put on GLV - producing oil @ 8 m^3/d with 5% w/c)	This new pool discovery in the north-western part of Nandasan Field has provided exploratory leads for further exploration and exploitation.



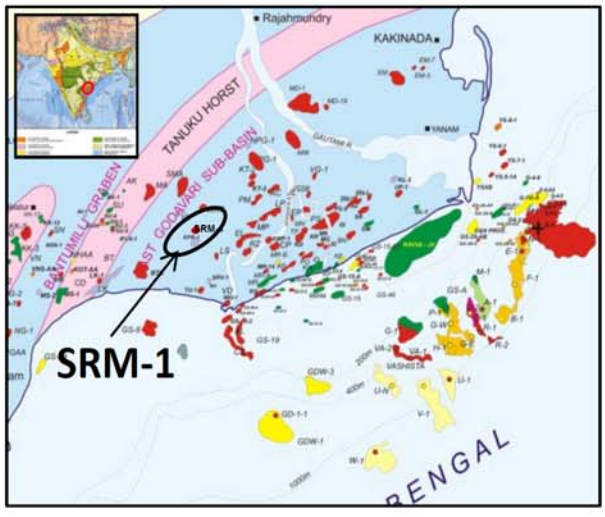
Time Map At OCS-1 Top Showing Well, NN-111



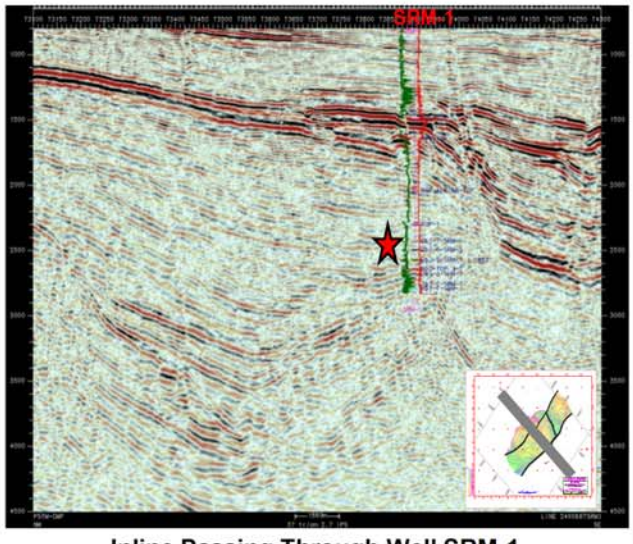
Inline 190 Passing Through Well, NN-111 (NNBC)

Seripalem-1 (Godavari Onland ML) — OPERATOR : ONGC

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Seripalem-1 (SRM-1)	**Obj. VII:** 3357 – 3360m / RGP – Lr. Cretaceous. Flowed gas@ 82523 m3/d, water @ 98.4 m3/d at FTHP – 5477 psi through 6 mm choke	This has established Raghavapuram prospectivity in area between Kavitam and Bantumilli South fields and to the southwest of earlier discoveries of Raghavapuram play in Penugonda, Vygreswaram, Vygreswaram Southwest areas.



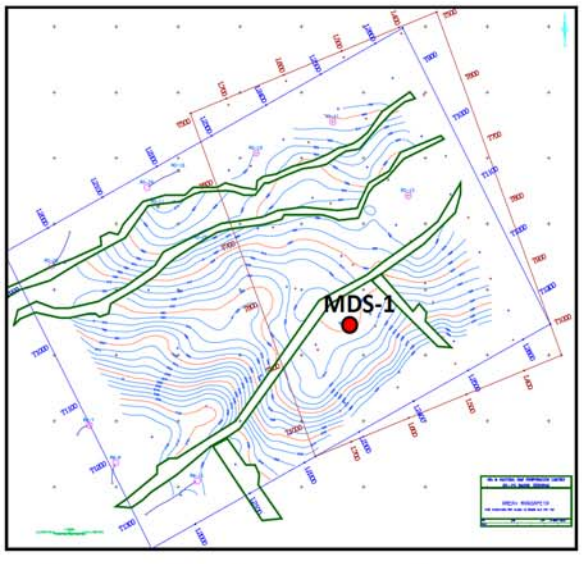
Prospectivity Map Of KG Basin Indicating SRM-1



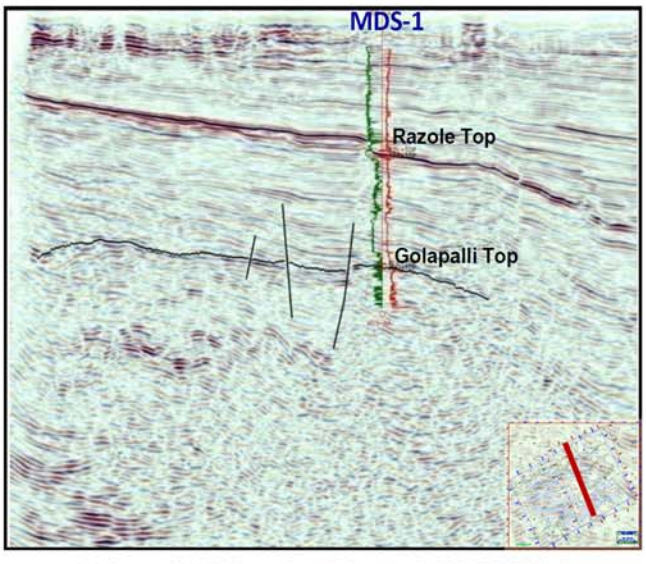
Inline Passing Through Well SRM-1

Mandapeta South-1 (Godavari Onland ML) — OPERATOR : ONGC

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Mandapeta South / MDS-AA / Mandapeta South-1	**Obj-I:** 2385-2373 m. Flowed gas @ 32,472 m^3/day through 6 mm bean (after hydro-fracturing).	This discovery has established the prospectivity of Golapalli Play to the south of Mandapeta Field.



Time Structure Map close to Gollapalli Top

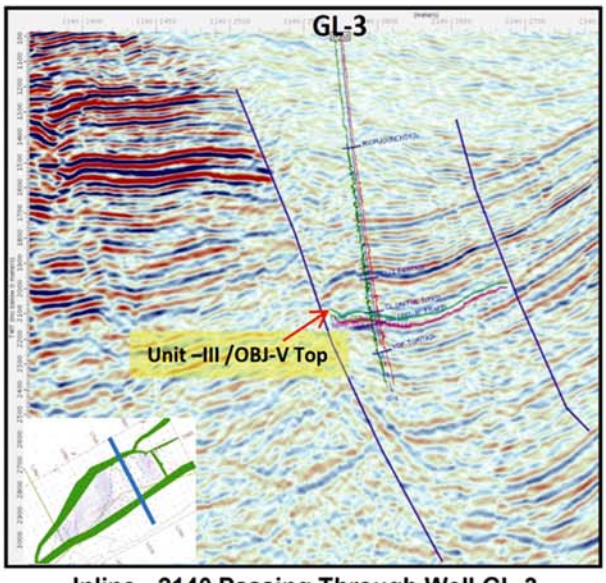


Inline - 2357 Passing Through Well MDS-1

Geddanapalli-3 (Godavari Onland ML) — OPERATOR : ONGC

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Geddanapalli / GLAC / Geddanapalli-3	**Obj-V**: 2650-2648 m. Cumulative oil flow: about 39.4 m3 (the well has been put on SRP and completed as oil producer from Obj-V).	This discovery has established the prospectivity of Matsyapuri Play in a separate fault block east of Gopavaram Field.

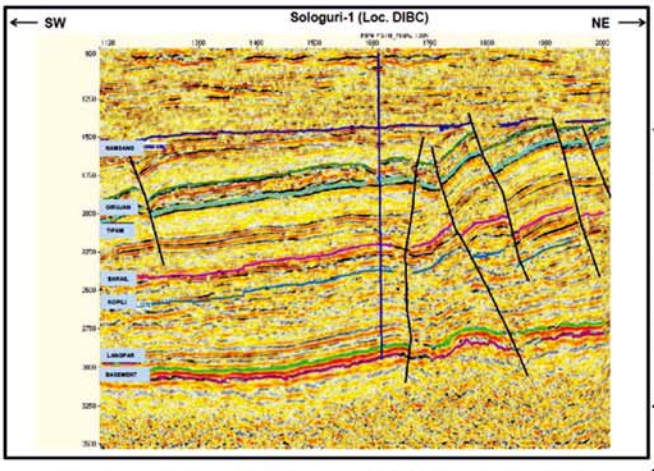
Time Structure Map on Top of OBJ-V



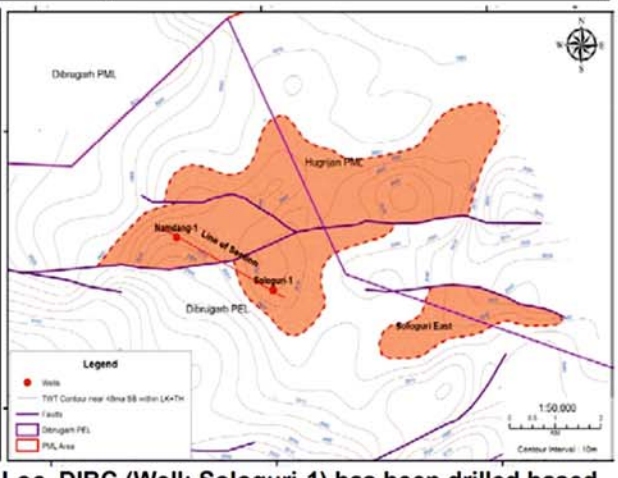
Inline - 2140 Passing Through Well GL-3

Sologuri-1 (Dibrugarh PEL) — OPERATOR : OIL

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Sologuri structure / Sologuri-1 (Loc. DIBC)	**Obj:** 3829-m Lakadong+Therria Sand / Paleocene – Lower Eocene **Perforation Range**: 3829.0-3830.0 m & 3832.0 – 3835.0 m Oil: 35 KLPD (API: 24.20, Pour Point: 33°C)	The discovery of oil in this well has opened up new avenues for exploration and exploitation of hydrocarbon in Paleocene-Eocene Formations in Sologuri area. The size of the structure is about 4.2 sq. km. Accretion to in-place volume of OEG in 2P category is around 1.10 MMSKL.



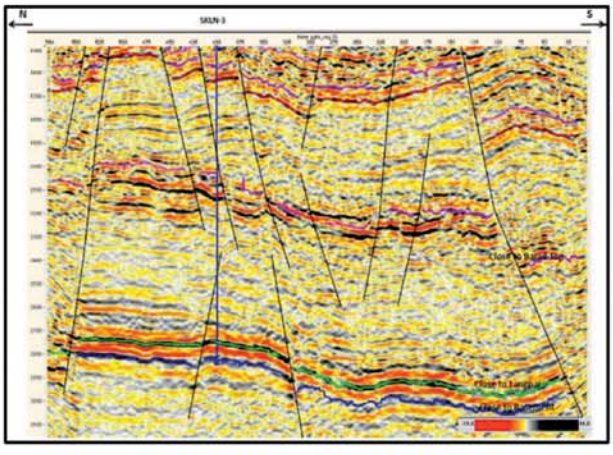
Seismic Section- IL-1304 across Sologuri Structure well Sologuri-1 (Loc. DIBC)



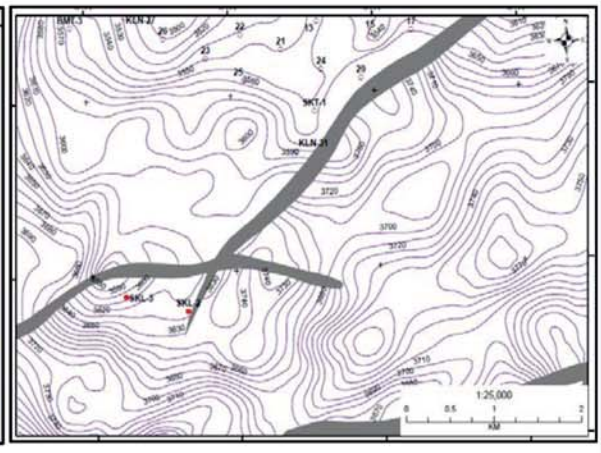
Loc. DIBC (Well: Sologuri-1) has been drilled based on the interpretation of 2D seismic data.

South Kathaloni-3 (Hugrijan ML) — OPERATOR : OIL

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
South Kathaloni structure / South Kathaloni-3 (Loc. HVX)	**Obj**: 3578-m Lakadong+Therria Sand / Paleocene – Lower Eocene **Perforation Range** : 3578.0-3580.5m, Oil: 60 klpd through 6 mm bean FTHP: 52 kg/cm².	The discovery of oil in this well has opened up new avenues for exploration and exploitation of hydrocarbon in Paleocene-Eocene Formations in South Kathaloni area. Size of the structure is around 1.2 sq.km. Accretion to in-place volume of O+OEG in 2P category is around 0.134 MMSKL.



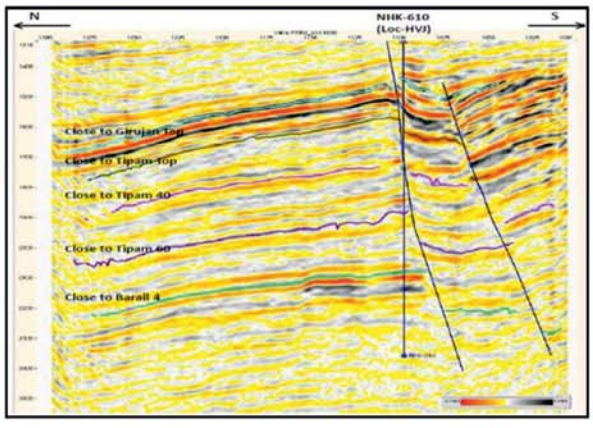
Seismic Section- IL-26 across South Kathaloni Structure well South Kathaloni-3 (Loc. HVX)



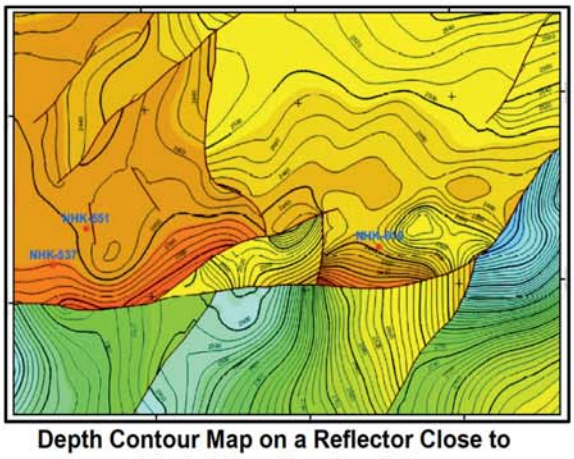
Depth Contour Map close to Langpar / 49.5 ma SB

NHK-610 (Hugrijan ML) — OPERATOR : OIL

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
East Deohal structure NHK-610 (Loc. HVJ)	**Obj:** 2568-m Barail 4th Sand/ Upper Eocene to Lower Oligocene **Perforation Range :** 2585.0-2591.0 m, Gas: 85000 SCUMD through 7 mm bean. FTHP: 180 kg/cm²	The discovery of gas in this well has opened up new areas for exploration and exploitation of hydrocarbon in Barail Formation in East Deohal structure. The areal extent of the structure is about 2.3 Sq.km. Accretion to in-place volume of O+OEG in 2P category is around 0.782 MMSKL.



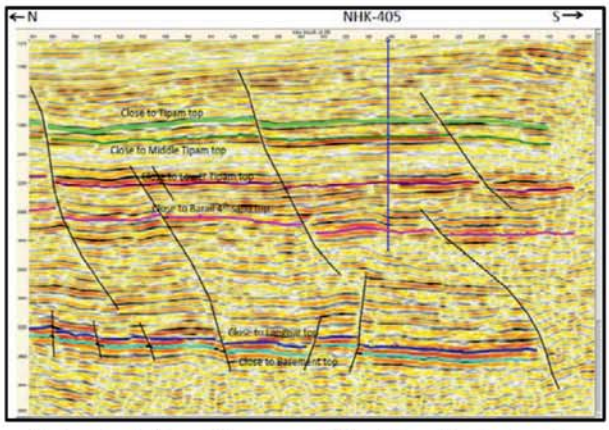
Seismic IL-1636 passing through the well NHK-610 (Loc-HVJ) in East Deohal Structure



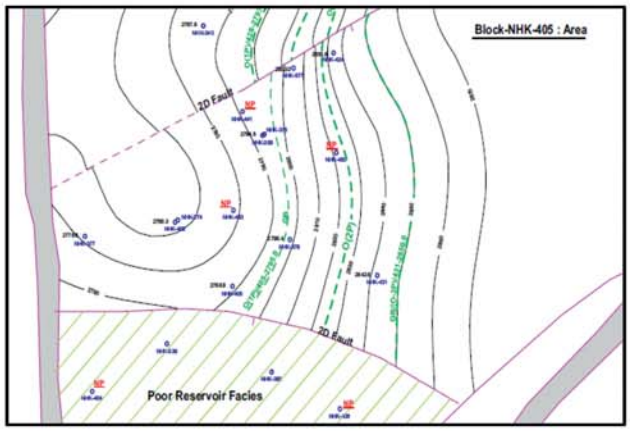
Depth Contour Map on a Reflector Close to 34mfs / Near Top Barail 4

NHK-405 (Hugrijan ML) New Pay — OPERATOR : OIL

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Nagajan Structure NHK-405 (Loc. HDL-II)	**Obj:** 2877-m Upper Tipam sand / Miocene **Perforation Range:** 2877.5 -2879.5 m, 2880.5 – 2883.0 m Gas: gas @ 45000 SCUMD through 7mm bean FTHP: 210 kg/cm².	The discovery of gas in this well has opened up a new reservoir for exploration and exploitation of gas in South Nagajan area. The areal extent of the structure is about 0.9 sq. km. Accretion to in-place volume of OEG in 2P category is around 0.185 MMSKL.



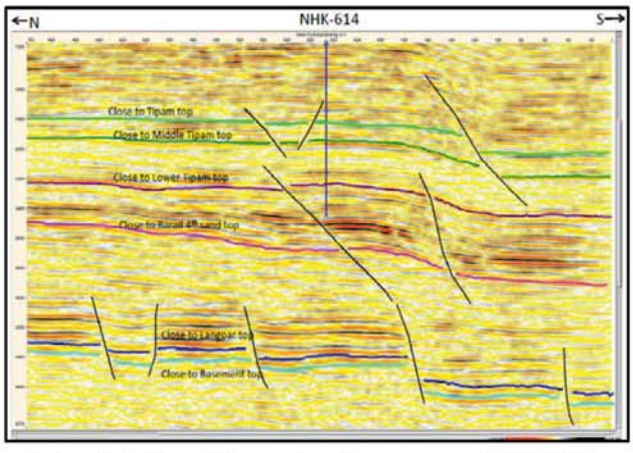
Seismic Inline-22 across West Barekuri structure well Barekuri-12 (Loc.DGJ)



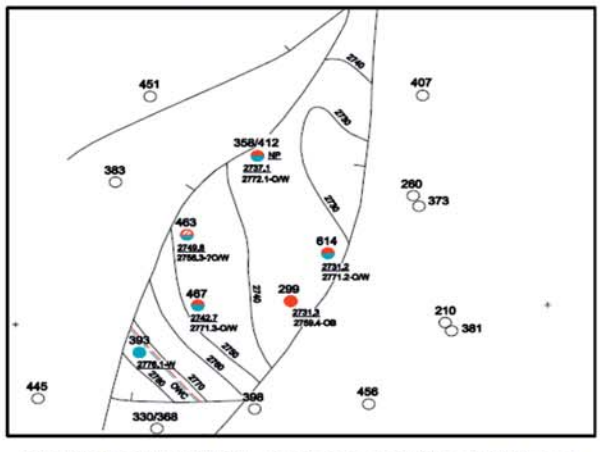
Depth Contour Map on Top of Lower Tipam Sand

NHK-614 (NHK Ext. ML) — OPERATOR : OIL

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Jaipur Structure NHK-614 (Loc. NLE)	**Obj:** 2860-m Middle Tipam Sand/Miocene **Perforation Range** : 2873.0-2876.0 m, 2865.0 – 2871.0 m Oil: Produced oil @ 11 klpd through GL/FB with 2.5 mm gas input bean	The discovery of oil in the Middle Tipam Formation has opened up a new reservoir for exploration and exploitation of oil in Jaipur area. The areal extent of the structure is about 0.5 sq. km. Accretion to in-place volume of O+OEG in 2P category is around 1.26 MMSKL.



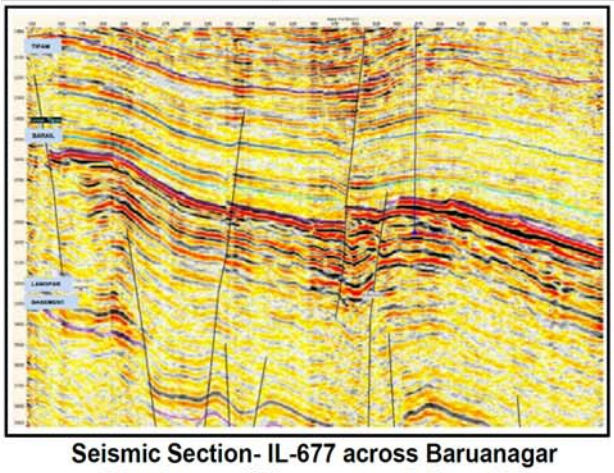
Seismic Inline 411 passing through well NHK-614



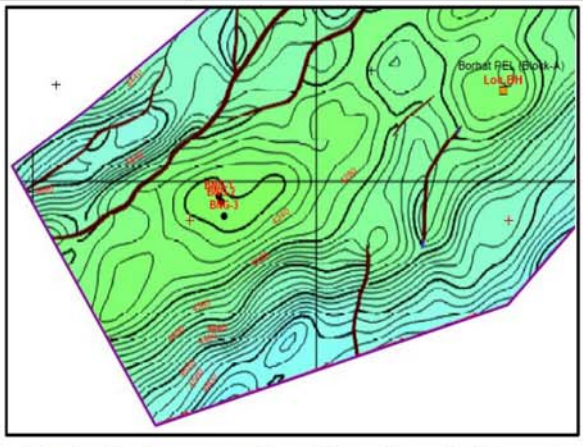
Depth Contour Map on Top of 2765 m MT Sand

Baruanagar-3 (Borhat PEL) — OPERATOR : OIL

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Baruanagar Structure / Baruanagar-3 (Loc. BE)	**Obj:** 4305 & 4254-m Barail Sand /Upper Eocene to Lower Oligocene and 4056-m Tipam sand/Miocene Perforation Ranges : 4306.5-4314.0 m, 4256.5.0-4262.5 m, 4077.5 – 4083.5 m. Oil: well produced minor amount of oil (API: 33.4°, PP: 33°C), (API: 31.4°, PP: 33°) & (API: 28.8°, PP:33° C) from all the levels but self flow did not sustain	DGH has accepted the Baruanagar-3 discovery notified by OIL as a technical discovery only. The discovery of oil in this well has opened up a new area for exploration and exploitation of oil in Baruanagar area. Size of the structure is about 5.7 sq. km.



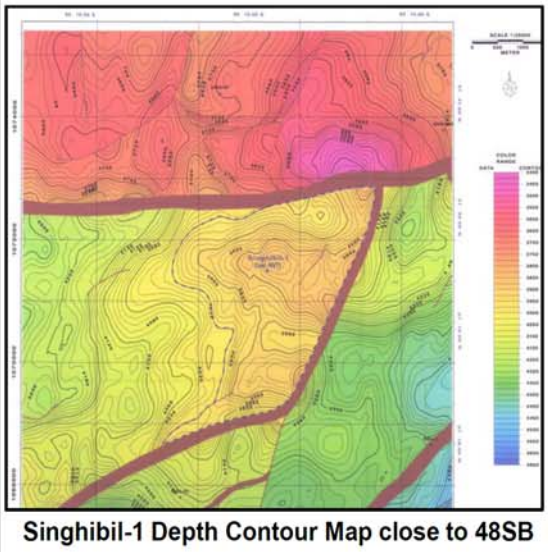
Seismic Section- IL-677 across Baruanagar Structure well Baruanagar-3 (Loc. BE)



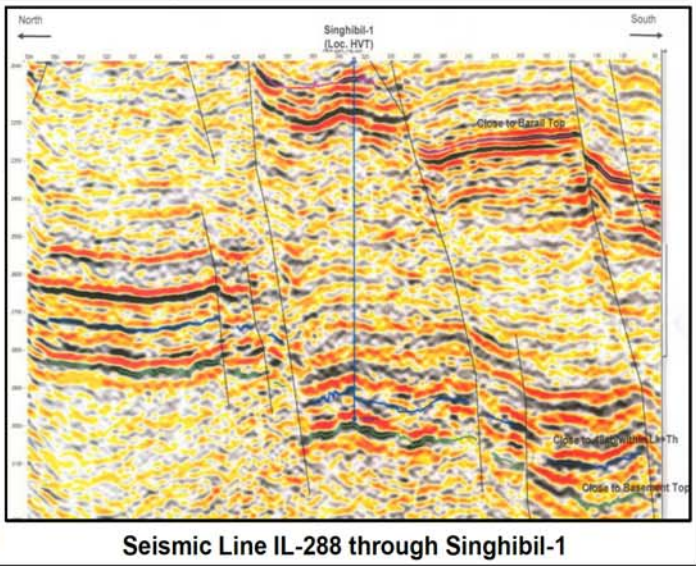
Depth Contour map Near Top of Barail 4/5 sand

Singhibil-1 — OPERATOR : OIL

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Singhhibil-1 (Loc. HVT) / Hugrijan ML	**Obj**: Lakadong+Therria Sand / Paleocene – Lower Eocene **Perforation Range** : 3936.0-3939m, Gas: 45000 SCMD through 7 mm bean FTHP: 415.7 KSC.	The discovery of oil in this well has opened up new avenues for exploration and exploitation of hydrocarbon in Lakadong + Therria Sand / Paleocene – Lower Eocene Formations. Size of the structure is around 8.66 sq.km.



Singhibil-1 Depth Contour Map close to 48SB

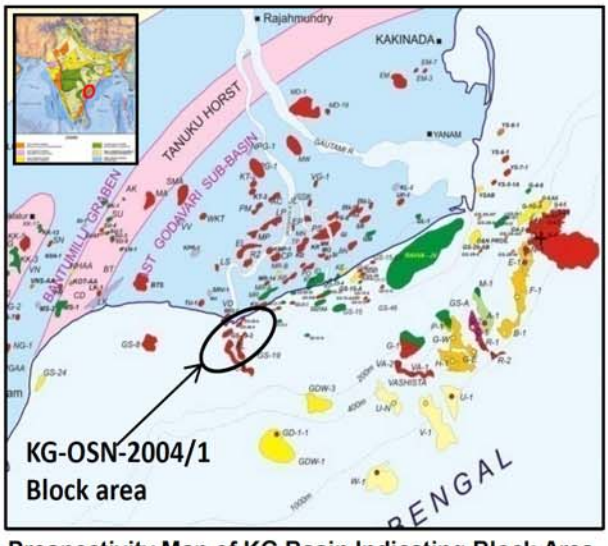


Seismic Line IL-288 through Singhibil-1

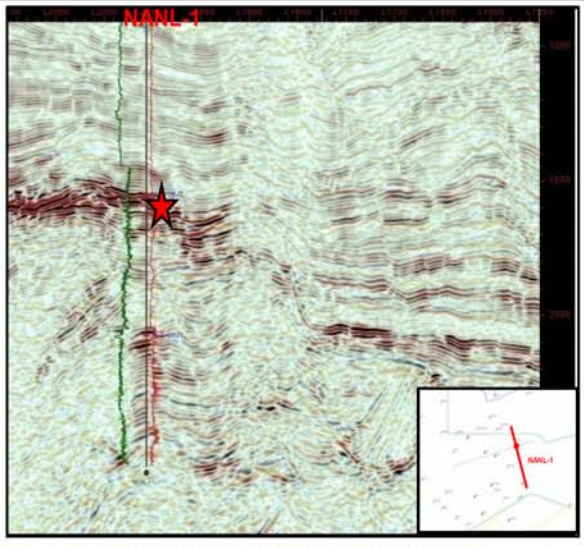
NEW DISCOVERIES IN PSC REGIME

KGOSN041NANL-1 (KG-OSN-2004/1) — OPERATOR : ONGC

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
KGOSN041NANL-1 (KGOSN041NANL-C)	**Obj-II:** 1440.5-1442.5, 1451-1455 & 1459.5-1460.5m , Pliocene / Godavari Clay. Flowed gas @261269 m^3/d along with water @ 4.8m^3/d at FTHP of 1750 psi through 1/2" choke	Fifth gas discovery in the shallow water NELP VI block KG-OSN-2004/1 after Chandrika South-1, Alankari-1, Saveri-1 and NANL-2 signifying the hydrocarbon prospectivity of Pliocene channel sands and the hydrocarbon potential of the block.



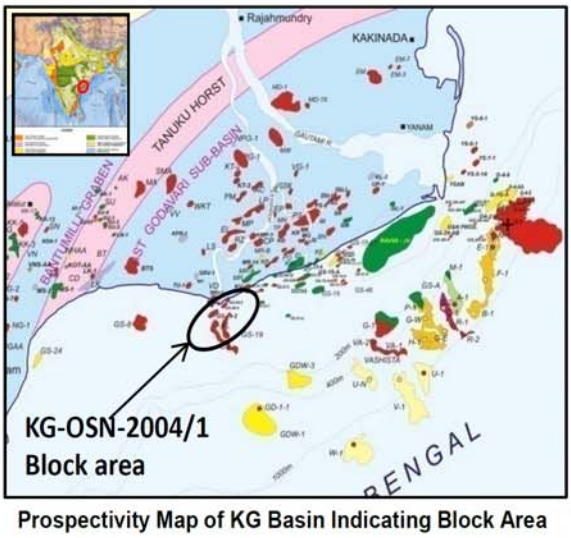
Prospectivity Map of KG Basin Indicating Block Area



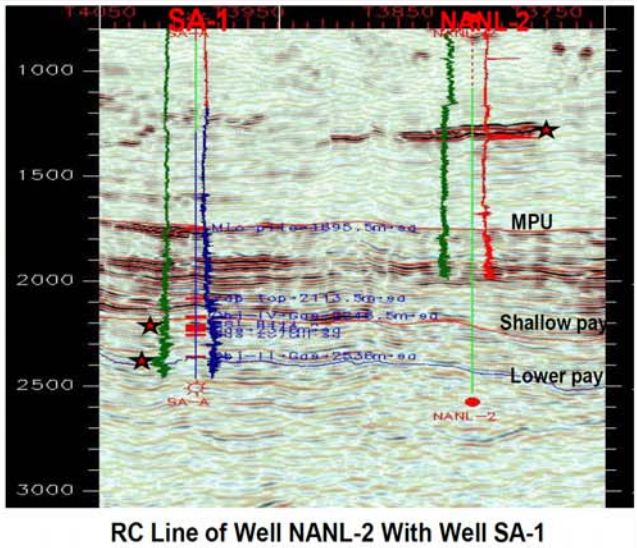
Trace 3297 passing Through Well

KGOSN041NANL-2 (KG-OSN-2004/1) — OPERATOR : ONGC

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
KGOSN041NANL-2 (KGOSN041NANL-A)	**Obj :** 1231 - 1249 m, Pliocene / Godavari Clay. Flowed gas @ 1,50,034 m^3/d at FTHP of 1610 psi through 3/8" choke	Fourth gas discovery in the shallow water NELP VI block KG-OSN-2004/1 after Chandrika South-1, Alankari-1, Saveri-1 signifying the hydrocarbon prospectivity of Pliocene channel sands and the hydrocarbon potential of the block.



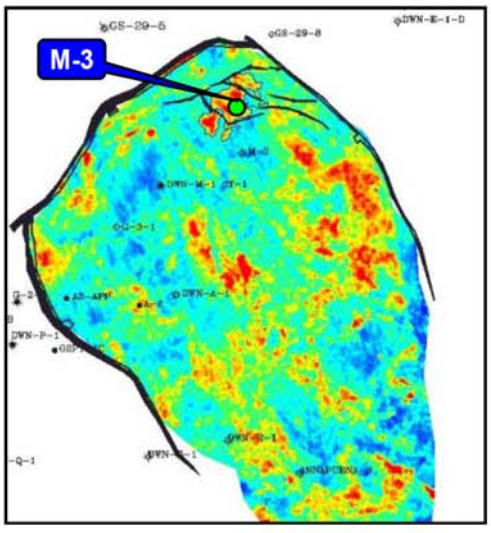
Prospectivity Map of KG Basin Indicating Block Area



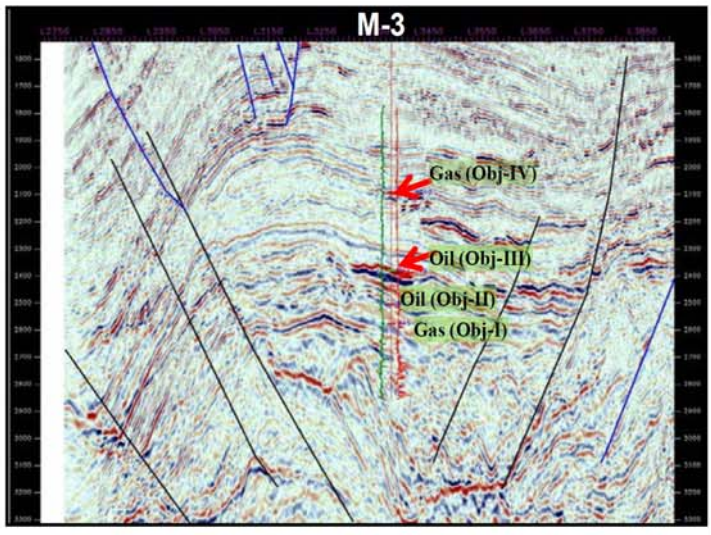
RC Line of Well NANL-2 With Well SA-1

KGD982NAMAC-M-3 (KG-DWN-98/2) — OPERATOR : ONGC

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
KG-DWN-98/2-M-3 KG982NA-M-AC / KGD982NA-M-3	**Obj-II** : 2506-2496.5 & 2483.5-77 m flowed oil @ 6,173 bopd and gas @ 1,02,059 m^3/d through 40/60" choke. **Obj-III** : 2432-27.5 & 2424-2402.5 m flowed oil @ 5,646 bopd and gas @ 1,05,573 m^3/d through 40/60" choke.	The success of M-3 in M-Dome area establishing further oil volume is significant for the development of NDA in KG-DWN-98/2 Block.



RMS Amplitude Map of M-3 Oil Pay Pack

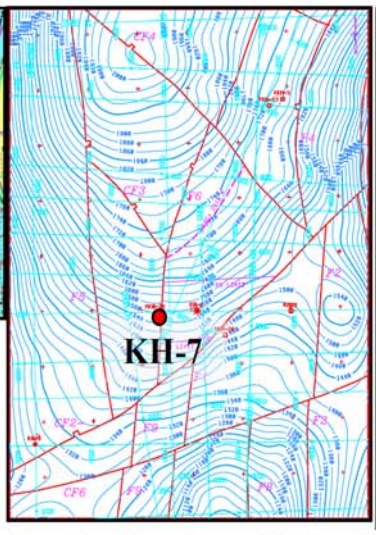


Seismic Line Through Well, M-3

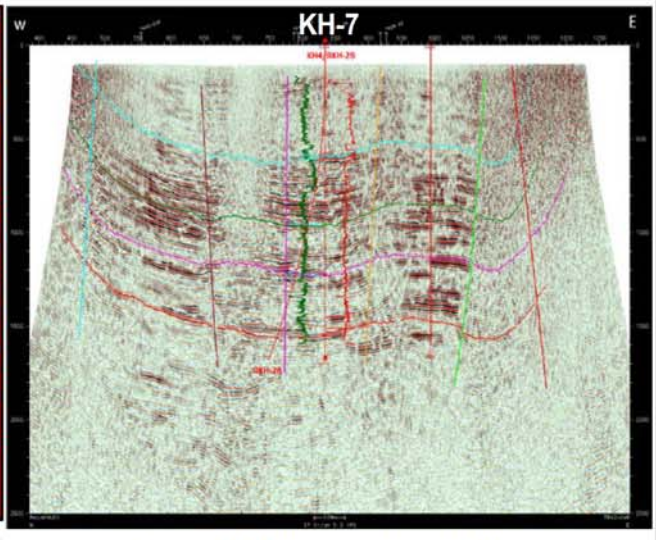
Khubal-7 (AA-ONN-2001/1) — OPERATOR : ONGC

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Khubal / KHBJ / KH-7	**Obj-IVb** : (3116-11m) with **Obj-V** (3094-85m): flowed gas @ 78,000 m^3/day and condensate @ 2.1 m^3/day through 6 mm bean.	This discovery has opened up new area for Middle Bhuban exploration in Khubal NELP area (AA-ONN-2001/1).

Geological Map Showing Khubal



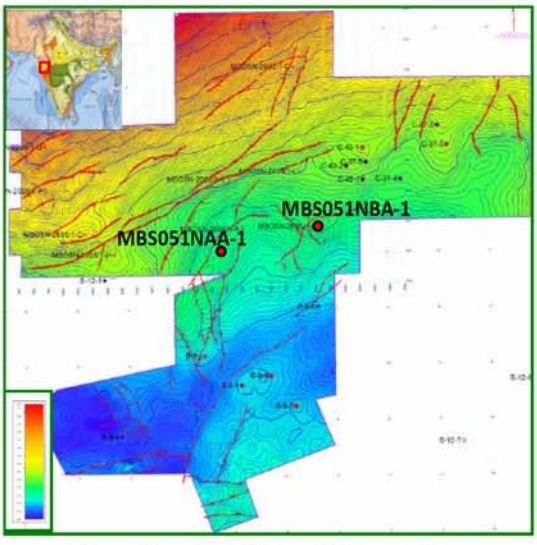
Isochron Map Near Lower Bhuban Top



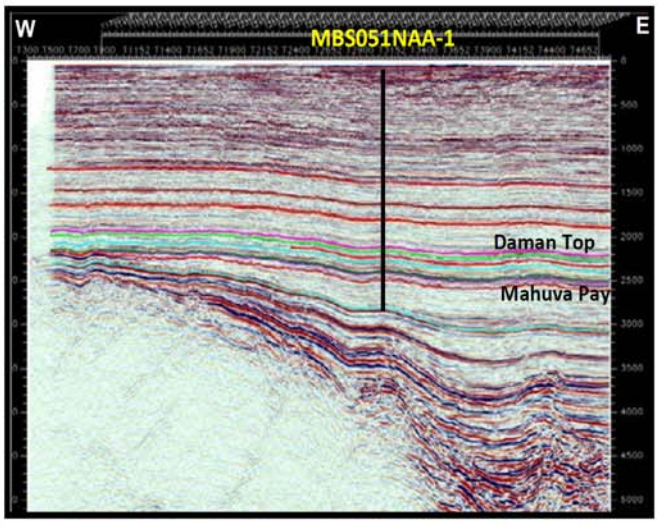
Line TR 42-04 Passing Through KH-7

MBS051NAA-1 (MB-OSN-2005/1) — OPERATOR : ONGC

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
MBS051-A / MBS051NAA-1	**Obj-I:** 2555-2549.5 m, flowed gas @ 4,16,430 m^3/d and condensate @ 365 bpd through ½" choke.	This gas find will further augment the gas volume established by earlier discovery in well, MBS051NBA-1 and thereby opened up the possibilities of commercial exploitation of gas from this area.



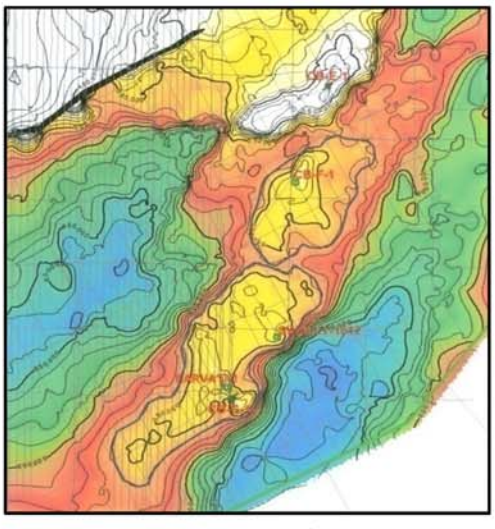
Time Structure Map at Daman Top



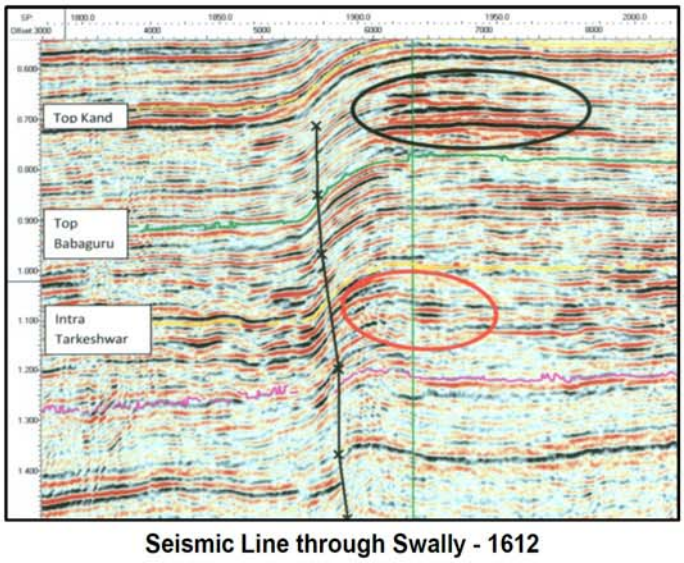
Inline 2630 Passing Through Location MBS051NAA-1

SWALLY (CB-OSN-2004/1) — OPERATOR : FOCUS

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Swally (Loc. Swally - 1612) / Gulf of Khambhat	Kand Formation of Middle Miocene Obj. : Interval 772 – 774 m MD Flow rate : Gas 1.6 MMSCF / D (6.35mm bean), FTHP 933 psi 2.5 MMSCF / D (8mm bean) FTHP 890 psi,	Hydrocarbon potentiality of Kand Formation of Middle Miocene has been established by this discovery. The bright amplitudes response in the area in Tarkeshwar / upper most Dadar section will open up a large area if the hydrocarbon potential is proved.



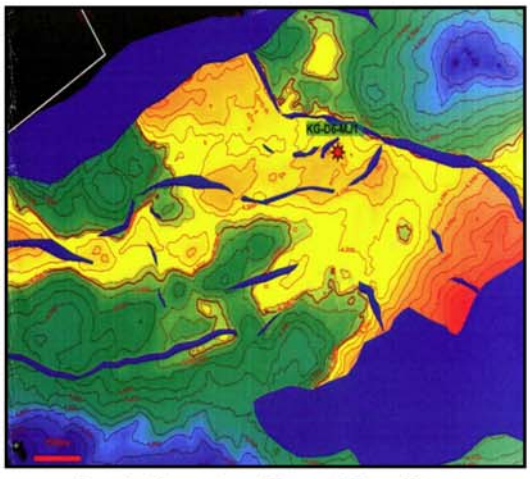
Top Kand Horizon Depth Structure Map



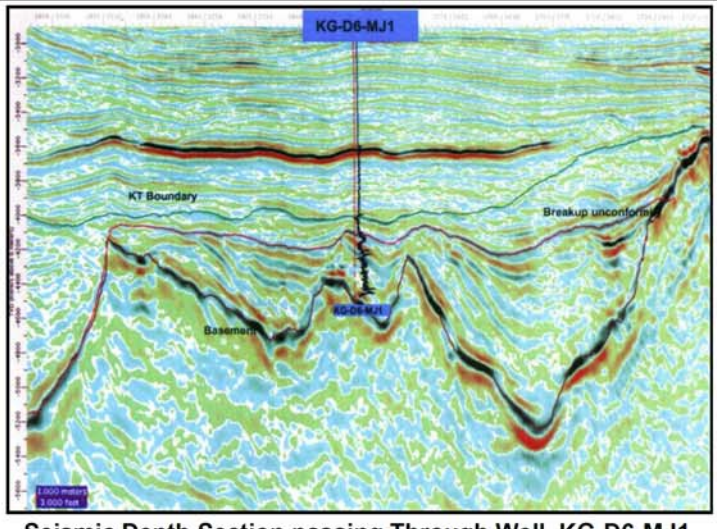
Seismic Line through Swally - 1612

KG-D6-MJ1 (KG-DWN-98/3) — OPERATOR : RIL

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
KG-D6-MJ1 / D – 55 Synrift fluvial system	Synrift Gas & condensate discovery Obj. : Interval 4178 - 4235 m MDRT Flowed ~ 30 MMSCFD gas ~ 2000 bbl / day condensate	Well MJ-I encountered reservoir sands within synrift fluvial siliciclastic reservoirs in the half graben set up sealed by upper cretaceous / paleocene post rift marrine shales



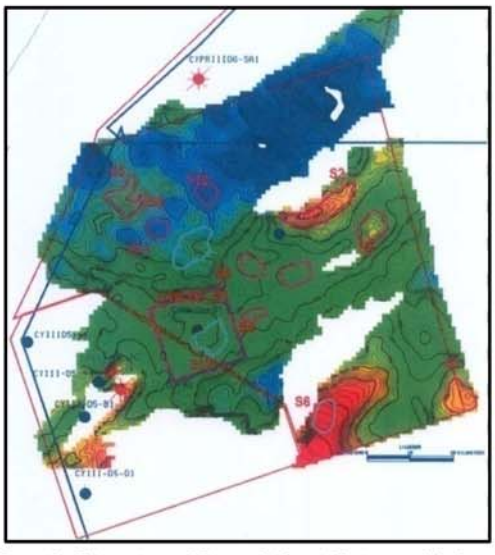
Depth Structure Map of Synrift Reservoir Top



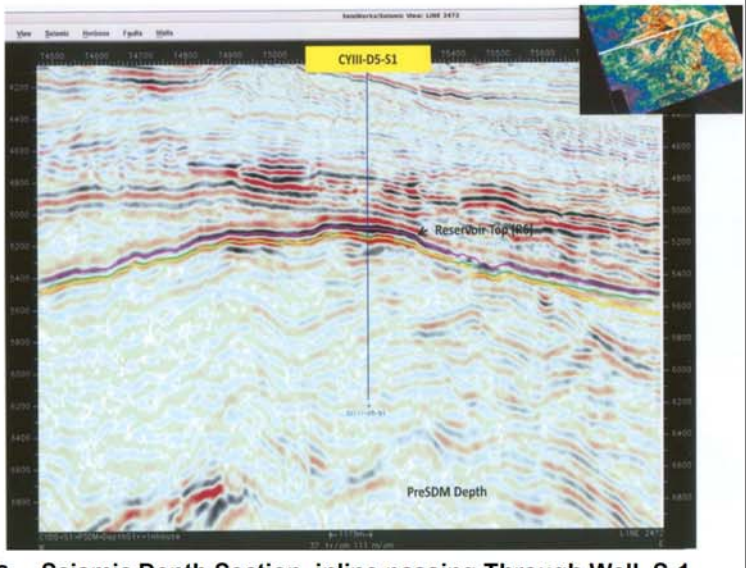
Seismic Depth Section passing Through Well, KG-D6-MJ1

D-56 (CY-DWN-2001/2) — OPERATOR : RIL

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
CYIII-D5-S1 / D-56 Early Cretaceous / Mesozoic structure	Obj. : Interval 5039 – 5164 m MDRT During DST well flowed 35.6 MMscfd gas and condensate of 11 bbls / MMscf with chock of 56 / 64".	Four way dip closure S-1 structure has proved hydrocarbon potential in early Cretaceous / Mesozoic level in this area.



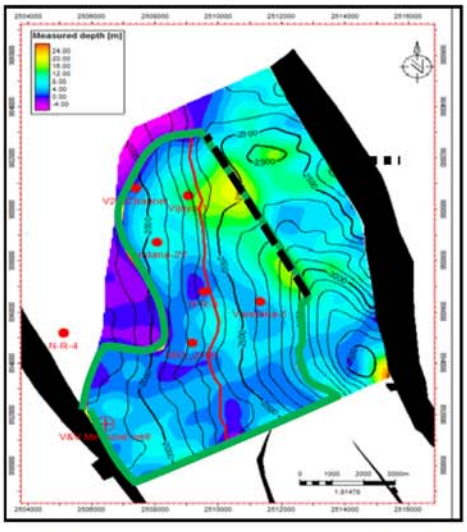
Depth Structure Map of Synrift top with leads



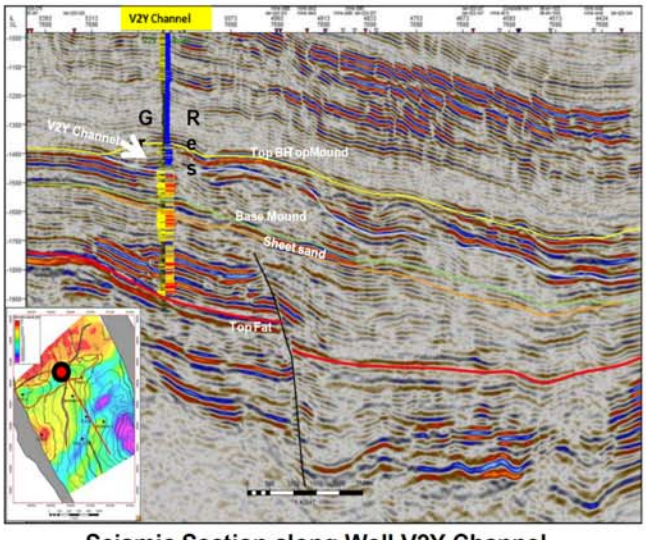
Seismic Depth Section inline passing Through Well, S-1

V2Y Channel (RJ-ON-90/1) — OPERATOR : CAIRN

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
V2Y Channel / Barmer Hill Formation & V2Y Channel	Obj.-I : Interval 1810 – 1873 m MD BHT-1 Formation Flow rate : 288 BOPD Oil (16/64") Obj.-II : Interval 2145 – 2185 m MD BHT-20 Formation Flow rate : 123 BOPD Oil (12/64")	V2Y Channel well has been successfully established hydrocarbon prospectivity of V2Y channel, Vijaya mound (Up Barmer Formation) and N-S channel of Lower Barmer Hill Formation



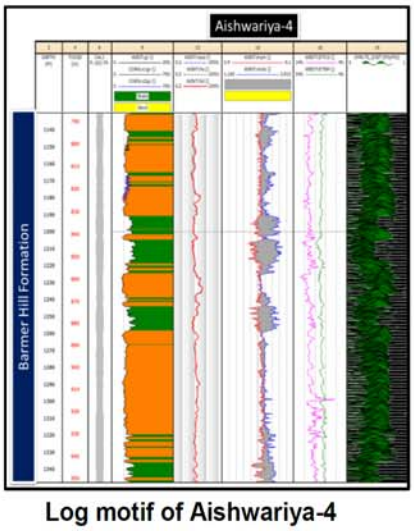
Isopach map with structure contours of BHT-20



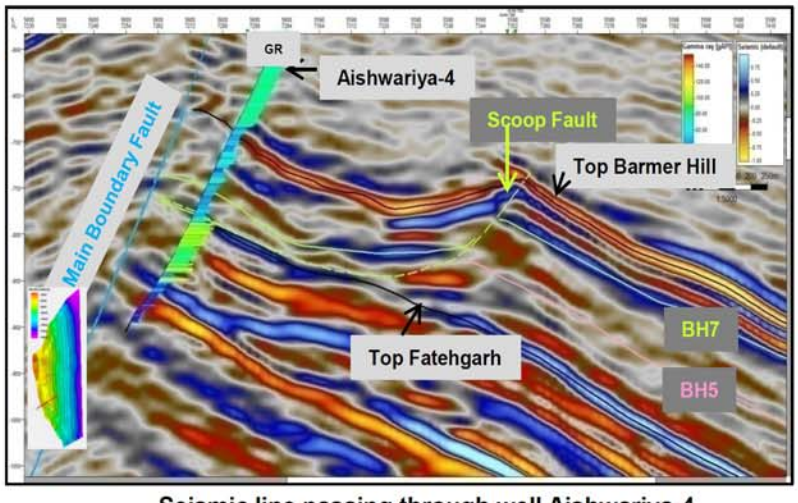
Seismic Section along Well V2Y Channel

Aishwariya-4 (RJ-ON-90/1) — OPERATOR : CAIRN

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Aishwariya – 4 / Barmer Hill Formation	Obj. : Interval 1140 – 1340m MD Barmer Hill Formation • Average Oil Rate = ~510 BOPD • Average Gas Rate = ~70,000 scf/d	The presence of hydrocarbon in Barmer Hill Formation was also confirmed in Aishwariya field from the well Aishwariya-4. The low permeability diatomite/porcellanite reservoir is unique in Indian subcontinent, optimal hydro-frac operation will improve the production performance from this type of reservoirs



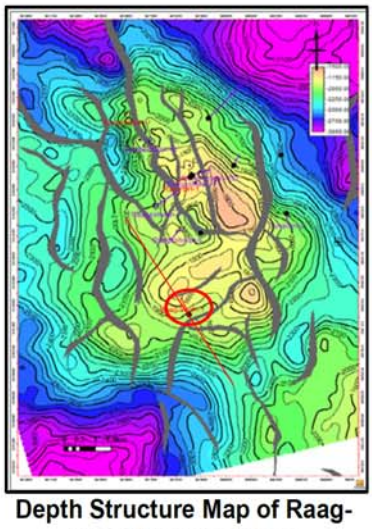
Log motif of Aishwariya-4



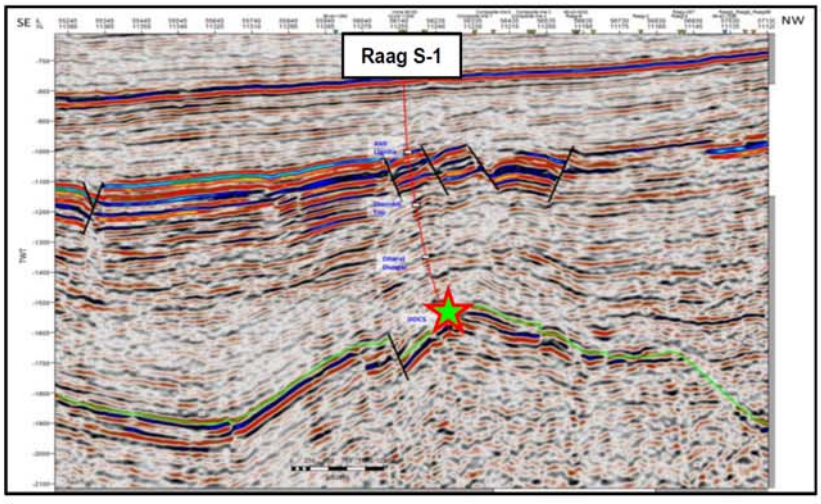
Seismic line passing through well Aishwariya-4

RAAG-S-1 (RJ-ON-90/1) — OPERATOR : CAIRN

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
Raag-S-1 / Raageshwari South-1	DDCS sand Oil rate 41 BOPD Obj. : Interval 2057.6 – 2066.8 m MD Flowed ~ Oil rate @ 41 BOPD (8/64") After fraccing the well flowed at an average rate of 300-350 bopd	This well has been established the hydrocarbon prospectivity in basal and upper thumbli interval and DDCS sands



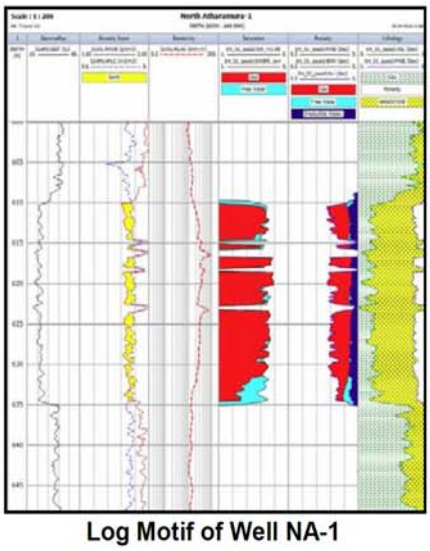
Depth Structure Map of Raag-DDCS Reservoir Top



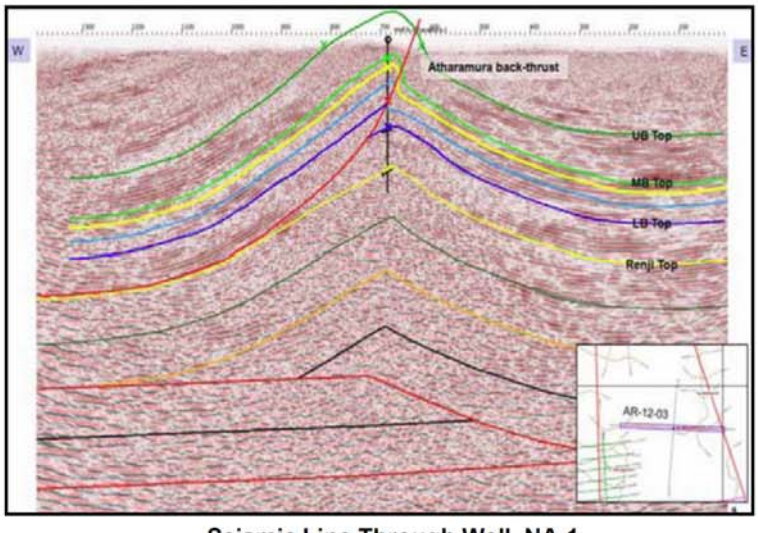
Seismic line (time) along the well path of Raag-S-1

North Atharamura-1 (AA-ONN-2002/1) — OPERATOR : JOGPL

Structure / Well No. & Location	Testing Result	Leads / Expl. Efficacy
North Atharamura-1 / NA-1 Supra-thrust / Sub-thrust	**Obj:** 610m – 625m MD Middle Buban Sand During RLT, flow rate of 2.6 MMSCFD Gas, through 32/64" THP = 508 – 514 Psi & BHP = 629 Psi	This discovery has proved hydrocarbon potential of Middle Buban Formation of Miocene age in the Atharamura Area. The Atharamura anticline is the largest anticlines exposed in Tripura fold belt.



Log Motif of Well NA-1



Seismic Line Through Well, NA-1

DGH Team at Petrotech, 2014

DGH Stall at Petrotech - 2014

Synopsis of Activities till 2013-14

Indian Offshore and Onland glimpses

SYNOPSIS OF ACTIVITIES TILL 2013-14

4.1 AWARD OF ACREAGES FOR CONVENTIONAL & UNCONVENTIONAL HYDROCARBONS

India has an estimated sedimentary area of 3.14 million sq km. comprising of 26 sedimentary basins, of which, 1.35 million sq km. area is in deepwater, 0.4 million sq.km in shallow water and remaining 1.39 million sq km. area is onland. At present **0.38** million sq km. area is held under Petroleum Exploration Licenses (PEL) by operating companies including National Oil Companies viz. Oil and Natural Gas Corporation Limited (ONGC), OIL India Limited (OIL) and the other Private/Joint Venture companies. Before implementing the New Exploration Licensing Policy (NELP) in 1999, 11% of Indian sedimentary basinal area was under exploration, which has now increased significantly.

Operating Regimes of Award of E&P Blocks/Fields & CBM

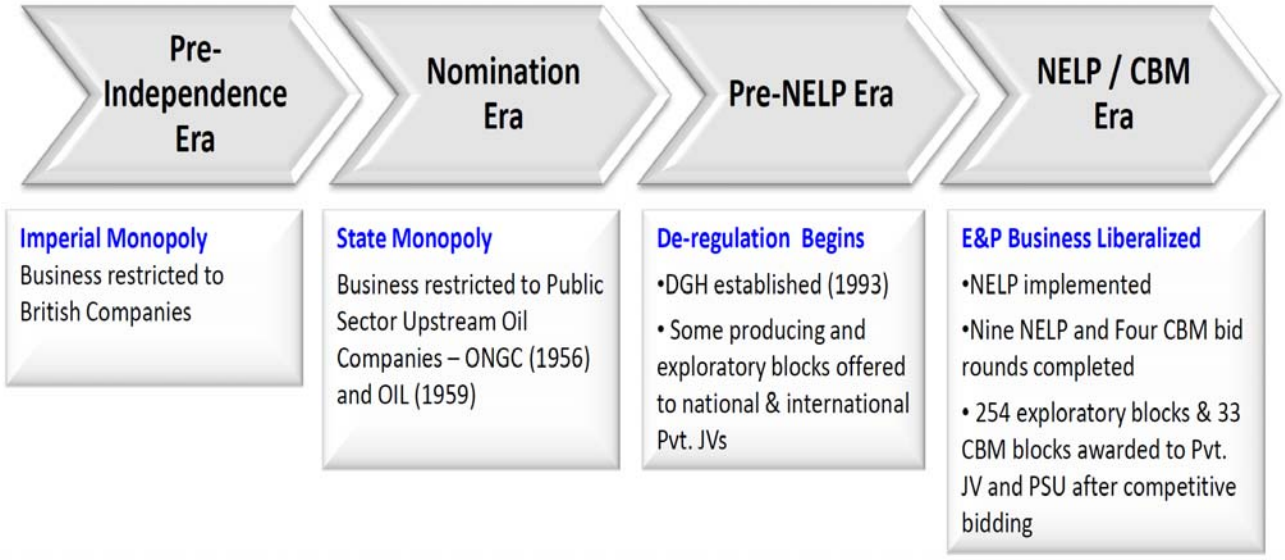
There are four different operating regimes for exploration/production of oil and gas, namely :

A) Petroleum Exploration License (PEL) and Petroleum Mining Lease (PML) granted to National Oil Companies viz Oil and Natural Gas Corporation Ltd.(ONGC) and Oil India Ltd. (OIL) on Nomination basis.

B) Mining Licenses granted under small/medium size discovered field Production Sharing Contract (PSCs),

C) Petroleum Exploration License and Petroleum Mining Lease granted under Pre-NELP, PSC regime and

D) PEL and PML granted under the New Exploration Licensing Policy (NELP) regime.



- Under the first regime, exploration blocks were offered to national oil companies on **nomination basis**. These companies are required to pay full statutory levies viz. royalty to the state government/central government for onland/offshore areas and cess to the central government.
- Some of the **small and marginal fields** discovered by ONGC and OIL were offered to other parties for rapid development under two rounds of bidding during the year 1991 to 1993. As per the PSCs relating to those fields, the rates of royalty and cess were frozen with a view to providing fiscal stability i.e. a stable tax regime to the contractors.
- Prior to 1997, **in the pre-NELP exploration blocks**, the two national oil companies as licensees, were required to bear all the liability of statutory levies, but the exploration blocks were offered to various companies in order to attract private investments in exploration and production of oil. The private companies were selected through a bidding process during six round of bidding between 1993 to 1995.
- From the year 2001 to 2008, total 33 CBM blocks have been awarded to different companies in four rounds.

4.2 AWARD OF ACREAGES - NELP REGIME

4.2.1 New Exploration Licensing Policy (NELP)

The system of offering exploration blocks to various parties was modified in **1997** with the introduction of the **NELP,** under which the national oil companies and private players are treated at par and are required to compete with each other for acquiring exploration acreages under uniform contractual and fiscal framework. NELP became effective in **1999**. Under NELP, pre-tax profit is to be shared between the contractor and the Government of India on the basis of an investment multiple system. The contractor is allowed full cost recovery on all costs incurred in an exploration block.

New Exploration Licensing Policy (NELP) was formulated by the Government of India, with Directorate General of Hydrocarbons (DGH) as a nodal agency, during 1997-98 to provide a level playing field to both Public and Private sector companies in exploration and production of hydrocarbons. Government of India's commitment to the liberalization process is reflected in NELP, which has been conceptualized keeping in mind the immediate need for increasing domestic production. To attract more investment in oil exploration and production, NELP has steered steadily towards a healthy spirit of competition between National Oil Companies and private companies. This has been a landmark event in the growth of the upstream oil sector in India. The foreign and Indian private companies are invited to supplement the efforts of National Oil Companies in the discovery of hydrocarbons. The development of E&P sector has been significantly boosted through this policy of Government of India, which brought major liberalization in the sector and opened up E&P for private and foreign investment, where 100% Foreign Direct Investment (FDI) is allowed.

Under NELP, which became operational in February 1999, acreages were offered to the participating companies through the process of open global competitive bidding. The terms and conditions of this open and transparent policy rank amongst the most attractive in the world. The first round of offer of blocks was in the year 1999 and the latest ninth round in 2010 . The Government of India has so far completed Nine rounds of offer of acreages under NELP where in 360 exploration blocks were offered and 254 blocks were awarded till 31.03.2014. (Oil and Oil-Equivalent Gas (O+OEG) in place reserve accretion under NELP is approximately **745** MMT).

- In the first round of NELP (NELP-I), 24 blocks were awarded for hydrocarbon exploration, which included 7 blocks in east coast deep water, 16 blocks in shallow water of east and west coasts and 1 onland. 20 blocks have been relinquished/surrendered. 4 exploration blocks are presently under operation.
- Under NELP-II, 23 blocks were awarded for exploration including 8 in the deep waters off the West Coast, 8 in the shallow water of both east and west coasts and 7 onland. 19 blocks have been relinquished / surrendered. 1 block got converted to PML. 3 exploration blocks are presently under operation.
- Under NELP-III, 23 blocks were awarded for exploration including 9 in the deep waters off the west and east coast of India, 6 in the shallow water of both east and west coasts and 8 onland. 16 blocks have been relinquished and presently 7 blocks are under operation.
- Under NELP-IV, a total of 20 blocks were awarded, of which 10 blocks are in onland and 10 in the deep water of the west coast, east coast and Andamans. Blocks in Andaman offshore were awarded for the first time. 13 blocks have been relinquished and presently 7 blocks are under operation.
- Under NELP-V, a total of 20 blocks were awarded, of which 6 blocks in the deepwater, 2 in the shallow water and 12 in onland. 12 blocks have been relinquished and presently 8 blocks are under operation.
- Under NELP-VI, a total of 52 blocks were awarded of which 21 blocks are in deepwater, 6 blocks in shallow water and 25 blocks fall in onland. 28 blocks have been relinquished and presently 24 blocks are under operation.
- Under NELP-VII, a total of 41 blocks were awarded of which 11 are deepwater, 7 shallow water and 23 onland blocks. 5 blocks have been relinquished and presently 36 blocks are under operation.
- Under NELP-VIII, a total of 32 blocks were awarded of which 8 deepwater, 11 shallow water and 13 onland including type S blocks. All 32 blocks are presently under operation.

➢ Under NELP-IX, a total of 19 blocks, were awarded of which 1 deepwater, 3 shallow offshore and 15 onland including type S blocks. 1 block relinquished and presently 18 blocks are under operation.

4.2.2 Progressive modifications of terms & conditions in different NELP rounds

Sl. No.	NELP-I to V	NELP-VI	NELP-VII	NELP-VIII & IX
1.	• Blocks categorized as Deepwater blocks, shallow offshore blocks and onland blocks. • No sub categorization of blocks.	• Each category is sub categorized as Type A and Type B.	• Sub categories Type A and Type B continued. • New category Type S with small onland blocks of size less than 200 sq.km. introduced. • For Type S blocks, Technical capability is not considered for pre-qualification or evaluation.	• Type A & B classification among onland, shallow water and deep water blocks removed. • Category Type S continued.
2.	Three exploration phases	Two exploration phases	Two exploration phases	Two exploration phases
3.	No mandatory work programme.	Mandatory work specified in the NIO for some of the blocks.	Mandatory work specified in the NIO for some of the blocks.	Mandatory work specified in the NIO for some of the blocks.
4.	**Bid Evaluation Criteria** 1. Technical capability 2. Work Programme 3. Fiscal Package	**Bid Evaluation Criteria** 1. Technical capability 2. Work Programme 3. Fiscal Package	**Bid Evaluation Criteria** 1. Technical capability 2. Work Programme 3. Fiscal Package	**Bid Evaluation Criteria** 1. Technical capability 2. Work Programme 3. Fiscal Package
5.	Stair-step based system of Investment multiple for GOI Share.	Stair-step based system of Investment multiple for GOI Share.	Linear based system of Investment multiple for GOI Share.	Linear based system of Investment multiple for GOI Share.
6.	Part area relinquishment, after phase-I and after phase-II.	Part area relinquishment, after phase-I.	Part area relinquishment, after phase-I.	No part area relinquishment, after phase-I.
7.	No Liquidated damages (LD) specified. Penalties for unfinished work programme computed case-to-case basis.	No Liquidated damages (LD) specified. Penalties for unfinished work programme computed case-to-case basis.	No Liquidated damages (LD) specified. Penalties for unfinished work programme computed case-to-case basis.	Liquidated damages (LD) specified upfront for unfinished work programme.
8.	Bank Guarantee @ 35% of Annual Work Programme.	Bank Guarantee @ 35% of Annual Work Programme.	Bank Guarantee @ 35% of Annual Work Programme.	One time BG introduced @ 7.5% of total committed work programme.
9.	No Bid bond to be furnished at the time of submission of bids.	No Bid bond to be furnished at the time of submission of bids.	No Bid bond to be furnished at the time of submission of bids.	Bid bond to be submitted at the time of submission of bids.

4.2.3 Chronology of Pre-NELP and NELP Bid Rounds

Round	Launch Year	Signing Year
PRE-NELP	1993	1993-2003
NELP-I	1999	2000
NELP-II	2000	2001
NELP-III	2002	2003
NELP-IV	2003	2004
NELP-V	2005	2005
NELP-VI	2006	2007
NELP-VII	2007	2008
NELP-VIII	2009	2010
NELP-IX	2010	2012

4.2.4 Status of Blocks under NELP

Round	Offered	Awarded				Relinquished	Operational
		Deep Water	Shallow Water	Onland	Total		
Pre-NELP	28	0	11	17	28	16	12
NELP-I	48	7	16	1	24	20	4
NELP-II	25	8	8	7	23	19	3
NELP-III	27	9	6	8	23	16	7
NELP-IV	24	10	-	10	20	13	7
NELP-V	20	6	2	12	20	12	8
NELP-VI	55	21	6	25	52	28	24
NELP-VII	57	11	7	23	41	5	36
NELP-VIII	70	8	11	13	32	0	32
NELP-IX	34	1	3	15	19	1	18
TOTAL	**388**	**81**	**70**	**131**	**282**	**130**	**151**

4.2.5 Investments in NELP blocks

One of the objective of NELP is to attract investments in E&P sector. Under the nine rounds of NELP bidding held so far, the committed exploration investment is about US$ 11.73 Billion. As against this an investment to the tune of US$ 14.2 Billion has been expended by the contractors for exploration activities in the awarded blocks. In addition, about US$ 9.00 Billion has been incurred by the contractors for carrying out development activities. The details are as under:

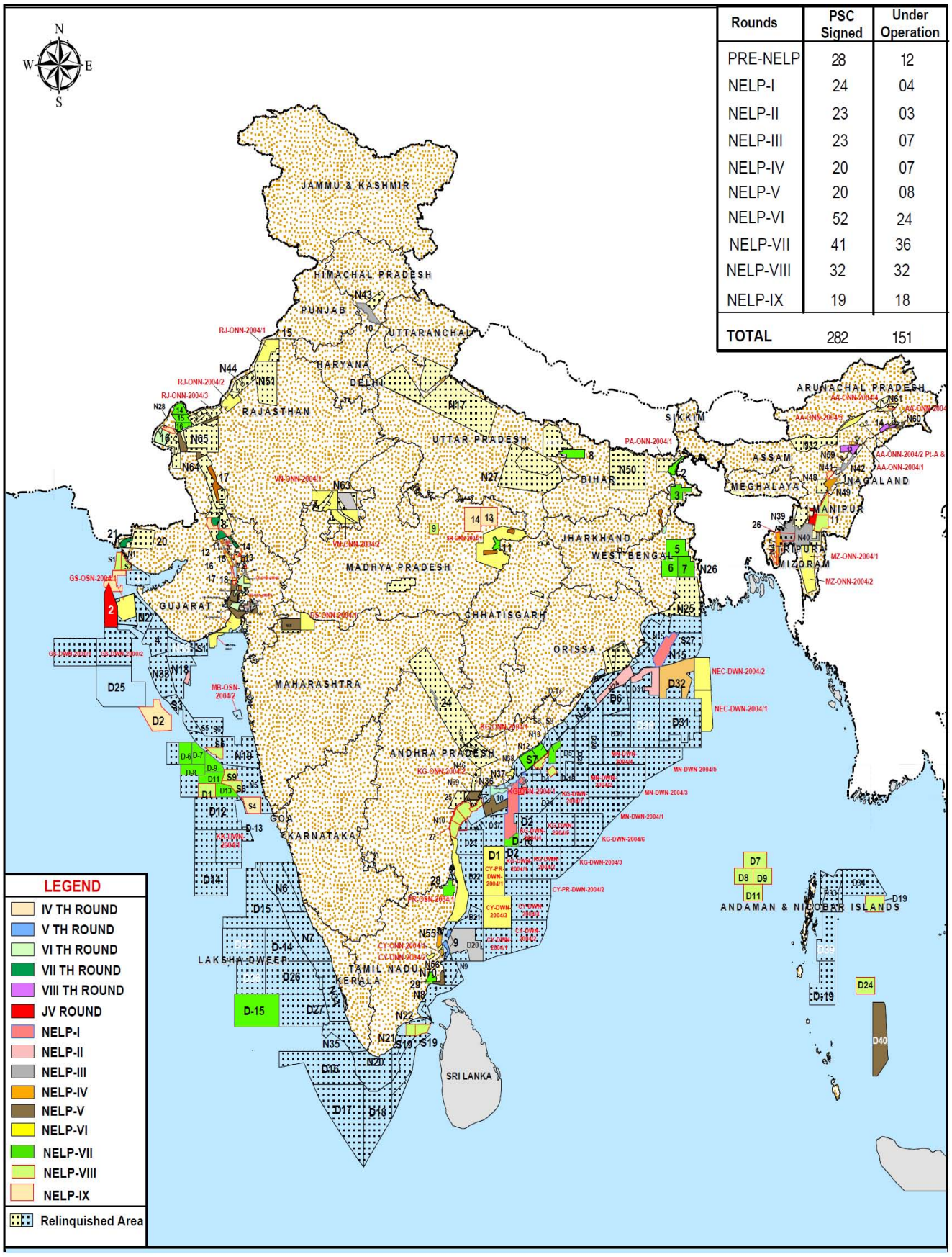
(US $ Million)

NELP Committed Investment		Actual Investment as on 31.03.2014		
NELP Rounds	Exploration Investment Commitment	Actual Exploration Investment	Actual Development Investment	Total Investment
NELP-I	1082.23	4412.48	7760.0	12172.48
NELP-II	775.41	823.82	33.36	857.18
NELP-III	978.18	3307.04	1197.61	4504.65
NELP-IV	1135.05	2068.75	3.738	2072.488
NELP-V	847.22	754.88	0	754.88
NELP-VI	3570.00	2001.87	0	2001.87
NELP-VII	1504.61	593.73	0	593.73
NELP – VIII	1102.25	173.87	0	173.87
NELP-IX	733.66	62.12	0	62.12
Grand Total	**11728.61**	**14198.56**	**8994.708**	**23193.268**

4.2.6 Pre-NELP & NELP Exploration Blocks under Operation by NOC'S & Pvt/JV Companies

(As on 31.03.2014)

Rounds	PSC Signed	Under Operation
PRE-NELP	28	12
NELP-I	24	04
NELP-II	23	03
NELP-III	23	07
NELP-IV	20	07
NELP-V	20	08
NELP-VI	52	24
NELP-VII	41	36
NELP-VIII	32	32
NELP-IX	19	18
TOTAL	282	151



DGH

EXPLORATION BLOCKS AWARDED UNDER PRE-NELP

(As on 31.03.2014)

SL. NO.	BASIN	BLOCK NAME	REF. NO ON MAP	CONSORTIUM (PARTICIPATING INTEREST IN %)	DATE OF SIGNING CONTRACT	AWARDED AREA	RELINQ. AREA (in sq.km)	PRESENT AREA
CURRENT ACTIVE BLOCKS (11 BLOCKS)								
ONLAND								
1	RJ	RJ-ON-90/1	17	**CIL(35)**, CEHL (35) & ONGC (30)	15-05-1995	11108	7996.73	3111.27
2		RJ-ON/6	16	**FEL(10)**, ISIL(65) & NOCL(25)	30-06-1998	5378	1351.84	4026.16
3	CB	CB-ON/7	22	**HOEC(50)** & GSPCL(50)	-	525	517.36	7.64
4		CB-ON/2	23	**GSPC(80)**, GGR(20)	12-04-2000	1618	408	1210
5		CB-ON/3	19	**EOL (100)**	16-07-1998	510	390.95	119.05
6	GK	GK-ON/4	21	**FEL(100)**	30-06-1998	1550	775	775
7	A A	AAP-ON-94/1	14	**HOEC(40.32),**OIL(16.12)&IOC(43.56)	30-06-1998	870	565	305
8		AA-ON-07*	13	**ACL(100)**	19-02-1999	1934	1615	319
9		AA-ONJ/2	11	**ONGC(100)**	07-11-2003	1595	318	1277
SHALLOW WATER								
10	CB	CB-OS/1	6	**ONGC(55.26)**, HOEC (38.04) & TPL(6.7)	19-11-1996	3290	3230	60
11		CB-OS/2	7	**CIL(40),**ONGC(50)&TPL(10)	-	3315	3110	205
12	CY	CY-OS-90/1(PY3)	-	**HARDY(18)**, ONGC (40), TPL (21) & HOEC (21)	-	81	0	81
RELINQUISHED BLOCKS (16 BLOCKS)								
13	A A	AA-ON/3	26	OKLAND(100)	-	3000	3000	0
14		CR-ON-90/1	12	PONEI(29),EOL(16),IOC(35)&OIL(20)	-	2570	2570	0
15	RJ	RJ-ON-90/5	15	ESSAR (75) & POGC(25)	-	16030	16030	0
16		RJ-ON-90/4	28	EOL (100)	-	16600	16600	0
17	GK	GK-ON-90/2	20	OKLAND(100)	-	11820	11820	0
18		GK-OS/5	3	RIL(40),TOIL(50)&OKLAND(10)	-	5000	5000	0
19		GK-OSJ/1	1	RIL(50),TULLOW(25) &ONGC(25)	-	1275	1275	0
20	KG	KG-ON/1	25	RIL(40) & TOIL(60)	-	4180	4180	0
21		KG-OS/6	10	CAIRN(50) & VIDIOCON(50)	-	8775	8775	0
22		KG-OS-90/1	27	HARDY	-	3720	3720	0
23	MB	BB-OS/5	5	ESSAR (79) &PETROM SA(21)	-	9095	9095	0
24	CY	CY-OS/2**	9	HEPI(75) & GAIL(25)	19-11-1996	5010	5010	0
25	GS	SR-OS-94/1	4	RIL(100)	12-04-2000	9150	9150	0
26	PG	GN-ON-90/3	24	HOEC(75)& MIL(25)	29-03-1993	29200	29200	0
27		CB-ON/1	18	RIL(40),TIOL(50)& OOHL(10)	16-07-1998	6133	6133	0
28	GK	GK-OSJ/3	2	RIL(60),ONGC(25)& OIL(15)	06-09-2001	5725	5725	0
					TOTAL AREA :	**169057**	**157560.88**	**11496.12**

NOTE : * Execution of new PSC after resolution of Nagaland issue

** Arbitral award pronounced in favour of HEPI. Govt. challenged the arbitral award

- Bold indicates Operatorship

AA	-	Assam Arakan	MB	-	Mumbai
AN	-	Andaman Nicobar	MN	-	Mahanadi - NEC
PG	-	Pranhita Godavari	KK	-	Kerala Konkan
CB	-	Cambay	SR	-	South Rewa
RJ	-	Rajasthan	WB	-	Bengal
GK	-	Gujarat Kutch	VN	-	Vindhyan
GS	-	Gujarat Saurashtra	DS	-	Deccan Syneclise
GV	-	Ganga Valley	PR	-	Palar
HF	-	Himalayan Foreland	PA	-	Purnea
KG	-	Krishna Godavari	MZ	-	Mizoram
CY	-	Cauvery			

EXPLORATION BLOCKS AWARDED UNDER FIRST ROUND OF NELP (NELP-I)

(As on 31.03.2014)

SL. NO.	BASIN	BLOCK NAME	REF. NO ON MAP	CONSORTIUM (PARTICIPATING INTEREST IN %)	DATE OF SIGNING CONTRACT	AWARDED AREA	RELINQ. AREA	PRESENT AREA
						(in sq.km)		
CURRENT ACTIVE BLOCKS (4 BLOCKS)								
DEEP WATER								
1		KG-DWN-98/2	D2	**ONGC(100)**	12-04-2000	9757	2462	7295
2		KG-DWN-98/3*	D3	**RIL(60)**, BPEAL (30) & NIKO(10)	12-04-2000	7645	6198.88	298
3		MN-DWN-98/3	D7	**ONGC(60)** & PIB-BV(40)	12-04-2000	10005	5017	4988
SHALLOW WATER								
4	MN	NEC-OSN-97/2	N-15	**RIL(60)**, BPEAL(30) & NIKO(10)	12-04-2000	14535	9895	4640
RELINQUISHED BLOCKS (20 BLOCKS)								
5	MN	NEC-OSN-97/1	N-16	GAZPROM(100)	12-04-2000	10425	10425	0
6	MN	MN-OSN-97/3	N-14	ONGC(85) & GAIL(15)	12-04-2000	5420	5420	0
7	KG	KG-DWN-98/4	D4	ONGC(55), BG(30) & OIL(15)	12-04-2000	9940	9940	0
8		KG-OSN-97/4	N-10	RIL(100)	12-04-2000	4020	4020	0
9		KG-OSN-97/31	N-11	RIL(100)	12-04-2000	2460	2460	0
10		KG-OSN-97/2	N-12	RIL(100)	12-04-2000	4790	4790	0
11		KG-OSN-97/1	N-13	ONGC(100)	12-04-2000	4485	4485	0
12	CY	CY-OSN-97/1	N-9	Mosbacher(20)** & HOEC(80)	12-04-2000	4940	4940	0
13	CY	CY-OSN-97/2	N-8	OIL(100)	12-04-2000	5215	5215	0
14	KK	KK-OSN-97/2	N-6	RIL(100)	12-04-2000	19450	19450	0
15		KK-OSN-97/3	N-7	ONGC(100)	12-04-2000	15910	15910	0
16	MB	MB-OSN-97/2	N-3	RIL(100)	12-04-2000	5270	5270	0
17		MB-OSN-97/3	N-4	RIL(100)	12-04-2000	5740	5740	0
18		MB-OSN-97/4	N-5	ONGC(70) & IOC(30)	12-04-2000	18870	18870	0
19	SR	SR-OSN-97/1	N-2	RIL(100)	12-04-2000	5040	5040	0
20	GK	GK-OSN-97/1	N-1	RIL(100)	12-04-2000	1465	1465	0
21	GV	GV-ONN-97/1	N-17	ONGC(40),IOC(30),CEIL(15) & CEEPC(15)	12-04-2000	36750	36750	0
22	KG	KG-DWN-98/1	D1	RIL(70) & BPEAL (30)	12-04-2000	10810	10810	0
23		KG-DWN-98/5	D5	ONGC(85) & OIL(15)	12-04-2000	8980	8980	0
24	MN	MN-DWN-98/2	D6	RIL(100)	12-04-2000	9605	9605	0
					TOTAL AREA :	**231527**	**213157.88**	**17221**

NOTE : * 1148.12 SQ.KM Area converted to PML, 298 Sq.Km is tentative PEL area.

** Shutdown India Operations

DGH

EXPLORATION BLOCKS AWARDED UNDER SECOND ROUND OF NELP (NELP-II)

(As on 31.03.2014)

SL. NO.	BASIN	BLOCK NAME	REF. NO ON MAP	CONSORTIUM (PARTICIPATING INTEREST IN %)	DATE OF SIGNING CONTRACT	AWARDED AREA	RELINQ. AREA	PRESENT AREA
						(in sq.km)		
CURRENT ACTIVE BLOCKS (3 BLOCKS)								
SHALLOW WATER								
1	GS	GS-OSN-2000/1*	N18	**RIL (90)**,HEPI (10)	17-07-2001	8841	8241	600
2	MN	MN-OSN-2000/2	N24	**ONGC (40)**, GAIL (20), IOC (20), OIL (20)	17-07-2001	8330	4269	4061
ONLAND								
3	CB	CB-ONN-2000/1	N29	**GSPC (50)** ,GAIL (50)	17-07-2001	1424	999	425
RELINQUISHED BLOCKS (19 BLOCKS)								
4	KK	KK-DWN-2000/1	D12	RIL (100)	17-07-2001	18113	18113	0
5		KK-DWN-2000/2	D13	ONGC (85), GAIL (15)	17-07-2001	20998	20998	0
6		KK-DWN-2000/3	D14	RIL (100)	17-07-2001	14889	14889	0
7		KK-DWN-2000/4	D15	ONGC (100)	17-07-2001	26149	26149	0
8		KK-OSN-2000/1	N20	ONGC (100)	17-07-2001	16125	16125	0
9	CY	CY-OSN-2000/1	N21	ONGC (100)	17-07-2001	5920	5920	0
10		CY-OSN-2000/2	N22	ONGC (100)	17-07-2001	3530	3530	0
11	GS	GS-DWN-2000/1	D8	ONGC (100)	17-07-2001	13937	13937	0
12		GS-DWN-2000/2	D9	ONGC (85), GAIL (15)	17-07-2001	14825	14825	0
13	MB	MB-DWN-2000/1	D10	ONGC (85), IOC (15)	17-07-2001	11239	11239	0
14		MB-DWN-2000/2	D11	ONGC (50), GAIL(15) IOC (15), OIL (10), GSPC (10)	17-07-2001	19106	19106	0
15		MB-OSN-2000/1	N19	ONGC (75), IOC (15), GSPC (10)	17-07-2001	18414	18414	0
16	MN	MN-OSN-2000/1	N23	ONGC (100)	17-07-2001	6730	6730	0
17		MN-ONN-2000/1	N31	ONGC (20), GAIL (20), IOC (20), OIL (25), SUNTERA (15)	17-07-2001	7900	7900	0
18	WB	WB-OSN-2000/1	N25	ONGC (85), IOC (15)	17-07-2001	6700	6700	0
19		WB-ONN-2000/1	N26	ONGC (85), IOC (15)	17-07-2001	12505	12505	0
20	GV	GV-ONN-2000/1	N27	ONGC (85), IOC (15)	17-07-2001	23500	23500	0
21	RJ	RJ-ONN-2000/1	N28	OIL (60), SUNTERA (40)	17-07-2001	2535	2535	0
22	A A	AS-ONN-2000/1	N32	RIL (90), HARDY (10)	17-07-2001	5754	5754	0
CONVERT TO PML (1 BLOCK)								
23	CB	CB-ONN-2000/2	N30	NIKO (100)	17-07-2001	419	394.75	24.25
					TOTAL AREA :	**267883**	**262772.75**	**5086**

NOTE : * PROPOSED FOR RELINQUISHMENT

EXPLORATION BLOCKS AWARDED UNDER THIRD ROUND OF NELP (NELP-III)

(As on 31.03.2014)

SL. NO.	BASIN	BLOCK NAME	REF. NO ON MAP	CONSORTIUM (PARTICIPATING INTEREST IN %)	DATE OF SIGNING CONTRACT	AWARDED AREA	RELINQ. AREA	PRESENT AREA
						(in sq.km)		
CURRENT ACTIVE BLOCKS (7 BLOCKS)								
DEEP WATER								
1	CY	CY-DWN-2001/2	D20	**RIL(70)** & BPEAL(30)	04-02-2003	14325	3670	10655
SHALLOW WATER								
2	KG	KG-OSN-2001/3	N38	**GSPC(80)**,GGR(10) & JOGPL(10)	04-02-2003	1870.5	1340	530.5
ONLAND								
3	A A	AA-ONN-2001/1	N39	**ONGC(100)**	04-02-2003	3010	2050	960
4		AA-ONN-2001/2	N40	**ONGC(80)** & IOC(20)	04-02-2003	5340	2680	2660
5		AA-ONN-2001/3	N41	**ONGC(85)** & OIL(15%)	04-02-2003	110	0	110
6		AA-ONN-2001/4	N42	**ONGC(100)**	04-02-2003	645	0	645
7	CB	CB-ONN-2001/1	N45	**ONGC(100)**	04-02-2003	215	189	26
RELINQUISHED BLOCKS (16 BLOCKS)								
8	KK	KK-DWN-2001/3	D18	ONGC(100)	04-02-2003	21775	21775	0
9		KK-DWN-2001/2	D17	RIL(70) & BPEAL (30)	04-02-2003	31515	31515	0
10		KK-DWN-2001/1	D16	RIL(70) & BPEAL(30)	04-02-2003	27315	27315	0
11		KK-OSN-2001/2	N34	ONGC(100)	04-02-2003	14120	14120	0
12		KK-OSN-2001/3	N35	ONGC(100)	04-02-2003	8595	8595	0
13	CY	CY-DWN-2001/1	D19	ONGC(80) & OIL(20)	04-02-2003	12425	12425	0
14		CY-PR-DWN-2001/3	D21	RIL(70) & BPEAL(30)	04-02-2003	8600	8600	0
15		CY-PR-DWN-2001/4	D22	RIL(70) & BPEAL(30)	04-02-2003	10590	10590	0
16	KG	KG-DWN-2001/1	D24	RIL(60), BPEAL(30) & HEPI(10)	04-02-2003	11605	11605	0
17		KG-OSN-2001/1	N36	RIL(100)	04-02-2003	1100	1100	0
18		KG-OSN-2001/2	N37	RIL(100)	04-02-2003	210	210	0
19	GS	GS-OSN-2001/1	N33	ONGC(100)	04-02-2003	9468	9468	0
20	RJ	RJ-ONN-2001/1	N44	ONGC(30), OIL(40)&SUNTERA(30)	04-02-2003	3425	3425	0
21	PG	PG-ONN-2001/1	N46	ONGC(100)	04-02-2003	6920	6920	0
22	HF	HF-ONN-2001/1	N43	ONGC(100)	04-02-2003	3175	3175	0
23	PR	PR-DWN-2001/1	D23	RIL(70) & BPEAL(30)	04-02-2003	8255	8255	0
					TOTAL AREA :	**204608.50**	**189022**	**15586.50**

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EXPLORATION BLOCKS AWARDED UNDER FOURTH ROUND OF NELP (NELP-IV)

(As on 31.03.2014)

SL. NO.	BASIN	BLOCK NAME	REF. NO ON MAP	CONSORTIUM (PARTICIPATING INTEREST IN %)	DATE OF SIGNING CONTRACT	AWARDED AREA	RELINQ. AREA	PRESENT AREA
						(in sq.km)		
CURRENT ACTIVE BLOCKS (7 BLOCKS)								
DEEP WATER								
1	MN	NEC-DWN-2002/2	D32	**ONGC(100)**	06-02-2004	15465	3879	11586
ONLAND								
2	AA	AA-ONN-2002/1	N47	**JOGPL(20)** & GAIL(80)	06-02-2004	1680	420	1260
3		AA-ONN-2002/3	N48	**OIL(30)** & ONGC(70)	06-02-2004	1460	365	1095
4		AA-ONN-2002/4	N49	**ONGC(90)** & OIL(10)	06-02-2004	1060	0	1060
5	CB	CB-ONN-2002/1	N52	**ONGC(100)**	06-02-2004	135	118	17
6		CB-ONN-2002/3	N54	**GSPC(55)**, JEPL(20), PPCL(15) & GGR (10)	06-02-2004	285	245.2	39.80
7	CY	CY-ONN-2002/2	N56	**ONGC(60)** & BPRL(40)	06-02-2004	280	140	140
RELINQUISHED BLOCKS (13 BLOCKS)								
8	GV	GV-ONN-2002/1	N50	CIL(50) & CESL(50)	06-02-2004	15550	15550	0
9	GS	GS-DWN-2002/1	D25	ONGC(100)	06-02-2004	21450	21450	0
10	RJ	RJ-ONN-2002/1	N51	OIL(60) & ONGC(40)	06-02-2004	9900	9900	0
11	KK	KK-DWN-2002/2	D26	ONGC(80) & HPCL(20)	06-02-2004	22810	22810	0
12		KK-DWN-2002/3	D27	ONGC(80) & HPCL(20)	06-02-2004	20910	20910	0
13	MN	MN-DWN-2002/1	D29	ONGC(36), ENI(34), OIL(20) & BPCL-10	06-02-2004	9980	9980	0
14		MN-DWN-2002/2	D30	ONGC(75) & BGEPIL(25)	06-02-2004	11390	11390	0
15		NEC-DWN-2002/1	D31	RIL(100)	06-02-2004	25565	25565	0
16	AN	AN-DWN-2002/2	D34	ONGC(100)	06-02-2004	12495	12495	0
17	AN	AN-DWN-2002/1	D33	ONGC(100)	06-02-2004	10990	10990	0
18	KG	KG-DWN-2002/1	D28	ONGC(70), OIL(20) & BPCL(10)	06-02-2004	10600	10600	0
19	CB	CB-ONN-2002/2	N53	JOGPL(30), GSPC(60) & GGR(10)	06-02-2004	125	125	0
20	CY	CY-ONN-2002/1	N55	JOGPL(30) GAIL(50) & GSPC(20)	06-02-2004	680	680	0
					TOTAL AREA :	**192810**	**177612.2**	**15197.80**

NOTE : * PROPOSED FOR RELINQUISHMENT

EXPLORATION BLOCKS AWARDED UNDER FIFTH ROUND OF NELP (NELP-V)

(As on 31.03.2014)

SL. NO.	BASIN	BLOCK NAME	REF. NO ON MAP	CONSORTIUM (PARTICIPATING INTEREST IN %)	DATE OF SIGNING CONTRACT	AWARDED AREA	RELINQ. AREA	PRESENT AREA
						(in sq.km)		
CURRENT ACTIVE BLOCKS (8 BLOCKS)								
DEEP WATER								
1	KG	KG-DWN-2003/1	D37	**RIL(60)**, BPEAL(30) & HEPI(10)	23-09-2005	3288	0	3288
2	AN	AN-DWN-2003/2*	D40	**ENI (40)**, ONGC(45) & GAIL(15)	23-09-2005	13110	0	13110
SHALLOW WATER								
3	CB	CB-OSN-2003/1	N57	**ONGC(100)**	23-09-2005	2394	598.5	1795.5
ONLAND								
4	A A	AA-ONN-2003/1	N59	**JOGPL(10)**, JSPL(35), GSPC(20) & GAIL(35)	23-09-2005	81	0	81
5	RJ	RJ-ONN-2003/2	N65	**FEL(10)**, BIL(40) & XOIL(50)	23-09-2005	13195	11031	2164
6	CB	CB-ONN-2003/1	N66	**RIL (70)** & BP (30)	23-09-2005	635	0	635
7		CB-ONN-2003/2	N67	**GSPC(50)**, GAIL(20), JSPL(20) & GGR(10)	23-09-2005	448	276	172
8	KG	KG-ONN-2003/1	N69	**CIL(49)** & ONGC(51)	23-09-2005	1697	1382	315
RELINQUISHED BLOCKS (12 BLOCKS)								
9	CY	CY-ONN-2003/1	N70	NR(V)L(100)	23-09-2005	957	957	0
10	KK	KK-DWN-2003/1	D35	RIL(100)	23-09-2005	18245	18245	0
11		KK-DWN-2003/2	D36	RIL(100)	23-09-2005	12285	12285	0
12	GS	GS-OSN-2003/1	N58	ONGC(51) & CE7L(49)	23-09-2005	5970	5970	0
13	A A	AA-ONN-2003/2 (Arunachal Pradesh)	N60	GPI(30), NTPC(40), CRL(15) & Brownstone (15)	23-09-2005	295	295	0
14		AA-ONN-2003/3	N61	OIL(85) & HPCL(15)	23-09-2005	275	275	0
15	GV	GV-ONN-2003/1	N62	CIL(24), CE1L(25) & ONGC(51)	23-09-2005	7210	7210	0
16	RJ	RJ-ONN-2003/1	N64	ENI(34),ONGC(36) & CE2L(30)	23-09-2005	1335	1335	0
17	DS	DS-ONN-2003/1	N68	GGR(100)	23-09-2005	3155	3155	0
18	MN	MN-DWN-2003/1	D38	RIL(55) NIKO(15) & BPEAL(30)	23-09-2005	17050	17050	0
19	AN	AN-DWN-2003/1	D39	ONGC(100)	23-09-2005	9970	9970	0
20	VN	VN-ONN-2003/1	N63	ONGC(100)	23-09-2005	3585	3585	0
					TOTAL AREA :	**115180**	**93619.50**	**21560.50**

NOTE : * PROPOSED FOR RELINQUISHMENT

EXPLORATION BLOCKS AWARDED UNDER SIXTH ROUND OF NELP (NELP-VI)

(As on 31.03.2014)

SL. NO.	BASIN	BLOCK NAME	REF. NO ON MAP	CONSORTIUM (PARTICIPATING INTEREST IN %)	DATE OF SIGNING CONTRACT	AWARDED AREA	RELINQ. AREA	PRESENT AREA
						(in sq.km)		
DEEP WATER								
1	CY	CY-DWN-2004/3	D6	**ONGC(70)**, GSPC(10), HPCL(10) & GAIL(10)	02-03-2007	12017	0	12017
2		CY-PR-DWN-2004/1	D8	**ONGC(70)**, GSPC(10), HPCL(10) & GAIL(10)	02-03-2007	13451	0	13451
3	MN	NEC-DWN-2004/1	D22	**SANTOS (100)**	02-03-2007	7790	0	7790
4		NEC-DWN-2004/2	D23	**SANTOS (100)**	02-03-2007	8706	0	8706
SHALLOW WATER								
5	GS	GS-OSN-2004/1	1	**ONGC (100)**	02-03-2007	6589	1647	4942
6	CB	CB-OSN-2004/1	2	**FOCUS(10)** & NEWBURY (90)	02-03-2007	2616	0	2616
7	PR	PR-OSN-2004/1	5	**CIL(35)**, ONGC(35) & TATA(30)	02-03-2007	9417	0	9417
8	KG	KG-OSN-2004/1	6	**ONGC (55)** & BGEPI (45)	02-03-2007	1151	20	1131
ONLAND								
9	MZ	MZ-ONN-2004/1	7	**OIL(85)** & SHIV-VANI(15)	02-03-2007	3213	0	3213
10	AA	AA-ONN-2004/2	10	**OIL (100)**	02-03-2007	218	0	218
11		AA-ONN-2004/3	11	**ESSAR ENERGY(90)** & ESSAR OIL (10)	02-03-2007	1252	0	1252
12		AA-ONN-2004/5	13	**ESSAR ENERGY(90)** & ESSAR OIL (10)	02-03-2007	46	0	46
13	SR	SR-ONN-2004/1	16	**PRIZE PETROLEUM (10)** & JAIPRAKASH ASSOCIATES LTD. (90)	02-03-2007	13277	1456	11821
14	VN	VN-ONN-2004/1	17	**ONGC (100)**	02-03-2007	5801	1470	4331
15		VN-ONN-2004/2	18	**ONGC (100)**	02-03-2007	4466	1120	3346
16		RJ-ONN-2004/2	20	**OIL (75)** & GEOGLOBAL (25)	02-03-2007	2196	0	2196
17	CB	CB-ONN-2004/1	22	**ONGC(50)**, GSPC(40) & HERAMEC (10)	02-03-2007	32	22.27	9.73
18		CB-ONN-2004/2	23	**ONGC(55)** & GSPC(45)	02-03-2007	423	0	423
19		CB-ONN-2004/3	24	**ONGC(40)**, GSPC(35) & ENSEARCH (25)	02-03-2007	113	0	113
20	KG	KG-ONN-2004/1	28	**OIL(90)** & GEOGLOBAL(10)	02-03-2007	549	0	549
21	CY	CY-ONN-2004/1	30	**ONGC (80)** & BPCL(20)	02-03-2007	214	0	214
22		CY-ONN-2004/2	31	**ONGC (80)** & BPCL(20)	02-03-2007	375	0	375
23	RJ	RJ-ONN-2004/1*	19	**GSPC(22.22)**, GAIL(22.22), HPCL(22.22), HALLWORTHY(PANAMA)(11.11), NITINFIRE (11.11), & BPCL (11.11)	02-03-2007	4613	0	4613
24	DS	DS-ONN-2004/1	27	**GEOGLOBAL RESOURCES (BARBADOS) (100)**	02-03-2007	2649	0	2649
RELINQUISHED BLOCKS (28 BLOCKS)								
25	KK	KK-DWN-2004/1	D1	ONGC(45), CIL(40) & TATA(15)	02-03-2007	12324	12324	0
26	KG	KG-DWN-2004/1	D10	ONGC(70), GSPC(10), HPCL(10) & GAIL(10)	02-03-2007	11951	11951	0
27		KG-DWN-2004/2	D11	ONGC(60),GSPC(10),HPCL(10),GAIL(10)&BPCL(10)	02-03-2007	11851	11851	0
28		KG-DWN-2004/3	D12	ONGC(70), GSPC(10), HPCL(10) & GAIL(10)	02-03-2007	6205	6205	0
29		KG-DWN-2004/4	D13	RIL(70) & BPEAL (30)	02-03-2007	11904	11904	0
30		KG-DWN-2004/5	D14	ONGC(50), GSPC(10), HPCL(10), GAIL(10), OIL(10) & BPCL(10)	02-03-2007	11922	11922	0
31		KG-DWN-2004/6	D15	ONGC(34),GSPC(10),HPCL(10),GAIL(10) Impex Corporation Japan (26) & OIL (10)	02-03-2007	10907	10907	0
32		KG-ONN-2004/2	29	GSPC (40), GAIL (40) & PETROGAS (20)	02-03-2007	1140	1140	0
33		KG-DWN-2004/7	D16	RIL (70) & BPEAL (30)	02-03-2007	11856	11856	0
34	MN	MN-DWN-2004/1	D17	RIL (70) & BPEAL (30)	02-03-2007	9885	9885	0
35		MN-DWN-2004/2	D18	RIL (70) & BPEAL (30)	02-03-2007	11813	11813	0
36		MN-DWN-2004/3	D19	RIL (70) & BPEAL (30)	02-03-2007	11316	11316	0
37		MN-DWN-2004/4	D20	RIL (70) & BPEAL (30)	02-03-2007	8822	8822	0
38		MN-DWN-2004/5	D21	RIL (70) & BPEAL (30)	02-03-2007	10454	10454	0
39	RJ	RJ-ONN-2004/3	21	OIL(60), GEOGLOBAL(25) & HPCL (15)	02-03-2007	1330	1330	0
40		MZ-ONN-2004/2**	8	NAFTOGAZ(10),RNRL(10),GEOPETROL(10)&REL(70)	02-03-2007	3619	3619	0
41	AA	AA-ONN-2004/1**	9	OIL(85) & SHIV-VANI (15)	02-03-2007	144	144	0
42		AA-ONN-2004/4**	12	ADANI ENTERPRISES(35), AISPL(20), NAFTOGAZ(10) & WPPL(35)	02-03-2007	95	95	0
43	CB	CB-ONN-2004/4	25	ONGC(50), GSPC(40) & HERAMEC(10)	02-03-2007	70	70	0
44		CB-ONN-2004/5**	26	ADANI ENTEREPRISES(35), ADANI PORT(20), NAFTOGAZ (10) & WELSPUN (35)	02-03-2007	75	75	0
45	CY	CY-DWN-2004/1	D4	ONGC(70), GSPC(10), HPCL(10) & GAIL(10)	02-03-2007	10302	10302	0
46		CY-DWN-2004/2	D5	ONGC(70), GSPC(10), HPCL(10) & GAIL(10)	02-03-2007	12059	12059	0
47		CY-DWN-2004/4	D7	ONGC(70), GSPC(10), HPCL(10) & GAIL(10)	02-03-2007	12025	12025	0
48		CY-PR-DWN-2004/2	D9	ONGC(70), GSPC(10), HPCL(10) & GAIL(10)	02-03-2007	9994	9994	0
49	MB	MB-OSN-2004/1	3	GSPC(20), IOC(20), GAIL(20), HPCL(20) & PETROGAS (20)	02-03-2007	1520	1520	0
50		MB-OSN-2004/2	4	PETROGAS(20),GAIL(20),IOC(20),GSPC(20)&HPCL(20)	02-03-2007	741	741	0
51	PA	PA-ONN-2004/1	14	ONGC (100)	02-03-2007	2537	2537	0
52	GV	GV-ONN-2004/1	15	ONGC (100)	02-03-2007	8354	8354	0
					TOTAL AREA :	**306389**	**210950.27**	**95438.73**

NOTE : * PROPOSED FOR RELINQUISHMENT ** PSC TERMINATED BY MOP&NG

EXPLORATION BLOCKS AWARDED UNDER SEVENTH ROUND OF NELP (NELP-VII)

(As on 31.03.2014)

SL. NO.	BASIN	BLOCK NAME	REF. NO ON MAP	CONSORTIUM (PARTICIPATING INTEREST IN %)	DATE OF SIGNING CONTRACT	AWARDED AREA	RELINQ. AREA	PRESENT AREA
						(in sq.km)		
DEEP WATER								
1.	**KK**	KK-DWN-2005/2	D-15	**ONGC** (90) & GSPC (10)	22-12-2008	19,234	0	19,234
2.	**MB**	MB-DWN-2005/2#	D-6	**BHP BILLITON** (26) & GVK (74)	22-12-2008	3,660	0	3,660
3.		MB-DWN-2005/3#	D-7	**BHP BILLITON** (26) & GVK (74)	22-12-2008	3,097	0	3,097
4.		MB-DWN-2005/4#	D-8	**BHP BILLITON** (26) & GVK (74)	22-12-2008	3,408	0	3,408
5.		MB-DWN-2005/5#	D-9	**BHP BILLITON** (26) & GVK (74)	22-12-2008	3,169	0	3,169
6.		MB-DWN-2005/7#	D-11	**BHP BILLITON** (26) & GVK (74)	22-12-2008	3,324	0	3,324
7.		MB-DWN-2005/9#	D-13	**BHP BILLITON** (26) & GVK (74)	22-12-2008	3,138	0	3,138
SHALLOW WATER								
8.	**MB**	MB-OSN-2005/1	S-1	**ONGC** (80) & GSPC (20)	22-12-2008	2811	0	2,811
9.		MB-OSN-2005/2	S-2	**ADAANI WELSPUN** (100)	22-12-2008	1191	0	1,191
10.		MB-OSN-2005/3	S-3	**EEPL (50)** & NEIL (50)	22-12-2008	2810	1,125	1,685
11.		MB-OSN-2005/5	S-5	**ONGC (70)** & GSPC (30)	22-12-2008	2402	0	2,402
12.		MB-OSN-2005/6	S-6	**ONGC (80)** & GSPC (20)	22-12-2008	2820	0	2,820
13.	**KG**	KG-OSN-2005/1	S-7	**ONGC (60)**, GSPC (20) & HMEL (20)	22-12-2008	2810	0	2,810
14.		KG-OSN-2005/2	S-8	**ONGC (80)** & HMEL (20)	22-12-2008	1881	0	1,881
ONLAND								
15.	**AA**	AA-ONN-2005/1	1	**ONGC (60)**, OIL (30) & ACL (10)	22-12-2008	363	0	363
16.	**PA**	PA-ONN-2005/1	2	**ONGC (100)**	22-12-2008	1096	0	1,096
17.		PA-ONN-2005/2	3	**ONGC (100)**	22-12-2008	2552	0	2,552
18.	**WB**	WB-ONN-2005/2	5	**ONGC (100)**	22-12-2008	3792	0	3,792
19.		WB-ONN-2005/3	6	**ONGC (100)**	22-12-2008	4001	0	4,001
20.		WB-ONN-2005/4	7	**ONGC (75)** & OIL (25)	22-12-2008	3940	0	3,940
21.	**GV**	GV-ONN-2005/3	10	**ONGC (80)** & TATA PETRO (20)	22-12-2008	2227	0	2,227
22.	**SR**	SR-ONN-2005/1	11	**DEEP ENERGY(10)**,DEEP INDUS(70) KANVEL FINANCE (10) & SAVLA ELECTRONICS (10)	22-12-2008	789	0	789
23.	**RJ**	RJ-ONN-2005/1	14	**HOEC (33.34)**, BPRL (33.33) & IMC (33.33)	22-12-2008	1424	0	1,424
24.		RJ-ONN-2005/2	15	**OIL (60)**, HOEC (20) HPCL & MITTAL ENERGY (20)	22-12-2008	1517	0	1,517
25.		RJ-ONN-2005/3	16	**GSPC (60)** & ONGC (40)	22-12-2008	1217	0	1,217
26.	**CB**	CB-ONN-2005/2	18A&B	**IOCL (100)**	22-12-2008	81	0	81
27.		CB-ONN-2005/3	19	**MERCATOR PETROLEUM (100)**	22-12-2008	48	0	48
28.		CB-ONN-2005/4	20	**ONGC (51)** & GSPC (49)	22-12-2008	31	0	31
29.		CB-ONN-2005/5	21	**OMKAR NATUAL RESOUR. (100)**	22-12-2008	83	0	83
30.		CB-ONN-2005/6	22	**OMKAR NATUAL RESOUR. (100)**	22-12-2008	102	0	102
31.		CB-ONN-2005/7	23	**IOCL (100)**	22-12-2008	199	0	199
32.		CB-ONN-2005/9*	25	**MERCATOR PETROLEUM (100)**	22-12-2008	170	37.80*	132.20
33.		CB-ONN-2005/10	26	**ONGC (51)** & GSPC (49)	22-12-2008	270	0	270
34.		CB-ONN-2005/11*	27	**QUEST (20)**, QQVS (40), SREI (20), VIPL2 (10) & PRIM (10)	22-12-2008	257	33.13*	223.87
35.	**PR**	PR-ONN-2005/1	28	**ONGC (80)** & TATA PETRO. (20)	22-12-2008	1807	0	1,807
36.	**CY**	CY-ONN-2005/1	29	**GAIL (40),** GSPC (30) & BENGAL ENERGY (30)	22-12-2008	946	0	946
RELINQUISHED BLOCKS (5 BLOCKS)								
37.	**KK**	KK-DWN-2005/1	D-14	**BHP BILLITON** (26) & GVK (74)	22-12-2008	14,675	14,675	0
38.	KG	KG-DWN-2005/2	D-17	**BP EXPLORATION** (50) & RIL (50)	22-12-2008	1,949	1,949	0
39.	**KG**	KG-DWN-2005/1	D-16	**ONGC** (70), IOCL (20) & GSPC (10)	22-12-2008	1,727	1,727	0
40.	**AN**	AN-DWN-2005/1	D-19	**ONGC** (90) & OIL (10)	22-12-2008	11,837	11,837	0
41.	**CB**	CB-ONN-2005/8**	24	**VASUNDHARA RESOUR (100)**	22-12-2008	133	133	0
					TOTAL AREA :	**112,988**	**31,516.93**	**81,471.07**

NOTE : * PEL area not granted by Gujarat Govt. ** PSC Terminated by MOP&NG # Proposed for Relinquishment

DGH

EXPLORATION BLOCKS AWARDED UNDER EIGHTH ROUND OF NELP (NELP-VIII)

(As on 31.03.2014)

SL. NO.	BASIN	BLOCK NAME	REF. NO ON MAP	CONSORTIUM (PARTICIPATING INTEREST IN %)	DATE OF SIGNING CONTRACT	AWARDED AREA	RELINQ. AREA	PRESENT AREA
						(in sq.km)		
DEEP WATER								
1.	MB	MB-DWN-2009/1	D-1	**CIL(100)**	30-06-2010	2,961	0	2,961
2.	KG	KG-DWN-2009/1	D-6 (A&B)	**BGEPIL(30)**, OIL(15), ONGC(45) & APGIC (10)	30-06-2010	1,800	0	1,800
3.	AN	AN-DWN-2009/1	D-7	**ONGC (70)** & OIL (30)	30-06-2010	4,981	0	4,981
4.		AN-DWN-2009/2	D-8	**ONGC (60)** & OIL (40)	30-06-2010	3,995	0	3,995
5.		AN-DWN-2009/3	D-9	**ONGC (60)** & **OIL (40)**	30-06-2010	3,992	0	3,992
6.		AN-DWN-2009/5	D-11	**ONGC (90)** & GSPC (10)	30-06-2010	4,002	0	4,002
7.		AN-DWN-2009/13	D-19	**ONGC (70),** NTPC (10), GAIL (10) & GSPC (10)	30-06-2010	4,007	0	4,007
8.		AN-DWN-2009/18	D-24	**ONGC (60),** OIL (30) & GAIL (10)	30-06-2010	4,040	0	4,040
SHALLOW WATER								
9.	GK	GK-OSN-2009/1	S-1	**ONGC (40),** GSPC (20), AWEL (20) & IOC (20)	30-06-2010	1,264	0	1,264
10.		GK-OSN-2009/2	S-2	**ONGC (40),** AWEL (30) & IOC (30)	30-06-2010	1,242	0	1,242
11.	MB	MB-OSN-2009/3	S-5	**BHP (100)**	30-06-2010	1,492	0	1,492
12.		MB-OSN-2009/6	S-8	**BHP (100)**	30-06-2010	1,876	0	1,876
13.		MB-OSN-2009/7	S-9	**BHP (100)**	30-06-2010	1,865	0	1,865
14.	CY	CY-OSN-2009/1	S-19	**Bengal Energy International Inc(100)**	30-06-2010	1,362	0	1,362
15.		CY-OSN-2009/2	S-20	**OIL (50)** & ONGC (50)	30-06-2010	1,621	0	1,621
16.	KG	KG-OSN-2009/1	S-22	**ONGC (80)**, APGIC (10) & NTPC (10)	30-06-2010	1,472	0	1,472
17.		KG-OSN-2009/2	S-23	**ONGC (90)** & APGIC (10)	30-06-2010	1,471	0	1,471
18.		KG-OSN-2009/3	S-24	**CIL (100)**	30-06-2010	1,988	0	1,988
19.		KG-OSN-2009/4	S-25	**ONGC (50)**, OIL (30), NTPC (10) & APGIC (10)	30-06-2010	835	0	835
ONLAND								
20.	A A	AA-ONN-2009/1	1	**JOGPL(47)**, JEKPL(17) & JODPL(36)	30-06-2010	2,217	0	2,217
21.		AA-ONN-2009/2	2	**JOGPL(47)**, JEKPL(17) & JODPL(36)	19-07-2010	1,740	0	1,740
22.		AA-ONN-2009/3	3	**ONGC (50)** & OIL (50)	30-06-2010	84	0	84
23.		AA-ONN-2009/4	4	**OIL (50)** & ONGC (50)	30-06-2010	84	0	84
24.	VN	VN-ONN-2009/3	9	**ONGC (100)**	30-06-2010	1,250	0	1,250
25.	CB	CB-ONN-2009/1	11	**ESGPL (100)***	30-06-2010	113	0	113
26.		CB-ONN-2009/2	12	**ESGPL (100)***	30-06-2010	68	0	68
27.		CB-ONN-2009/3**	13	**HCIL (100)**	30-06-2010	71	0	71
28.		CB-ONN-2009/4	14	**ONGC (50)** & GSPC (50)	30-06-2010	58	0	58
29.		CB-ONN-2009/5	15	**NTPC (100)**	30-06-2010	165	0	165
30.		CB-ONN-2009/6**	16	**HCIL (100)**	30-06-2010	177	0	177
31.		CB-ONN-2009/7	17	**ESGPL (100)***	30-06-2010	144	0	144
32.		CB-ONN-2009/8	18	**JPIL (87)** & JPPL (13)	30-06-2010	136	0	136
						TOTAL AREA : 52,573	**0**	**52,573**

NOTE : * Company name change proposed to Sintex Oil & Gas Limited **PEL not yet granted

EXPLORATION BLOCKS AWARDED UNDER NINTH ROUND OF NELP (NELP-IX)

(As on 31.03.2014)

SL. NO.	BASIN	BLOCK NAME	REF. NO ON MAP	CONSORTIUM (PARTICIPATING INTEREST IN %)	DATE OF SIGNING CONTRACT	AWARDED AREA	RELINQ. AREA	PRESENT AREA
						(in sq.km)		
DEEP WATER								
1.	MB	MB-DWN-2010/1	D-2	**BGEPIL (50)** & BHP (50)	10-09-2012	7,963	0	7,963
SHALLOW WATER								
2.	GK	GK-OSN-2010/1	S-1	**ONGC (60),** OIL (30) & GAIL (10)	28-03-2012	1,361	0	1,361
3.		GK-OSN-2010/2	S-2	**ONGC (90)** & GAIL (10)	28-03-2012	1,625	0	1,625
4.	MB	MB-OSN-2010/2	S-4	**OIL (50)**, HPCL (30) & BPRL (20)	30-08-2012	3,411	0	3,411
ONLAND								
5.	A A	AA-ONN-2010/2	2	**OIL(40)**, ONGC(30), GAIL(20) & East West Petroleum (10)	28-03-2012	396	0	396
6.		AA-ONN-2010/3	3	**OIL(40)**, ONGC(40) & BPRL(20)	28-03-2012	171	0	171
7.	VN	VN-ONN-2010/1	4	**Deep Energy LLC(10)** & KGN Industries(90)	28-03-2012	3776	0	3776
8.		VN-ONN-2010/2	5	**Deep Energy LLC (10), Deep Natural Resources Limited (15)** & Safak WSB Energy Pvt. Ltd. (75)	28-03-2012	4909	0	4909
9.	RJ	RJ-ONN-2010/2	8	**FEL (10) &** Birkbeck Investments Ltd. (90)	28-03-2012	535	0	535
10.	CB	CB-ONN-2010/1	9	**ONGC (100)**	28-03-2012	782	0	782
11.		CB-ONN-2010/3	11	**Deep Energy LLC (10)** & KGN Oil & Gas Pvt. Ltd. (90)	28-03-2012	534	0	534
12.		CB-ONN-2010/4	12	**Pratibha Oil & Natural Gas Pvt. Ltd.(100)**	28-03-2012	61	0	61
13.		CB-ONN-2010/5	13	**Pan India Consultants (20) & Frost International Ltd. (80)**	28-03-2012	49	0	49
14.		CB-ONN-2010/6	14	**ONGC (80) &** IOC (20)	28-03-2012	39	0	39
15.		CB-ONN-2010/8	16A&B	**BPRL(25), GAIL(25)**, EIL(20), BFIL(20) & MIEL(10)	30-08-2012	42	0	42
16.		CB-ONN-2010/9	17	**ONGC (100)**	30-08-2012	120	0	120
17.		CB-ONN-2010/10	18	**Sankalp Oil & Natural Resources Ltd. (100)**	27-06-2012	122	0	122
18.		CB-ONN-2010/11	19	**BPRL (25), GAIL (25)**, EIL (20) BFIL (15) & MIEL (15)	28-03-2012	131	0	131
RELINQUISHED BLOCKS (1 BLOCK)								
19.	A A	AA-ONN-2010/1	1	PPCL(20) & ABGEL (80)	30-08-2012	401	401	0
						TOTAL AREA : 26,428	**401**	**26,027**

ONGC	-	Oil & Natural Gas Corpn. Ltd.
IOC	-	Indian Oil Corpn. Ltd.
OIL	-	Oil India Ltd.
GSPC	-	Gujarat State Petroleum Corporation Ltd.
RIL	-	Reliance Industries Ltd.
EOL	-	Essar Oil Ltd.
Okland	-	Okland Offshore Holdings Ltd.
FEL	-	Focus Energy Ltd.
VPL	-	Videocon Petroleum Ltd.
HEPI	-	Hardy Exploration & Production (India) Inc.
JTI	-	Joshi Technologies Inc.
EEIPL	-	Energy Equity India Petroleum Pty. Ltd.
BPRL	-	Bharat Petroleum Resources Ltd.
CIL	-	Cairn India Ltd.
MIL	-	Mosbacher India LLC
BGEPIL	-	British Gas Explo. & Prod. India Ltd.
Naftogaz	-	Naftogaz India
Santos	-	Santos
BHP	-	BHP Billiton Pvt. Ltd.
Adani	-	Aadani Welspun
BPEAL	-	BP Exploration (Alpha) Ltd.
Deep Energy	-	Deep Energy LLC.
MP	-	Mercator Petroleum Ltd.
ONR	-	Omkar Natural Resources Pvt. Ltd.
Quest	-	Quest Petroleum Ltd.
Pan	-	Pan India Consultants
Sanklap	-	Sankalp Oil & Natural Resources Ltd.
NR(V)L	-	Niko Resources (NELP-V) Ltd.
ENI	-	ENI India Ltd.
JOGP	-	Jubilant Oil & Gas Pvt. Ltd.
JSPL	-	Jubilant Securities Pvt. Ltd.
NTPC	-	National Thermal Power Corporation Ltd.
PONEI	-	Premier Oil North East India
POGC	-	Polish Oil & Gas Company
HOEC	-	Hindusthan Oil Exploration Company Ltd.
GAIL	-	Gas Authority of India Ltd.
NIKO	-	Niko Resources Ltd.
GEO	-	Geo Global Resources (India) Inc.
PPCL	-	Prize Petroleum Company Ltd.
GGR	-	GeoGlobal Resources (Barbados) Inc.
CRL	-	Canoro Resources Ltd.
ACL	-	Assam Company Ltd.
Gaz	-	Gazprom
GPI	-	GeoPetrol International Inc.
XOIL	-	X Oil, Maruritius
ACL	-	Assam Company Ltd.

BASIN-WISE DISTRIBUTION OF PEL AREAS UNDER OPERATION (PRE-NELP & NELP BLOCKS)

(As on 31.03.2014)

SL. NO.	BASIN (No. of Blocks)	AREA (Sq. Km) PRE-NELP	NELP-I	NELP-II	NELP-III	NELP-IV	NELP-V	NELP-VI	NELP-VII	NELP-VIII	NELP-IX	TOTAL
DEEP WATER (27)												
1	MUMBAI (8)	—	—	—	—	—	—	—	19,796	2,961	7,963	30,720
2	KERALA KONKAN (1)	—	—	—	—	—	—	—	19,234	—	—	19,234
3	CAUVERY (2)	—	—	—	10,655	—	—	12,017	—	—	—	22,672
4	CAUVERY-PALAR (1)	—	—	—	—	—	—	13,451	—	—	—	13,451
5	KRISHNA-GODAVARI (4)	—	7,593	—	—	—	3,288	—	—	1800	—	12,681
6	MAHANADI-NEC (4)	—	4,988	—	—	11,586	—	16,496	—	—	—	33,070
7	ANDAMAN-NICOBAR (7)	—	—	—	—	—	13,110	—	—	25,017	—	38,127
TOTAL AREA :		**—**	**12,581**	**—**	**10,655**	**11,586**	**16,398**	**41,964**	**39,030**	**29,778**	**7,963**	**169,955**
SHALLOW WATER (33)												
8	GUJARAT-KUTCH (4)	—	—	—	—	—	—	—	—	2,506	2,986	5,492
9	GUJARAT-SAURASHTRA (2)	—	—	600	—	—	—	4,942	—	—	—	5,542
10	CAMBAY (4)	265	—	—	—	—	1,795.50	2,616	—	—	—	4,676.50
11	MUMBAI (9)	—	—	—	—	—	—	—	10,909	5,233	3,411	19,553
12	CAUVERY (3)	81	—	—	—	—	—	—	—	2,983	—	3,064
13	KRISHNA-GODAVARI (8)	—	—	—	530.50	—	—	1,131	4,691	5,766	—	12,118.50
14	MAHANADI-NEC (2)	—	4,640	4,061	—	—	—	—	—	—	—	8,701
15	PALAR (1)	—	—	—	—	—	—	9,417	—	—	—	9,417
TOTAL AREA :		**346**	**4,640**	**4,661**	**530.50**	**—**	**1,795.50**	**18,106**	**15,600**	**16,488**	**6,397**	**68,564**
ONLAND (91)												
16	VINDHYAN (5)	—	—	—	—	—	—	7,677	—	1,250	8,685	17,612
17	GUJARAT-KUTCH (1)	775	—	—	—	—	—	—	—	—	—	775
18	RAJASTHAN (9)	7,137.43	—	—	—	—	2,164	6,809	4,158	—	535	20,803.43
19	CAMBAY (38)	1,336.69	—	425	26	56.80	807	545.73	1,170.07	932	1,880	7,179.29
20	PALAR (1)	—	—	—	—	—	—	—	1,807	—	—	1,807
21	CAUVERY (4)	—	—	—	—	140	—	589	946.00	—	—	1,675
22	GANGA VALLEY (1)	—	—	—	—	—	—	—	2,227	—	—	2,227
23	ASSAM-ARAKAN (21)	1,901	—	—	4,375	3,415	81	1,516	363	4,125	567	16,343
24	KRISHNA-GODAVARI (2)	—	—	—	—	—	315	549	—	—	—	864
25	MIZORAM (1)	—	—	—	—	—	—	3,213	—	—	—	3,213
26	PURNEA (2)	—	—	—	—	—	—	—	3,648	—	—	3,648
27	BENGAL (3)	—	—	—	—	—	—	—	11,733	—	—	11,733
28	SOUTH REWA (2)	—	—	—	—	—	—	11,821	789	—	—	12,610
29	DECCAN SYNCLISE (1)	—	—	—	—	—	—	2,649	—	—	—	2,649
TOTAL AREA :		**11,150.12**	**—**	**425**	**4,401**	**3,611.80**	**3,367**	**35,368.73**	**26,841.07**	**6,307**	**11,667**	**103,138.72**
GRAND TOTAL :		**11,496.12**	**17,221**	**5,086**	**15,586.50**	**15,197.80**	**21,560.50**	**95,438.73**	**81,471.07**	**52,573**	**26,027**	**341,657.72**

COMPANY-WISE DISTRIBUTION OF PEL AREAS UNDER OPERATION (PRE-NELP & NELP ROUNDS)

(As on 31.03.2014)

SL. NO.	COMPANY/ OPERATOR	NO.OF BLOCKS	AREA (Sq. Km) PRE-NELP	NELP-1	NELP-II	NELP-III	NELP-IV	NELP-V	NELP-VI	NELP-VII	NELP-VIII	NELP-IX	TOTAL
1	ONGC	61	1337	12283	4061	4401	12803	1795.50	40352.73	52037	32693	3927	**165690.23**
2	RIL	6	—	4938	600	10655	—	3923	—	—	—	—	**20,116**
3	OIL	11	—	—	—	—	1095	—	6176	1517	1705	3978	**14,471**
4	CIL	6	3316.27	—	—	—	—	315	9417	—	4949	—	**17,997.27**
5	GSPC	7	1210	—	425	530.50	39.80	172	4613	1217	—	—	**8,207.30**
6	HOEC	3	312.64	—	—	—	—	—	—	1424	—	—	**1,736.64**
7	ACL	1	319	—	—	—	—	—	—	—	—	—	**319**
8	ESSAR	4	119.05	—	—	—	—	—	1298	1685	—	—	**3,102.05**
9	JOGP	4	—	—	—	—	1260	81	—	—	3957	—	**5,298**
10	FOCUS	5	4801.16	—	—	—	—	2164	2616	—	—	535	**10,116.16**
11	PRIZE PETROLEUM	1	—	—	—	—	—	—	11821	—	—	—	**11,821**
12	GAIL	1	—	—	—	—	—	—	—	946	—	—	**946**
13	IOCL	2	—	—	—	—	—	—	—	280	—	—	**280**
14	ENI	1	—	—	—	—	—	13110	—	—	—	—	**13,110**
15	ADAANI WELSPUN	1	—	—	—	—	—	—	—	1191	—	—	**1,191**
16	DEEP ENERGY	1	—	—	—	—	—	—	—	789	—	—	**789**
17	MERCATOR PET.	2	—	—	—	—	—	—	—	180.20	—	—	**180.20**
18	OMKAR NATURAL	2	—	—	—	—	—	—	—	185	—	—	**185**
19	QUEST	1	—	—	—	—	—	—	—	223.87	—	—	**223.87**
20	BGEPIL	2	—	—	—	—	—	—	—	—	1800	7963	**9,763**
21	BENGAL ENERGY	1	—	—	—	—	—	—	—	—	1362	—	**1,362**
22	ESGPL	3	—	—	—	—	—	—	—	—	325	—	**325**
23	HCIL	2	—	—	—	—	—	—	—	—	248	—	**248**
24	JPIL	1	—	—	—	—	—	—	—	—	136	—	**136**
25	NTPC	1	—	—	—	—	—	—	—	—	165	—	**165**
26	PRATIBHA OIL	1	—	—	—	—	—	—	—	—	—	61	**61**
27	PAN INDIA / FROST INT.	1	—	—	—	—	—	—	—	—	—	49	**49**
28	SANKALP	1	—	—	—	—	—	—	—	—	—	122	**122**
29	BPRL / GAIL	2	—	—	—	—	—	—	—	—	—	173	**173**
30	DEEP ENERGY/DNRL*	3	—	—	—	—	—	—	—	—	—	9219	**9,219**
31	SANTOS	2	—	—	—	—	—	—	16496	—	—	—	**16,496**
32	GEOGLOBAL RES.	1	—	—	—	—	—	—	2649	—	—	—	**2649**
33	BHP BILLITON	9	—	—	—	—	—	—	—	19796	5233	—	**25,029**
34	HARDY	1	81	—	—	—	—	—	—	—	—	—	**81**
35	NIKO**	0	—	—	—	—	—	—	—	—	—	—	—
TOTAL		**151**	**11,496.12**	**17,221**	**5086**	**15,586.50**	**15,197.80**	**21,560.50**	**95,438.73**	**81471.07**	**52,573**	**26,027**	**341,657.72**

** DNRL : Deep Natural Resources Limited

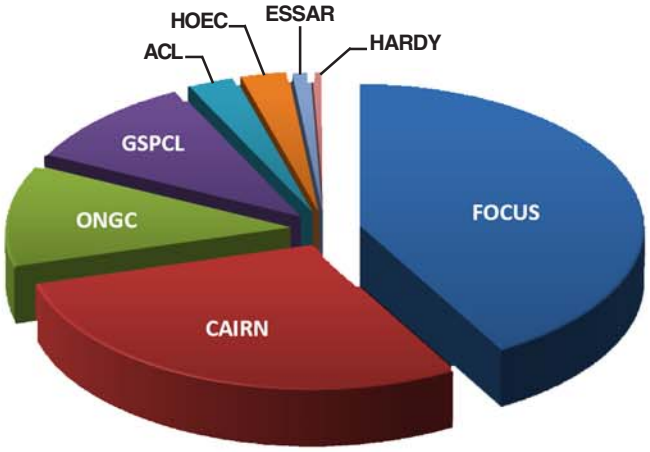
** CB-ONN-2000/2 (Area 24.25 Sq.km) Converted to ML

DGH

COMPANY - WISE DISTRIBUTION OF PEL AREAS UNDER OPERATION (PRE-NELP & NELP ROUNDS)

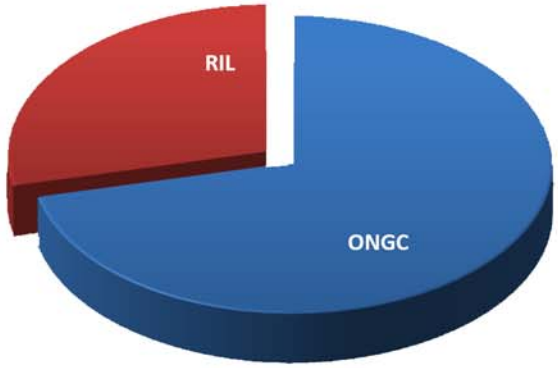
(As on 31.03.2014)

PRE-NELP



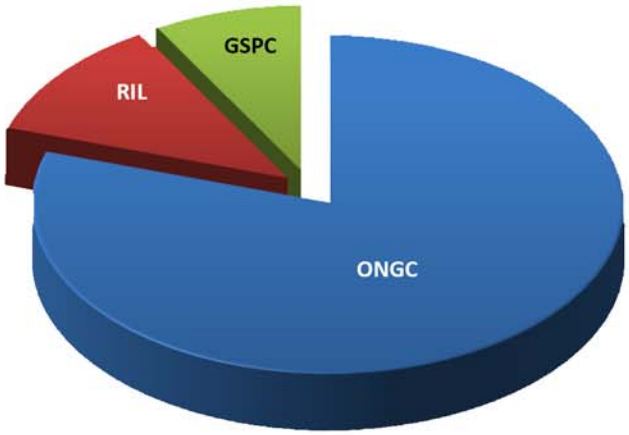
COMPANY / OPERATOR	Present Area (Sq. Km.)	(%)
FOCUS	4,801.16	41.76
CAIRN	3,316.27	28.85
ONGC	1,337.00	11.63
GSPCL	1,210.00	10.53
ACL	319.00	2.77
HOEC	312.64	2.72
ESSAR	119.05	1.04
HARDY	81.00	0.70
TOTAL	**11,496.12**	**100**

NELP - I



COMPANY / OPERATOR	Present Area (Sq. Km.)	(%)
ONGC	12,283.00	71.33
RIL	4,938.00	28.67
TOTAL	**17,221.00**	**100**

NELP - II

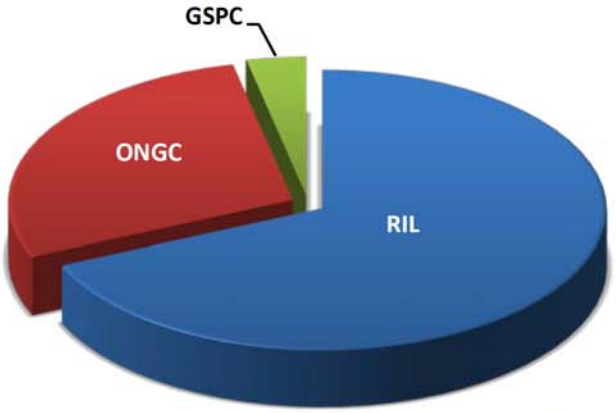


COMPANY / OPERATOR	Present Area (Sq. Km.)	(%)
ONGC	4,061.00	955.53
RIL	600.00	11.80
GSPC	425.00	8.36
TOTAL	**5,086.00**	**100**

COMPANY - WISE DISTRIBUTION OF PEL AREAS UNDER OPERATION (PRE-NELP & NELP ROUNDS)

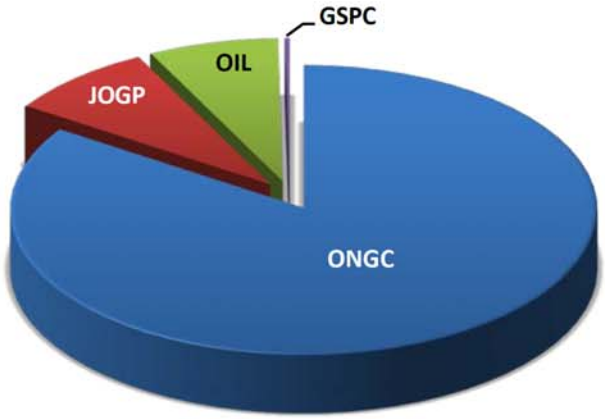
(As on 31.03.2014)

NELP - III



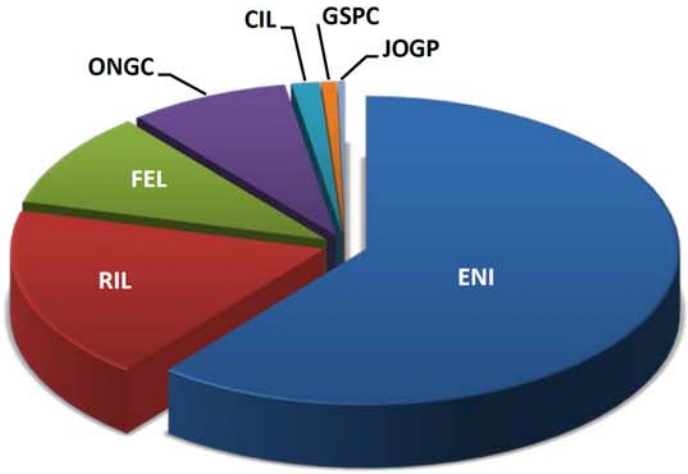
COMPANY / OPERATOR	Present Area (Sq. Km.)	(%)
RIL	10,655.00	68.36
ONGC	4,401.00	28.24
GSPC	530.50	3.40
TOTAL	**15,586.50**	**100.00**

NELP - IV



COMPANY / OPERATOR	Present Area (Sq. Km.)	(%)
ONGC	12,803.00	84.24
JOGP	1,260.00	8.29
OIL	1,095.00	7.20
GSPC	39.80	0.26
TOTAL	**15,197.80**	**100.00**

NELP - V



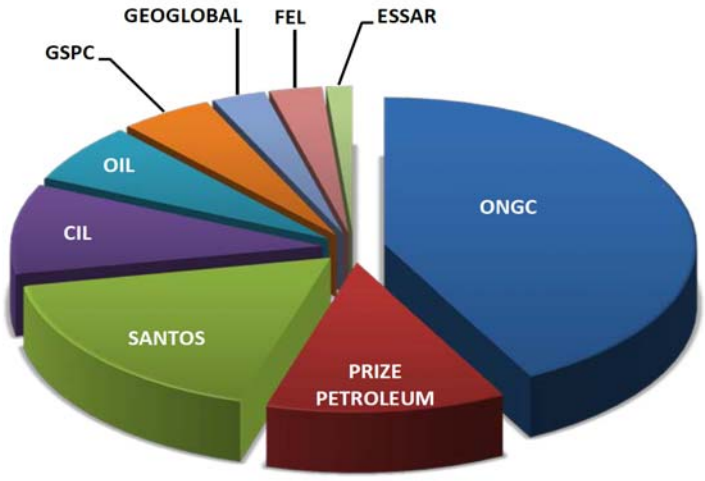
COMPANY / OPERATOR	Present Area (Sq. Km.)	(%)
ENI	13,110.00	60.81
RIL	3,923.00	18.20
FEL	2,164.00	10.04
ONGC	1,795.50	8.33
CIL	315.00	1.46
GSPC	172.00	0.80
JOGP	81.00	0.38
TOTAL	**21,560.50**	**100.00**

DGH

COMPANY - WISE DISTRIBUTION OF PEL AREAS UNDER OPERATION (PRE-NELP & NELP ROUNDS)

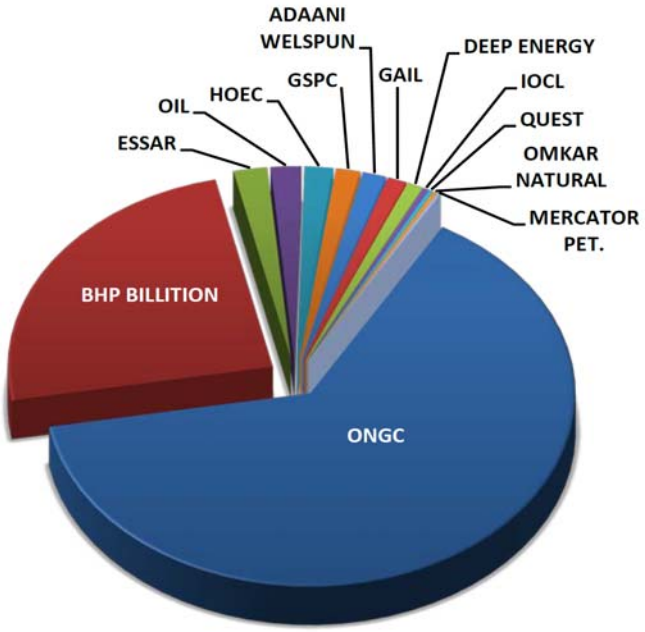
(As on 31.03.2014)

NELP - VI



COMPANY / OPERATOR	Present Area (Sq. Km.)	(%)
ONGC	40,352.73	42.28
PRIZE PETROLEUM	11,821.00	12.39
SANTOS	16,496.00	17.28
CIL	9,417.00	9.87
OIL	6,176.00	6.47
GSPC	4,613.00	4.83
GEOGLOBAL	2,649.00	2.78
FEL	2,616.00	2.74
ESSAR	1,298.00	1.36
TOTAL	**95,438.73**	**100.00**

NELP - VII

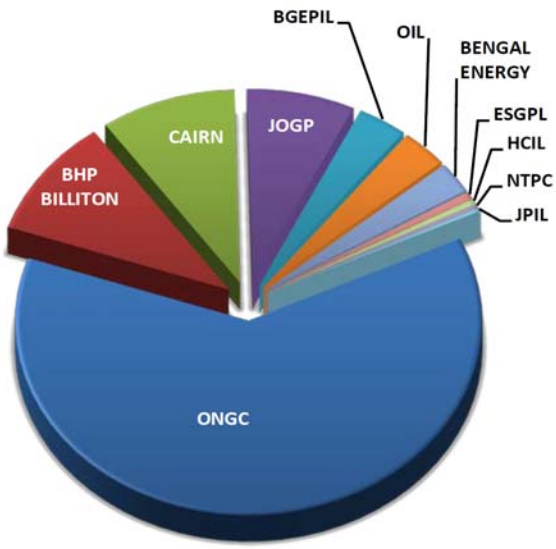


COMPANY / OPERATOR	Present Area (Sq. Km.)	(%)
ONGC	52,037.00	63.87
BHP BILLITON	19,796.00	24.30
ESSAR	1,685.00	2.07
OIL	1,517.00	1.86
HOEC	1,424.00	1.75
GSPC	1,217.00	1.49
ADAANI WELSPUN	1,191.00	1.46
GAIL	946.00	1.16
DEEP ENERGY	789.00	0.97
IOCL	280.00	0.34
QUEST	223.87	0.27
OMKAR NATURAL	185.00	0.23
MERCATOR PET.	180.20	0.22
TOTAL	**81,471.07**	**100.00**

COMPANY - WISE DISTRIBUTION OF PEL AREAS UNDER OPERATION (PRE-NELP & NELP ROUNDS)

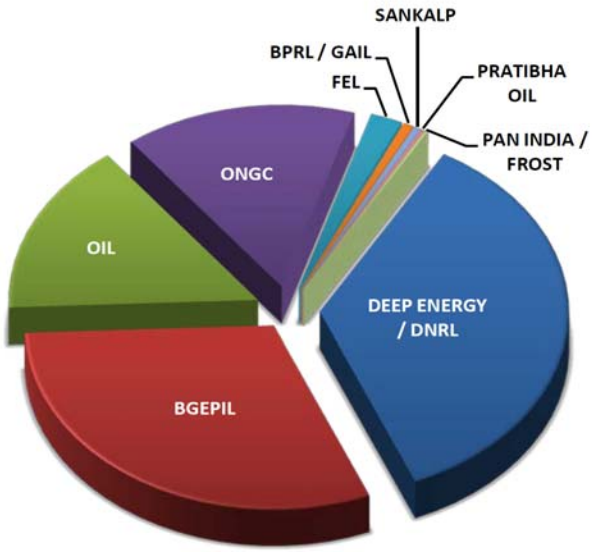
(As on 31.03.2014)

NELP - VIII



COMPANY / OPERATOR	Present Area (Sq. Km.)	(%)
ONGC	32,693.00	62.19
BHP BILLITON	5,233.00	9.95
CAIRN	4,949.00	9.41
JOGP	3,957.00	7.53
BGEPIL	1,800.00	3.42
OIL	1,705.00	3.24
BENGAL ENERGY	1,362.00	2.59
ESGPL	325.00	0.62
HCIL	248.00	0.47
NTPC	165.00	0.31
JPIL	136.00	0.26
TOTAL	**52,573.00**	**100.00**

NELP - IX



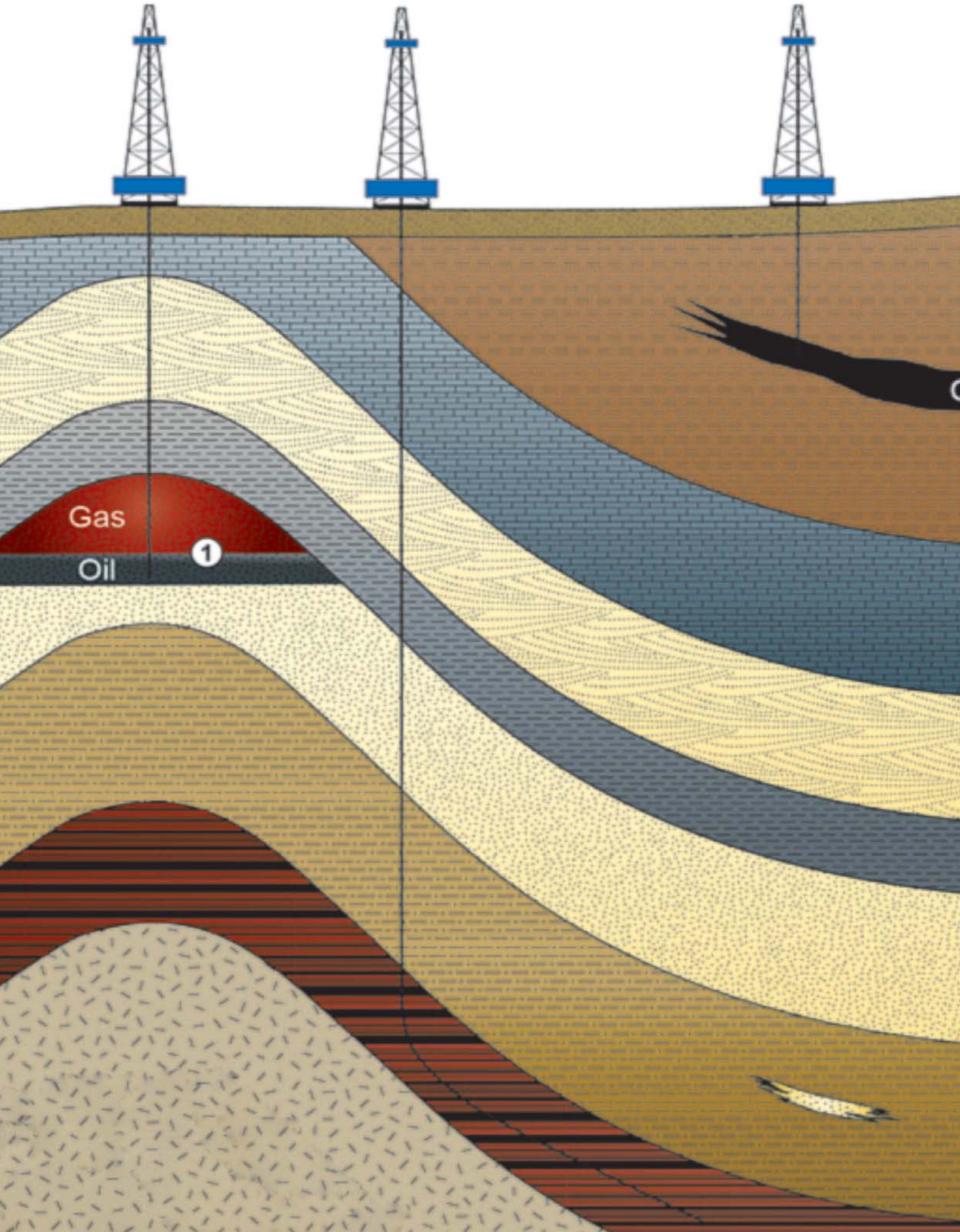
COMPANY / OPERATOR	Present Area (Sq. Km.)	(%)
DEEP ENERGY / DNRL	9,219.00	35.42
BGEPIL	7,963.00	30.60
OIL	3,978.00	15.28
ONGC	3,927.00	15.09
FEL	535.00	2.06
BPRL / GAIL	173.00	0.66
SANKALP	122.00	0.47
PRATIBHA OIL	61.00	0.23
PAN INDIA / FROST INT. LTD	49.00	0.19
TOTAL	**26,027.00**	**100.00**

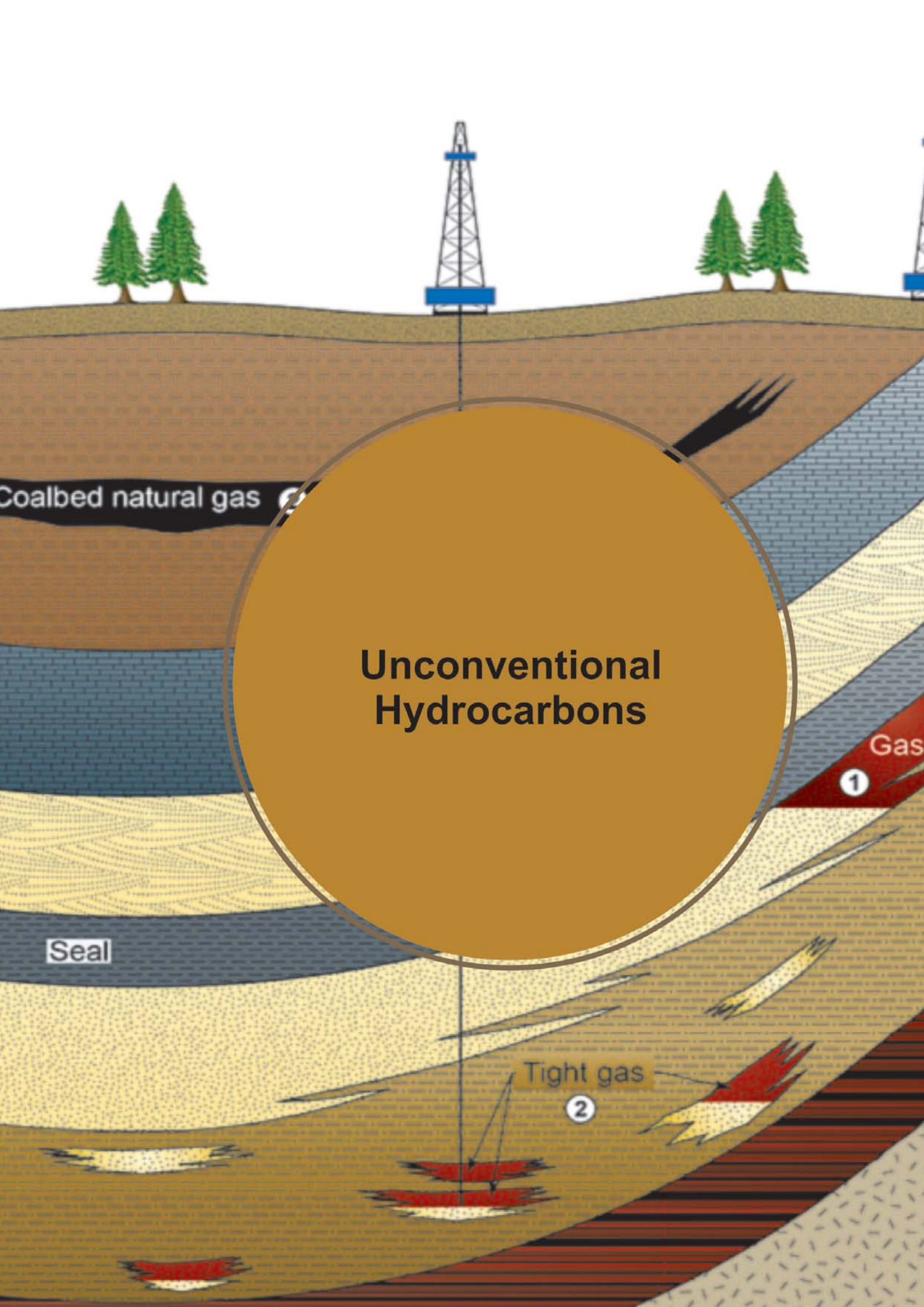
4.3 PRODUCING FIELDS OF PVT./JV UNDER PSC

SL. NO.	ROUND / BASIN	FIELD	CONSORTIUM (PARTICIPATING INTEREST)	DATE OF SIGNING CONTRACT	PRESENT AREA (Sq. Km.)
A.	**FIELDS AWARDED & PSC Signed**				
	MEDIUM- SIZED FIELDS				
1.	I ASSAM-ARAKAN	KHARSANG	**GEO-ENPRO** (10), JUBLIANT ENERGY (KHARSANG) (25), GEOPETROL (25) & OIL (40)	16.06.95	10.00
2.	I K-G OFFSHORE	RAVVA	**CEIL** (22.5), Videocon Industries Ltd.(25), RAVVA OIL PTE. LTD. (12.5) & ONGC (40)	28.10.94	331.26
3.	I MUMBAI OFFSHORE	MID & SOUTH TAPTI	**BRITISH GAS EXPLO. & PROD. INDIA LTD.** (BGEPIL) (30), **ONGC** (40) & **RELIANCE IND. LTD.** (RIL) (30)	22.12.94	1,471.00
4.		PANNA & MUKTA	**BGEPIL** (30), **RIL**(30) & **ONGC** (40)	22.12.94	430.00 777.00
				TOTAL AREA :	**3,010.26**
	SMALL- SIZED FIELDS				
5.	I CAMBAY	ASJOL	**HOEC** (50) & GSPCL (50)	03.02.95	15.00
6.		LOHAR	**SELAN EXPL. TECH. LTD.** (100)	13.03.95	5.00
7.		INDRORA	**SELAN EXPL. TECH. LTD.** (100)	13.03.95	130.00
8.		BAKROL	**SELAN EXPL. TECH. LTD.** (100)	13.03.95	36.00
9.		KARJISAN	**SELAN EXPL. TECH. LTD.** (100)	16.02.04	5.00
10.		WAVEL	**JOSHI TECH. INC. (JTI)** (100)	20.02.95	9.00
11.		DHOLKA	**JOSHI TECH. INC. (JTI)** (100)	20.02.95	48.00
12.		BAOLA	**INTERLINK PETROLEUM LTD** (100)	05.04.95	4.00
13.		MODHERA	**INTERLINK PETROLEUM LTD.** (100)	23.02.01	12.70
14.		SABARMATI	**OILEX LTD. HOLDINGS(I) LTD.** (40) & GSPCL (60)	23.09.94	5.80
15.		CAMBAY	**OILEX LTD. (30)**, GSPC (55), & OILEX LTD. HOLDINGS (I) LTD. (15)	23.09.94	161.00
16.		BHANDUT	**OILEX LTD. HOLDINGS(I) LTD.**(40) & GSPCL(60)	23.09.94	6.00
17.		HAZIRA	**NIKO** (33.33) & GSPCL (66.67)	23.09.94	50.00
18.	I CAUVERY OFFSHORE	PY-1	**HOEC** (100)	06.10.95	75.00
19.	II ASSAM-ARAKAN	AMGURI	**CRL / GOI** (60) & ASSAM CO. LTD. (40)	23.02.01	52.75
20.	II CAMBAY	N. BALOL	**HOEC** (25), GSPCL (45) & HERAMEC LTD. (30)	23.02.01	27.30
21.		KANAWARA	**HERAMEC LTD.** (30) & GSPCL (70)	23.02.01	6.30
22.		ALLORA	**HERAMEC LTD.** (30) & GSPCL (70)	23.02.01	6.85
23.		UNAWA	**GSPCL** (70) & HERAMEC LTD. (30)	23.02.01	5.65
24.		N. KATHANA	**HERAMEC LTD.** (30) & GSPCL (70)	23.02.01	12.20
25.		DHOLASAN	**HERAMEC LTD.** (30) & GSPCL (70)	23.02.01	8.80
26.		SANGANPUR	**HYDROCARBON DEV. CO. (P) LTD. (HDCPL)** (50) & **PRIZE PETROLEUM CORP. LTD.** (50)	23.02.01	4.40
27.		OGNAJ	**SELAN EXPL. TECH. LTD.** (100)	16.02.04	13.65
28.		MATAR	NIKO (65) & GSPC (35)	RELINQUISHED	
				TOTAL AREA :	**700.40**
				GRAND TOTAL : 3710.66 Sq.Km.	
B.	**AWARD OF FIELD AWAITING FINALIZATION OF CONTRACT**				
1.	II MUMBAI OFF.	RATNA-R-SERIES	**POL(10)**, ESSAR OIL LTD.(50) & ONGC(40)		57.60
C.	**PRODUCING FIELDS DISCOVERED/DEVELOPED IN EXPLORATION BLOCKS BY PVT./JV COMPANIES**				
1.	CAUVERY OFF.	PY-3(CY-OS-90/1)	**HARDY (18)**, ONGC (40), TPL (21) & HOEC (21)		81.00
2.	GULF OF CAMBAY	LAKSHMI (CB-OS/2)	**CAIRN(40)**, ONGC(50) & TPL(10)		121.06
3.		GAURI (CB-OS/2)	**CAIRN(40)**, ONGC(50) & TPL(10)		50.70
4.		CB-X	**CAIRN(40)**, ONGC(50) & TPL(10)		33.30
5.	CAMBAY	NS-A (CB-ONN-2000/2)	**NIKO(100)**		20.22
6.		BHEEMA (CB-ONN-2000/2)	**NIKO(100)**		4.03
7.		PALEJ-PROMODA (CB-ON/7)	**HOEC(35),** GSPC(35) & ONGC(30)		7.64
8.		INGOLI & SE-1 (CB-ONN-2000/1)	**GSPC (50)**, GAIL (50)		15.71
9.		ESU (CB-ON/3)	**EOL (70)** & ONGC (30)		0.54
10.		TARAPUR-1 & G (CB-ON/2)	**GSPC(56)**, GGR(14) & ONGC (30)		2.68
11.	RAJASTHAN	DA1, DA2 & DA3 (RJ-ON-90/1)	**CIL (35)**, CEHL (35) & ONGC (30)		3111.17
12.		RJ-ON/6 (SGL)	**FOCUS(7)**, ISIL(45.5), NOCL (17.5) & ONGC(30)		176.00
13.	KG OFFSHORE	D-1, D-3 & MA (KG-DWN-98/3)	**RIL (60)**, BPEAL (30) & NIKO(10)		389.12
14.		OFDP (D2,6,19,22) & FDP (D34)	**RIL (60)**, BPEAL (30) & NIKO(10)		759.00
15.		DDW (KG-OSN-2001/3)	**GSPC(80)**, JOGPL(10) & GGR(10)		37.5
16.	CAMBAY	ANK#21 (CB-ONN-2003/2)	**GSPC(50)**, GAIL(20), JSPL(20) & GGR(10)		1.60
17.		Miroli-1 & 6 (CB-ONN-2002/3)	**GSPC(55)**, JOGPL(20), HPCL(15) & GGR(10)		3.29

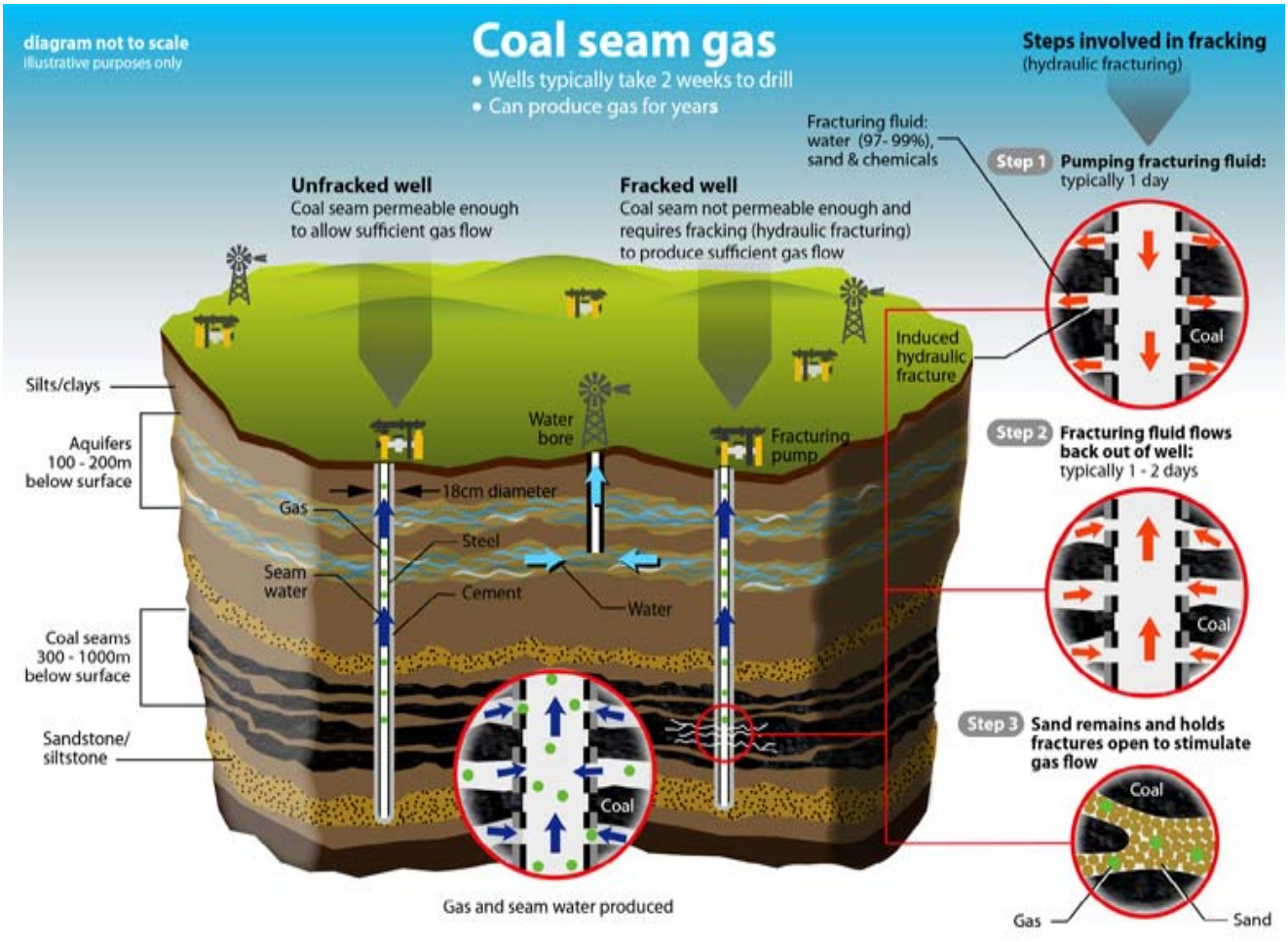
Technical Session with DG in VRC at DGH office

Shale Gas & Oil Work shop at Colorado School of Mines, USA


Gas
1
Oil


Coalbed natural gas
Unconventional Hydrocarbons
Gas
1
Seal
Tight gas
2

Unconventional Hydrocarbon Operations



UNCONVENTIONAL HYDROCARBONS

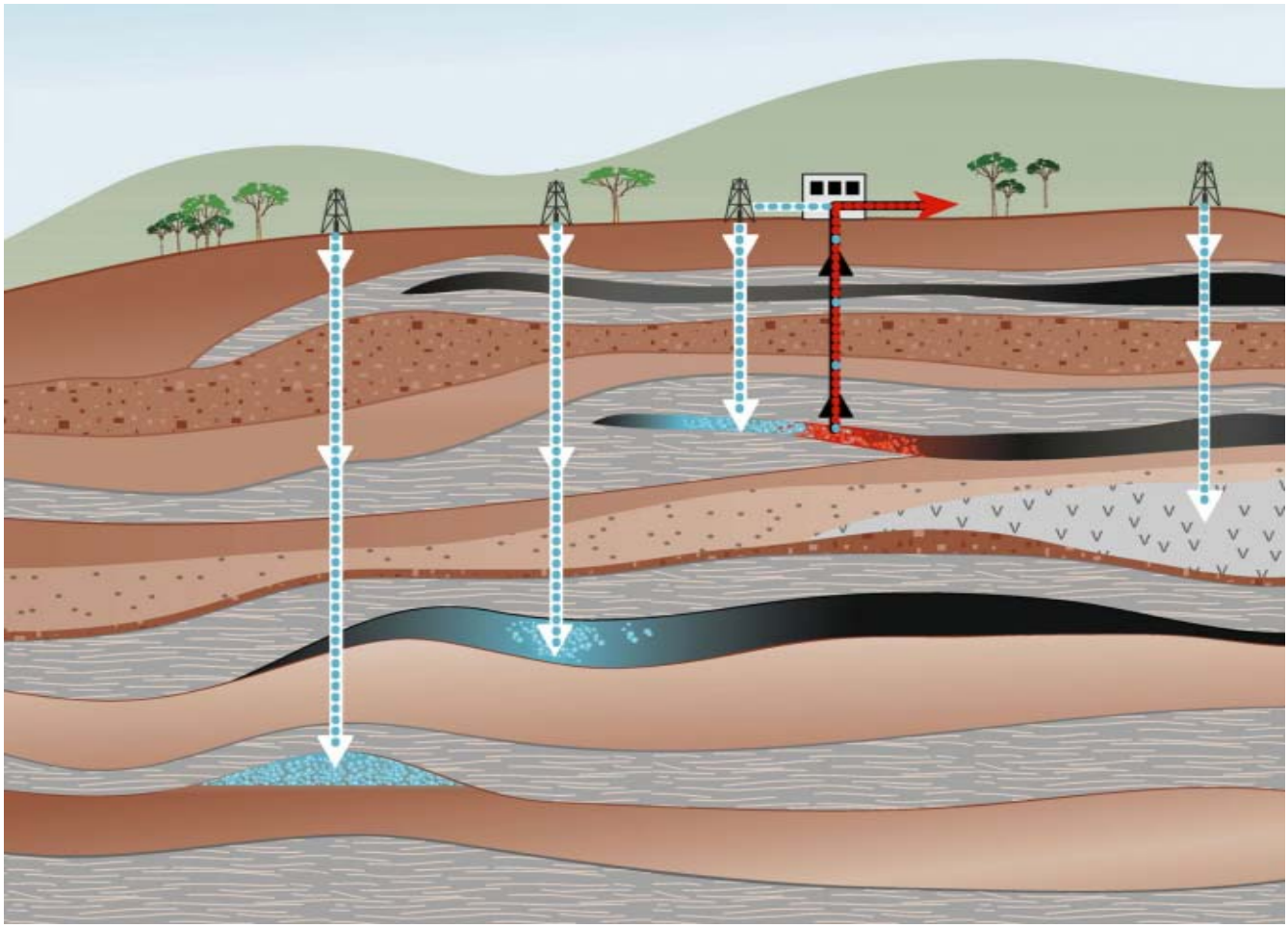
5.1 COAL BED METHANE (CBM)

India, having the fifth largest proven coal reserves in the world, holds significant prospects for exploration and exploitation of CBM. The prognosticated CBM resources in the country are about 92 TCF (2600 BCM). In order to harness CBM potential in the country, the Government of India formulated CBM policy in 1997 wherein CBM being Natural Gas is explored and exploited under the provisions of OIL Fields (Regulation & Development) Act 1948 (ORD Act 1948) and Petroleum & Natural Gas Rules 1959 (P&NG Rules 1959) administered by Ministry of Petroleum & Natural Gas (MOP&NG).

CBM blocks were carved out by DGH in close interaction with Ministry of Coal (MOC) & CMPDI. Till date, four rounds of CBM bidding rounds have been implemented by MOP&NG under the CBM policy resulting in award of 33 CBM blocks (including 3 blocks on Nomination/FIPB route) which covers 16,613 Sq.km out of the total available coal bearing areas for CBM exploration of 26,000 sq.km. Exploration under CBM policy has been undertaken by national and international companies. Total prognosticated CBM resource for awarded 33 CBM blocks, is about 62.4 TCF (1767 BCM), of which, so far, 9.9 TCF (280.34 BCM) has been established as Gas in Place (GIP).

CBM production has started since July 2007 and current production is around 0.6 MMSCMD from 3 CBM blocks. Seven more CBM blocks are expected to start commercial production in near future. The total CBM production is expected to be around 4MMSCMD by end of 12th plan as per XII plan document.

The blockwise details of CBM Contracts are provided on the next page.

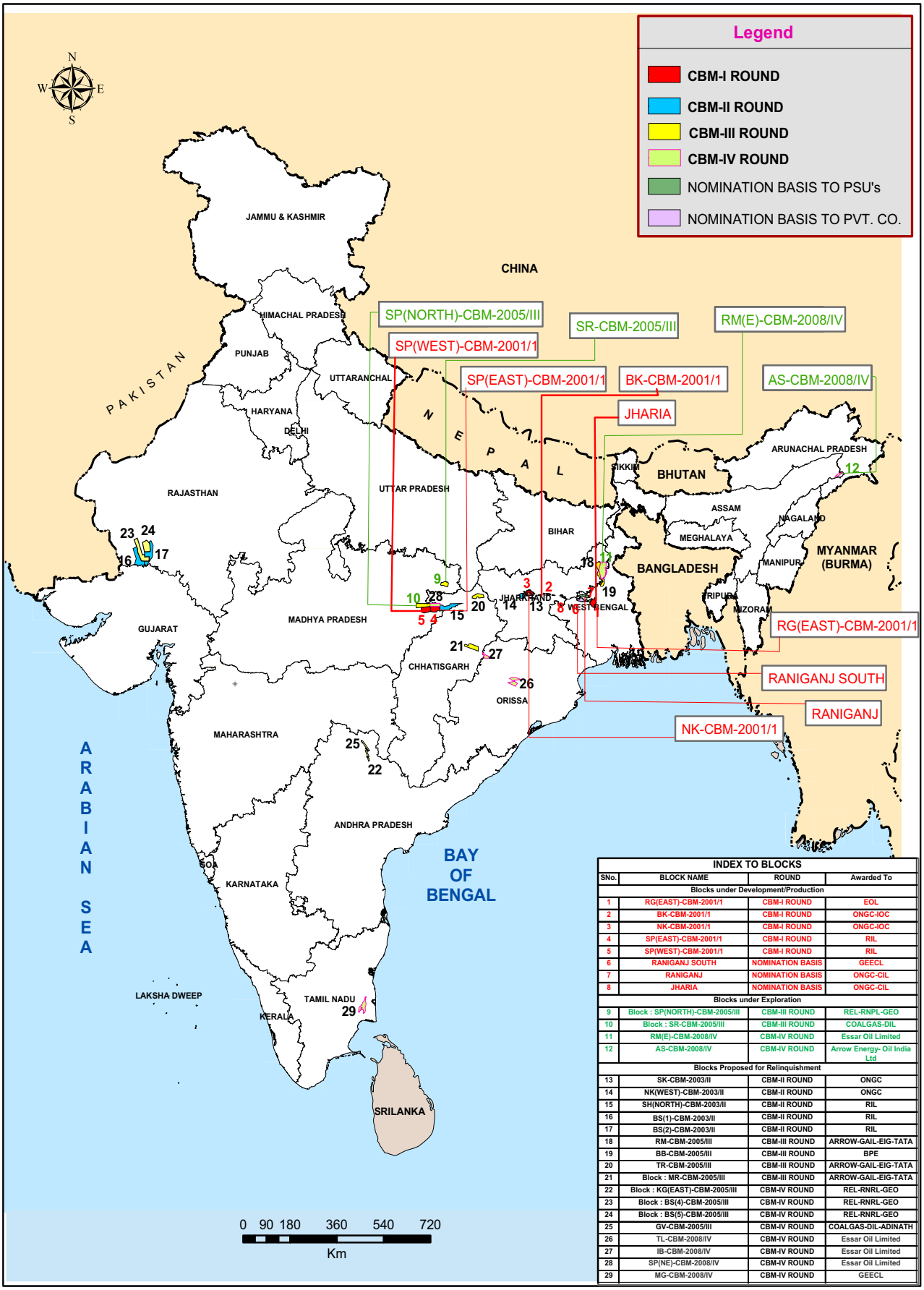


CBM BLOCKS AWARDED

SL NO.	COAL FIELD / STATE	BLOCK NAME	CONSORTIUM (PARTICIPATING INTEREST)	DATE OF SIGNING CONTRACT	AWARDED AREA (SQ. KM.)
CBM-I ROUND					
1.	RANIGANJ EAST / WEST BENGAL	RG(E)-CBM-2001/1	**EOL** (100)	26.07.2002	500
2.	BOKARO / JHARKHAND **	BK-CBM-2001/1	**ONGC** (80) & IOC (20)	26.07.2002	74.1
3.	N. KARANPURA / JHARKHAND **	NK-CBM-2001/1	**ONGC** (80) & IOC (20)	26.07.2002	271.5
4.	SOHAGPUR EAST / M.P	SP(E)-CBM-2001/1	**RIL** (100)	26.07.2002	495
5.	SOHAGPUR WEST / M.P	SP(W)-CBM-2001/1	**RIL** (100)	26.07.2002	500
				TOTAL AREA :	**1841**
ON NOMINATION BASIS					
6.	RANIGANJ NORTH / WEST BENGAL**	RANIGANJ NORTH	**ONGC** (74) & CIL (26)	06.02.2003	311.8
7.	JHARIA / JHARKHAND **	JHARIA	**ONGC** (90) & CIL (10)	06.02.2003	65.1
8.	RANIGANJ SOUTH / WEST BENGAL	RANIGANJ SOUTH	**GEECL** (100)	31.05.2001	210
				TOTAL AREA :	**586.9**
CBM-II ROUND					
9.	SOUTH KARANPURA / JHARKHAND	SK-CBM-2003/II*	**ONGC** (100)	06.02.2004	70
10.	NORTH KARANPURA / JHARKHAND	NK(WEST)-CBM-2003/II*	**ONGC** (100)	06.02.2004	267
11.	SONHAT / CHATTISGARH & M.P.	SH(NORTH)-CBM-2003/II*	**RIL** (100)	06.02.2004	825
12.	BARMER / RAJASTHAN	BS(1)-CBM-2003/II*	**RIL** (100)	06.02.2004	1045
13.	BARMER / RAJASTHAN	BS(2)-CBM-2003/II*	**RIL** (100)	06.02.2004	1020
				TOTAL AREA :	**3227**
CBM-III ROUND					
14.	RAJMAHAL / JHARKHAND	RM-CBM-2005/III*	**ARROW**(40)-GAIL(40)-EIG(10)-TATA(10)	07.11.06	469
15.	BIRBHUM / WEST BENGAL	BB-CBM-2005/III*	**BPE**(100)	16.11.06	248
16.	TATAPANI RAMKOLA / CHATTISGARH	TR-CBM-2005/III*	**ARROW**(35)-GAIL(35)-EIG(15)-TATA(15)	07.11.06	458
17.	MAND RAIGARH / CHATTISGARH	MR-CBM-2005/III*	**ARROW**(40)-GAIL(45)-EIG(15)	07.11.06	634
18.	SOHAGPUR / M.P.	SP(N)-CBM-2005/III	**GEO(10)**-REL(45)-RNPL(45)	07.11.06	609
19.	SINGRAULI / M.P.	SR(N)-CBM-2005/III	**COALGAS**(10)-DIL(90)	07.11.06	330
20.	KOTHAGUDEM / ANDHRA PRADESH	KG(E)-CBM-2005/III*	**GEO(10)**-REL(45)-RNPL(45)	07.11.06	750
21.	BARMER / RAJASTHAN	BS(4)-CBM-2005/III*	**GEO(10)**-REL(45)-RNPL(45)	07.11.06	1168
22.	BARMER / RAJASTHAN	BS(5)-CBM-2005/III*	**GEO(10)**-REL(45)-RNPL(45)	07.11.06	739
23.	GODAVARI / ANDHRA PRADESH	GV(N)-CBM-2005/III	**COALGAS**(10)-DIL(40)-ADINATH(50)	07.11.06	386
				TOTAL AREA :	**5791**
CBM-IV ROUND					
24.	RAJ MAHAL / JHARKHAND	RM(E)-CBM-2008/IV	**ESSAR OIL LIMITED** (100)	29.07.10	1128
25.	TALCHIR / ORISSA	TL-CBM-2008/IV	**ESSAR OIL LIMITED** (100)	29.07.10	557
26.	IB VALLEY / ORISSA	IB-CBM-2008/IV	**ESSAR OIL LIMITED**(100)	29.07.10	209
27.	SOHAGPUR / MP & CHHATTISGARH	SP(NE)-CBM-2008/IV	**ESSAR OIL LIMITED** (100)	29.07.10	339
28.	NORTH EAST / ASSAM	AS-CBM-2008/IV	**DART ENERGY**(60)–OIL INDIA(40)	29.07.10	113
29.	MANNARGUDI / TAMIL NADU	MG-CBM-2008/IV	**GEECL** (100)	29.07.10	667
				TOTAL AREA :	**3727**
RELINQUISHED CBM BLOCKS					
1.	SATPURA / M.P.	ST-CBM-2003/II	**ONGC** (100)	06.02.2004	714
2.	WARDHA / MAHARASHTRA	WD-CBM-2003/II	**ONGC** (100)	06.02.2004	503
3.	BARMER-SANCHOR / GUJARAT	BS(3)-CBM-2003/II	**ONGC**(70)&GSPCL(30)	06.02.2004	790
4.	SATPURA / MADHYA PRADESH	ST-CBM-2008/IV	**DART ENERGY**(80)–TATA POWER(20)	29.07.2010	714

** : Relinquishment proposed by Operator* *** : Part Relinquishment in Development Phase*
Note : Name of Arrow Energy has been changed to Dart Energy

CBM BLOCKS AWARDED UNDER ROUND-I, II, III, IV AND ON NOMINATION BASIS



INDEX TO BLOCKS

SNo.	BLOCK NAME	ROUND	Awarded To
	Blocks under Development/Production		
1	RG(EAST)-CBM-2001/1	CBM-I ROUND	EOL
2	BK-CBM-2001/1	CBM-I ROUND	ONGC-IOC
3	NK-CBM-2001/1	CBM-I ROUND	ONGC-IOC
4	SP(EAST)-CBM-2001/1	CBM-I ROUND	RIL
5	SP(WEST)-CBM-2001/1	CBM-I ROUND	RIL
6	RANIGANJ SOUTH	NOMINATION BASIS	GEECL
7	RANIGANJ	NOMINATION BASIS	ONGC-CIL
8	JHARIA	NOMINATION BASIS	ONGC-CIL
	Blocks under Exploration		
9	Block : SP(NORTH)-CBM-2005/III	CBM-III ROUND	REL-RNPL-GEO
10	Block : SR-CBM-2005/III	CBM-III ROUND	COALGAS-DIL
11	RM(E)-CBM-2008/IV	CBM-IV ROUND	Essar Oil Limited
12	AS-CBM-2008/IV	CBM-IV ROUND	Arrow Energy- Oil India Ltd
	Blocks Proposed for Relinquishment		
13	SK-CBM-2003/II	CBM-II ROUND	ONGC
14	NK(WEST)-CBM-2003/II	CBM-II ROUND	ONGC
15	SH(NORTH)-CBM-2003/II	CBM-II ROUND	RIL
16	BS(1)-CBM-2003/II	CBM-II ROUND	RIL
17	BS(2)-CBM-2003/II	CBM-II ROUND	RIL
18	RM-CBM-2005/III	CBM-III ROUND	ARROW-GAIL-EIG-TATA
19	BB-CBM-2005/III	CBM-III ROUND	BPE
20	TR-CBM-2005/III	CBM-III ROUND	ARROW-GAIL-EIG-TATA
21	Block : MR-CBM-2005/III	CBM-III ROUND	ARROW-GAIL-EIG-TATA
22	Block : KG(EAST)-CBM-2005/III	CBM-IV ROUND	REL-RNRL-GEO
23	Block : BS(4)-CBM-2005/III	CBM-IV ROUND	REL-RNRL-GEO
24	Block : BS(5)-CBM-2005/III	CBM-IV ROUND	REL-RNRL-GEO
25	GV-CBM-2005/III	CBM-IV ROUND	COALGAS-DIL-ADINATH
26	TL-CBM-2008/IV	CBM-IV ROUND	Essar Oil Limited
27	IB-CBM-2008/IV	CBM-IV ROUND	Essar Oil Limited
28	SP(NE)-CBM-2008/IV	CBM-IV ROUND	Essar Oil Limited
29	MG-CBM-2008/IV	CBM-IV ROUND	GEECL

5.2 GAS HYDRATES

Steered by the Ministry of Petroleum and Natural Gas and technically coordinated by Directorate General of Hydrocarbons (DGH), National Gas Hydrate Program (NGHP) is a consortium of National E&P companies, namely ONGC, GAIL, OIL, IOC and national research institutions NIO, NIOT and NGRI. During the period 1998 to 2003, data of Krishna Godavari Basin (offshore), Cauvery Basin (offshore), Gulf of Mannar and Western offshore were studied for assessing Gas Hydrate prospectivity. These studies provided technical support in formulating NGHP Expedition-01 program, wherein 21 sites (39 holes) were drilled / cored in Indian offshore in 2006 using the ship Joides Resolution.

The following are highlights of the findings of NGHP Expedition-01 :

- Established presence of gas hydrate in KG, Mahanadi and Andaman deep waters in numerous complex geologic settings.
- Collected an unprecedented number of gas hydrate cores
- Most of the recovered gas hydrate was characterized as either pore-filling grains or particles disseminated in coarser grain sediments or as a fracture-filling material in clay dominated sediments.
- Gas hydrate was found occurring in “combination reservoirs” consisting of horizontal or sub-horizontal coarse grained permeable sediments (sands for the most part) and apparent vertical to sub-vertical fractures that provide the conduits for gas migration.
- Delineated and sampled one of the richest marine gas hydrate accumulations yet discovered (Site NGHP-01-10 in the KG Basin).
- Discovered one of the thickest and deepest (612m below sea floor) gas hydrate occurrences yet known (offshore of the Andaman Islands, Site NGHP-01-17).
- Scientific Contribution globally acknowledged.

NGHP Expedition-02

Based on the findings of NGHP Expedition-01, the Krishna Godavari deepwater basin and the Mahanadi deep waters have been considered potential areas where large tracts of turbidity sand channel systems can be expected in the delta sequence accumulations.

The aims and objectives of the NGHP Expedition-02 are to identify gas hydrate bearing sands, identify the free gas below the gas hydrate stability zone and identify suitable location for carrying out pilot production testing in NGHP Expedition-03. 3D seismic data interpretation is in progress to identify potential sand channel systems. The results of the studies will yield potential sites for NGHP Expedition-02. The NGHP Expedition-02 is likely to consist of an exclusive Logging while Drilling (LWD) programme followed by selective coring.

Identification of Locations:

Based on the geophysical studies carried out so far, in over 8000 km^2 in Krishna Godavari and Mahanadi offshore deepwater areas more than 80 sites have been identified for NGHP Expedition-02. These locations have been prioritized in consultation with NGHP and US scientists and NGHP Exp-02 will be carried out at 20 of these locations.

Resource Estimation:

Earlier studies have prognosticated gas hydrate resources of 1894 TCM for India and USDOE in Feb 2012 published that around 933 TCF is the concentration of gas hydrate in sands within the gas hydrate stability zone. This estimate is encouraging, although the estimated presence of sand is approximated based on gross geological depositional models. Under NGHP, NGRI completed a research project on quantitative estimation of gas hydrates computing seismic attenuation and other attributes on the characteristic high velocity anomaly observed in gas hydrate bearing sediments. The studies indicate

51.56 BCM gas in 2.47 x 10^9 m^3 of gas hydrate sediments for the localized area of study. Under NGHP, NIO completed a study around the site NGHP-01-10 where ~128 m thick gas hydrate has been recovered. The study aimed at understanding the spatial extent of gas hydrate in the vicinity of the site NGHP-01-10 using the estimates of longitudinal seismic wave attenuation and velocity and model the heterogeneous, scattered hydrate deposits to understand the characteristic in the real seismic data. The studies indicate a resource estimate of ~ 16.5 million cubic meters from a gas hydrate bearing sediment over an area of 0.98 km^2.

Efforts on deriving benefits from MoU

NGHP has MoU with USGS, USMMS, USDOE, JOGMEC, GFZ-Potsdam and IFM-Geomar for collaborative research in gas hydrates. USGS scientists are in close consultation for R & D activities of NGHP Expedition-02.

Exploitation of methane from Gas Hydrates

Exploitation of methane from gas hydrates is still at a research stage globally. Various factors, such as characteristic nature of gas hydrates, dissociation and stability of gas hydrates and environmental factors have to be well understood before contemplating pilot production testing for the extraction of methane. NGHP has taken several initiatives in this direction based on the global R & D trends.

A collaborative project with ONGC-IIT-Kharagpur taken up to firm up the theoretical background has been completed. The project has brought out that the heat transfer rates are very slow and hence the ultimate production rate by thermal stimulation will be very low.

GAS HYDRATE CORE SAMPLES FROM KG BASIN – EXPEDITION-01

NGRI has demonstrated core competency development by successfully carrying out experimental studies on synthesizing gas hydrates in the laboratory and studying basic properties using Raman Microprobe. NGRI has proposed phase stability studies on synthesized gas hydrate, which is under active consideration as these studies will provide valuable insight in the nature of natural gas hydrates.

NIO has completed characterization of gas hydrate bearing sediments to evaluate the subsurface geological environments based on selected cores.

Global Analogues

Global efforts for the extraction of methane from gas hydrates began as early as 2002. However, these were restricted to onshore permafrost areas. It was only in March 2013 that the first ever marine offshore production trials for the extraction of methane from gas hydrates was conducted by Japan. A brief review of these tests is given below :-

(i) First Production Testing - Mallik :

In 2002, the "hot water circulation method" – a type of heating method – was selected for producing methane gas from methane hydrate. In this method, hot water heated up to 80° C was fed into test wells to heat methane hydrate layers existing approximately 1,100 m below ground so that methane hydrate can be dissociated. The temperature of hot water was estimated to be around 50° C when it came near the methane hydrate layers.

This test succeeded in producing approximately 470 m^3 of methane gas over the five-day production period. This was the first time in the world that anyone had ever produced methane gas from methane hydrate layers.

(ii) Second Production Testing - Mallik :

MH21, Research Consortium for Methane Hydrate Resources in Japan, carried out the Second Onshore Gas Production Test at the Mallik site in the Mackenzie Delta in the Northeast Territories of Canada, where they tested the hot water circulation method in 2002.

This testing was conducted twice, once in 2007 and again in 2008. The tests conducted in 2007 and 2008 are called the First Winter Test and the Second Winter Test, respectively. In the First Winter Test in 2007, methane gas was collected from methane hydrate being dissociated with the depressurization method. However, since methane hydrate layers are unconsolidated sediments, sand was also collected (sand production) along with methane gas and water and the sand stalled the pump. As a result, the test had to stop 12.5 hours after it began.

Although the test was terminated within a very short time, it was the first time in the world that methane gas had ever been successfully collected from methane hydrate layers using the depressurization method.

After developing measures to prevent sand production (sanding), MH21 reattempted the depressurization method-based production test again in the Second Winter Test in 2008. In this test, MH21 achieved continuous production over approximately 5.5 days. The amount of methane gas produced during the test period was approximately 13,000 m^3, much larger than the approximately 470 m^3 in the First Onshore Gas Hydrate Production Test. It demonstrated that the depressurization method is effective for producing methane hydrate.

On behalf of NGHP, DGH participated in this field test.

(iii) Ignik Sikumi Gas Hydrate Field Trial :

In 2012, ConocoPhillips, Japan Oil, Gas, and Metals National Corporation (JOGMEC) and the US Department of Energy (USDOE) completed the first field program designed to investigate the potential for CO2-CH4 exchange in naturally occurring methane hydrate reservoir. The well Ignik Sikumi#1 produced for approximately 30 days and the production rates achieved was as high as 1,75,000 scf/d.

The results of this latest field experiment were discussed in detail and DGH participated in the discussions. The database created on the results of this production trial has been shared with various participating global organizations including DGH.

(iv) First Marine offshore test for gas hydrate in Nankai Trough, Japan

In March 2013, Japan carried out the first ever marine offshore test in the Nankai trough. After a prolonged study of the various aspects of gas hydrates, five wells were drilled of which four were observation wells at a distance of 20m from the main pilot test well.

The well flowed for six days and testing was closed due to anticipated problems. The well flowed 1,20,000 m^3 of gas at an average rate of 20,000 m^3/day.

The test is considered successful as it has shown better flow conditions when compared with earlier tests in other areas which were onshore.

Future plans for NGHP

The NGHP technical committee is planning to locate an ideal gas hydrate bearing sand in the channel-levee system by drilling several of the identified locations in the areas KG & Mahanadi deepwater areas during NGHP Expedition-02. This would be followed up by taking pilot production testing under NGHP-03. The steering committe of NGHP has mandated ONGC to execute the NGHP Expedition-II.

The Geoscientific study has been carried out to identify gas hydrate sweet spots and firm up suitable sites for NGHP-02 expedition and estimate gas hydrate resources in this area. ONGC has identified prospective areas for Gas hydrate bearing sands in two areas in eastern offshore namely as GD Block (700 Sq.Km) and KG-DWN-98/2 Block (3500 Sq.Km) in Godavari offshore. Detailed studies were carried out on Seismo-geological data such as post stack processing (structural smoothening) of 3D seismic data,seismic event/horizon identification and correlation, sub-surface relief map generation; seismic amplitude attribute analysis and identification of seismo-geological features along sea floor and above BSR. Based on the studies at KDMIPE, total six prospective sites were identified.

Total 43 sites were proposed by ONGC to NGHP technical committee and the same were reviewed by the international expert committee. The recommendations for proposed sites were presented to NGHP Steering Committee chaired by Secretary- P&NG in its meeting held at MoP&NG on 7th October, 2013. The steering committee has approved for the NGHP-02 expedition for coring/drilling/LWD/MWD/WL of 40 wells at 20 sites in Indian Offshore.

In addition,a regional gas hydrate prospect map was generated for KG and Mahanadi basin by integrating the bathymetry derived from 3D seismic data along-with seismic attributes near the sea floor, BSR zones with identified prospective sites.

5.3 SHALE OIL & GAS

Shale oil and gas have gained predominance particularly in USA and contribute approx. 25-30% of total gas production. The experience accumulated so far in USA with the exploration and exploitation of these plays have encouraged other countries to venture into such plays. Though Shale oil and gas were recognized much earlier, two things in particular, horizontal multilateral drilling with hydraulic fracturing and improved prices of gas in the US markets, have changed the scenario rapidly after 2001.

There are large basinal segments, which appear prospective from Shale Oil & Gas point of view in India. A systematic approach has been initiated by DGH under MOPNG since 2010 to identify, characterize and prioritize the Indian sedimentary basins for focused shale oil /gas exploitation and also to assess and establish the potential of fields.

Memorandum of understanding (MoU) has been signed between Department of State, USA and MOPNG, GOI on November 06,2010 to cooperate in areas of

a. Assessment of Shale Gas Resources in India.
b. Technical Studies
c. Consultations in regulatory frameworks
d. Investment Promotion

In this respect technical workshops were held during Jan 2011, May 2011, Jan 2012 and Aug 2012 at Delhi attended by USGS Team, MOPNG, DGH, ONGC, OIL , GAIL and several others.

Based on the data available from conventional oil/gas exploration in the country for the last so many years, following sedimentary basins may be prospective from Shale oil & gas point of view under Phase-I.

a. Cambay Basin
b. Gondwana Basin
c. KG Basin
d. Cauvery Basin
e. Indo-Gangetic Basin
f. Assam Arakan Basin

- GoI has granted permission to ONGC for an R&D project in Gondwana Basin in the existing two CBM Blocks for exploration of Shale Gas. ONGC has drilled 4 Pilot wells to gather data relevant to Shale Gas. Presence of gas has been established by ONGC.
- A Multi Organizational Team (MOT) of DGH, ONGC, OIL, GAIL has been formed by MOPNG to analyze the existing data set and suggest methodology for Shale Oil & Gas development in India.
- Technical studies have been conducted by ONGC & CMPDI to identify prospective areas in several Basins / sub basins.
- Different agencies have reported the Shale oil and gas resources in India. EIA, USA (June'13) has reported a GIP concentration of 1278 TCF, risked gas-in-place of the order of 584 TCF with 96 TCF as recoverable in 4 Indian basins with shale oil / condensate in place of 178.5 billion bbl, risked value of 87 billion bbl and technically recoverable as 3.8 billion bbl. USGS (Jan'12) has estimated 6.1 TCF as technical recoverable in 3 Indian basins and mention potential for Shale oil. Media reports mention shale gas resources ranging from 300 to 2100 TCF in India. USGS (Apr'14) has estimated 62 million barrels of shale oil in Cambay basin and more than 3.7 TCF of gas in tight sandstone gas reservoirs in Cambay & Krishna Godavari.
- Govt. of India has announced "Policy guidelines for Exploration and Exploitation of Shale oil and gas by National Oil Companies under Nomination regime" in October 2013.

Future Action Plan

1. Exploration of Shale Oil & Gas by National Oil Companies under Nomination acreages.
2. Finalization of Shale Oil & Gas policy for other acreages / areas

Information provided by ONGC :

A number of Indian sedimentary basins are proven to have large volumes of shale deposits. ONGC has taken up a systematic approach to identify, characterize and prioritize Cambay, KG, Cauvery and Assam - Arakan basins for shale gas exploration and also to assess & establish the potential for shale gas. Preliminary study suggests that the shale formations like Cambay Shale and Olpad Formation in

Cambay Basin, Kommugudem and Raghavpuram Shale in KG Basin, Andimadam Shale and Sattapadi Shale in Cauvery Basin appears to be highly prospective.

Under R&D project,ONGC has drilled four wells viz., RNSG#1, NKSG#2, RNSG#2, NKSG#1, for assessment of shale gas potential in Damodar Valley. The well RNSG#1 has flowed water and gas in surges after hydro-fracturing on 25th January, 2011. It was recorded as first ever event in India to mark the presence of shale gas.

Subsequent to the completion of Pilot Project on Shale Gas in the Damodar Basin,MOU with Conocco-Phillips(COP, a global oil & gas major and experienced company in shale gas E&P in USA) was signed for undertaking joint studies on the shale gas prospectivity in other sedimentary basins of India. COP has carried out the study of G&G data of four basins namely, Cambay, KG, Cauvery and Damodar to assess their shale gas potential. COP has agreed to provide technical assistance to ONGC in its shale gas pilot programme which is planned to be taken up in Cambay basin. ONGC is planning to explore for shale gas in the identified basins i.e. Cambay, Krishna-Godavari, Cauvery and Bengal basins.

Government of India notified the New Shale Gas Policy for the NOCs on 14.10.2013. According to it, ONGC and OIL are allowed to initiate the shale gas and oil exploration activities in their nomination blocks in phased manner. Following the notification of the policy, ONGC has recently completed the drilling of first pilot Shale gas well JM#55(JMSGA) in Jambusar area in Cambay Basin. ONGC has identified and submitted list of 50 nomination blocks to MoPNG. Out of these, 28 blocks are in Cambay basin, 10 in KG basin, 9 in Cauvery basin and 3 in Assam Shelf. Process of identification of nomination blocks for shale gas has been completed under Phase-I and work is in progress.

Shale gas exploration and production is one of the key elements of ONGC's Perspective Plan PP-2030 wherein an accretion potential of 850 to 1150 MMtoe and production potential of 80 to 140 MMtoe have been envisaged by the year 2030. ONGC plans to take up shale gas activities proactively in different Indian basins. About 20 pilot wells are planned to be drilled in KG, Cauvery and A&AA basins in 2014-15 besides continuation of the pilot programme in Cambay Basin wherein one more location, GNSG-1 has been released in the Bharuch depression which will be taken up for drilling shortly. Success in these envisaged Shale Gas pilot programme will help in unlocking the unconventional shale gas and oil reserves in different basins.

ONGC was entrusted with the task of preparing the Information Docket (ID) for the identified basins by DGH along with generation of prospective area maps and estimation of resource potential for shale gas of all these basins. ONGC prepared and submitted shale gas information dockets of Cambay, KG, Cauvery, A&AA and Ganga and Rajasthan-Jaisalmer Basin,Kutch and Vindhyan Basin to DGH.

Information provided by OIL :

As per the policy guidelines, notified by MOP&NG, GOI on 14th October, 2013 vide F.No.O-32011/41/2009-ONG-I for Exploration & Exploitation of Shale Gas & Oil by National E&P companies under nomination regime, OIL has identified five blocks in its nominated PEL/ML areas for exploration of shale gas/oil, based on the available geoscientific data. The proposal has been submitted to MOP&NG before the stipulated time. The details of the shale gas/oil blocks are summarised in the table below :

Blocks in order of priority	Basin	Target Shales / Approx. Depth	PML / PEL	Area (Sq.km)	PML / PEL License Valid upto
1	Upper Assam	Upper Tikak Parbat (Barail) / 1400	Jairampur Ext. PEL	23.25	03.03.2019
2		Kopili / 2700 & Lakadong / 3440	Chabua ML	189.00	11.06.2022
3		Barail / 3000	Dum Duma PML	506.21	25.11.2029
4		Kopili / 3180 & Lakadong / 3730	Dibrugarh PML	186.00	21.01.2018
5	Rajasthan	Baisakhi/Badesar/2100	Jaisalmer PML	250.00	31.02.2015

5.4 OIL SHALE

Following work has been carried out in respect of exploration of oil shale in the country :

- Oil Shale prospectivity mapped in selected Assam-Arakan Basin areas
- Oil Shale resources has been estimated to be around 400 MMT of oil upto a depth of 500m in selected areas in Assam-Arakan Basin
- An MoU has been signed between IOCL, R&D centre, Faridabad and DGH related to feasibility studies for oil shale as nonconventional fossil fuel, characterization, recovery of oil and its characterization, economic aspect of oil shale processing
- Oil shale samples have been provided to IOCL, R&D centre by DGH

5.5 UNDERGROUND COAL GASIFICATION (UCG)

Information Provided by ONGC :

ONGC signed an Agreement of Collaboration (AOC) with M/s Skochinsky Institute of Mining (SIM), Russia on 25th November, 2004 for implementation of Underground Coal Gasification (UCG) program in India. As follow-up MOUs was signed with various coal companies for accessing the coal/lignite blocks for evaluating their suitability to UCG. After evaluating a number of coal/lignite blocks, Vastan Mine block belonging to GIPCL in Surat district, Gujarat was found suitable for UCG. This site has been taken up by ONGC as an R&D project to establish UCG technology.

Work at Vastan Mine Block:

All the ground work and inputs for pilot construction have been finalized for implementation of UCG pilot at Vastan. A Gazette notification from GoI for UCG block allocation in the form of NIA (Notice Inviting Application) had been issued on 29th July, 2013. Accordingly, GIPCL which is ONGC's partner for UCG venture has submitted a fresh application on 21st August, 2013.

Current Status of Vastan Mine Block:

The issue of Mining Lease for the block is awaited. The Pilot construction and erection of surface facilities shall be taken up only after the allocation of the Vastan Mine block.

Status of other UCG Sites:

In parallel action, other sites have been taken up for studying their suitability for UCG. ONGC and Neyveli Lignite Corporation Limited (NLC) jointly identified Tadkeshwar in Gujarat and Hodu-Sindhari& East Kurla in Rajasthan. One more site was also jointly identified by ONGC & Gujarat Mineral Development Corporation Ltd, Gujarat (GMDC) viz. Surkha in Bhavnagar Distt., Gujarat. The data of all the fields have already been analysed for evaluating the suitability of these sites for UCG and all the sites have been found suitable for UCG. These projects will be taken up on the basis of learning curve from Vastan project.

Laying of Crude Oil Pipeline

Drilling Operation

Investor's Pick for Hydrocarbon Industry

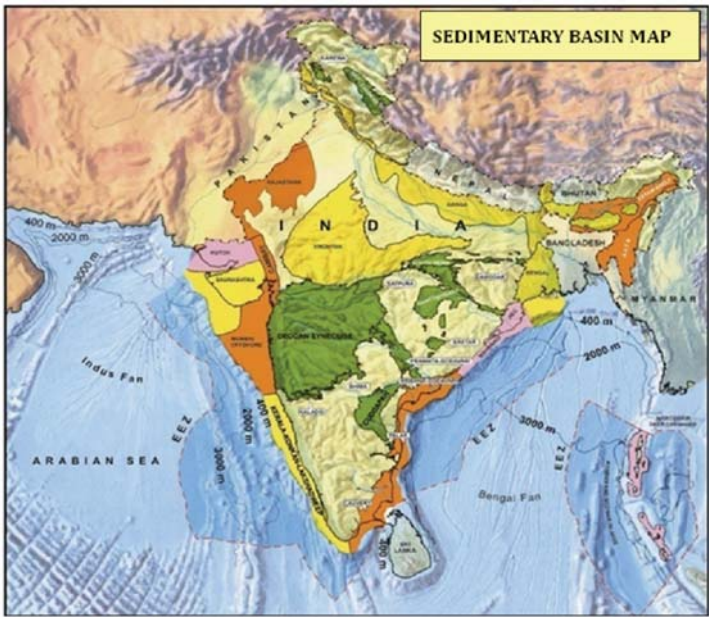
INVESTOR'S PICK FOR HYDROCARBON INDUSTRY

Keeping in view the growing requirement of energy in the country, Government of India has adopted multi-pronged strategy for giving momentum to exploration and production in the country. The major initiatives taken in this regard are:

6 POLICY INITIATIVES

6.1 RE-ASSESSMENT OF PROGNOSTICATED HYDROCARBON RESOURCES OF INDIA

The conventional hydrocarbon prognosticated resources in 15 sedimentary basins along with deep water areas of the country are of the order of over 28 Billion Tonnes of Oil and Oil Equivalent of Gas which was estimated before NELP. During the course of implementation of work program in Pre-NELP Blocks, NELP Blocks, nominations blocks awarded to NOCs and other exploration and production activities, substantial geoscientific data have been generated. To re-assess the hydrocarbon resources of India, Government has constituted a Multi Organization Team (MOT) with updated information on Indian sedimentary basins. The exercise will cover all the 26 sedimentary basins of India. Resource assessment is required to be completed within 30 months.



6.2 MULTI CLIENT GEOSCIENTIFIC SURVEYS

In order to acquire geophysical data in poorly explored and unexplored areas, the Government has formulated a new policy for Geoscientific data generation in Indian sedimentary Basins. GoI on 27.02.2014 and 20.05.2014 has approved the Data Policy and agreement to carry out Non-exclusive Multi-Client Geo-scientific surveys/activities relating to hydrocarbons in Offshore and/or Onland part of India. The offer to undertake such studies through non-exclusive Multi-client Business Model is open throughout the year.

6.3 NATIONAL DATA REPOSITORY

To consolidate and store all the geoscientific data available in the country and to create a base for Open Acreage Licensing Policy, GoI has taken initiative to build National Data Repository (NDR) for Oil and Gas Industry in India. NDR will be built up, populated and operated in a perpetual manner. Once NDR becomes operational, the companies can view Geoscientific data from anywhere in the world and firm up an opinion regarding prospectivity of the blocks prior to bidding for the block. This will enhance the exploration activity in the country. NDR would provide long term storage for future use, ensuring that data retains value in the future. The NDR is being hosted at the DGH office in Noida, India.

6.4 OPEN ACREAGE LICENSING POLICY (OALP)

To make India a favourable destination globally for exploration of oil and natural gas, the Government plans to move to the OALP regime soon. This will enable Upstream companies to bid for any oil and gas block without waiting for the announcement of bidding as currently under the New Exploration Licensing Policy (NELP) regime.

6.5 POLICY FRAMEWORK FOR RELAXATIONS, EXTENSIONS AND CLARIFICATIONS AT THE DEVELOPMENT AND PRODUCTION STAGE UNDER PSC REGIME FOR EARLY MONETIZATION OF HYDROCARBON DISCOVERIES:

The Cabinet Committee of Economic Affairs (CCEA) has approved the proposal regarding relaxations, extensions and clarifications at the Development and Production stage under PSC regime for early monetization of hydrocarbon discoveries. These reform initiatives will help in monetization of some of the pending discoveries, leading to resolution of various long pending operational issues which are hampering E&P operations and create better climate for investment.

The major steps in this line are as follows:

a. Clarity on functioning of Management Committee and scope of review functions

b. Guidelines for evaluation of Declaration of Commerciality (DoC), Field Development Plan (FDP) and well locations

c. Reduction in Minimum Work Program (MWP) in case of blocks overlapping with Special Economic Zone (SEZ), reserve forest, naval exercise areas, Defence Research and Development Organization (DRDO) danger zones, national parks, urban areas, firing ranges of Police/Armed Forces etc.

d. Allowing swapping of 2D seismic survey program under Minimum Work Program with 3D seismic survey program

e. Enabling entry into subsequent exploration phase, after paying cost of unfinished Minimum Work Program of previous phases

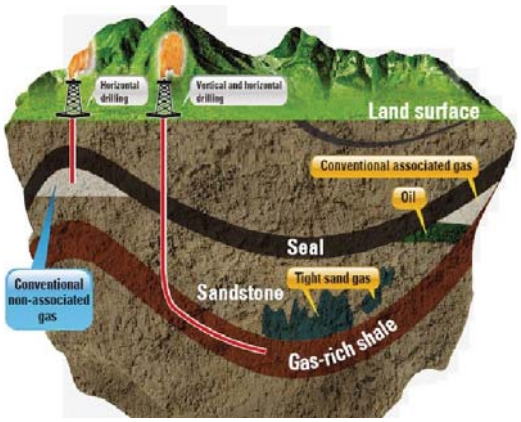
f. Condoning delays in submission of Annual Work Programme and Budget and the Appraisal work program and budget

6.6 EXPLORATION IN MINING LEASE AREAS:

Government of India has formulated a policy to allow exploration in Mining Lease Area with cost recovery subject to establishment of commerciality. This provides a way forward for development of discoveries arising out of further exploration in the Mining Lease area. Existing discoveries, if any, in the ML area which could not be developed or monetized earlier for some reasons, would be allowed to be developed provided that their commerciality and techno-economic feasibility is established at FDP stage.

6.7 POLICY GUIDELINES OF EXPLORATION AND EXPLOITATION OF SHALE GAS AND OIL:

The Government has issued "Policy Guidelines for Exploration and Exploitation of Shale Gas and Oil by National Oil Companies under Nomination regime" on 14th October, 2013. Under this Policy, the right to exploration and exploitation of Shale Gas & Oil will lie with the NOCs holding Petroleum Exploration License (PEL)/Petroleum Mining Lease (PML) granted under the nomination regime.



6.8 SITE RESTORATION GUIDELINES ON PETROLEUM OPERATIONS:

To establish the transparent policies and procedure for abandonment and decommissioning of petroleum operational activities in India towards end of field life, GoI has constituted a committee for formulation of Site Restoration guidelines for petroleum operations.

6.9 STANDING COMMITTEE ON PETROLEUM INDUSTRY PRACTICES:

To identify the areas requiring codification of "Good International Petroleum Industry Practices (GIPIP)" and to prepare national codes for petroleum operations, GoI has constituted a Standing Committee on Petroleum Industry Practices. First report is expected by mid 2015.

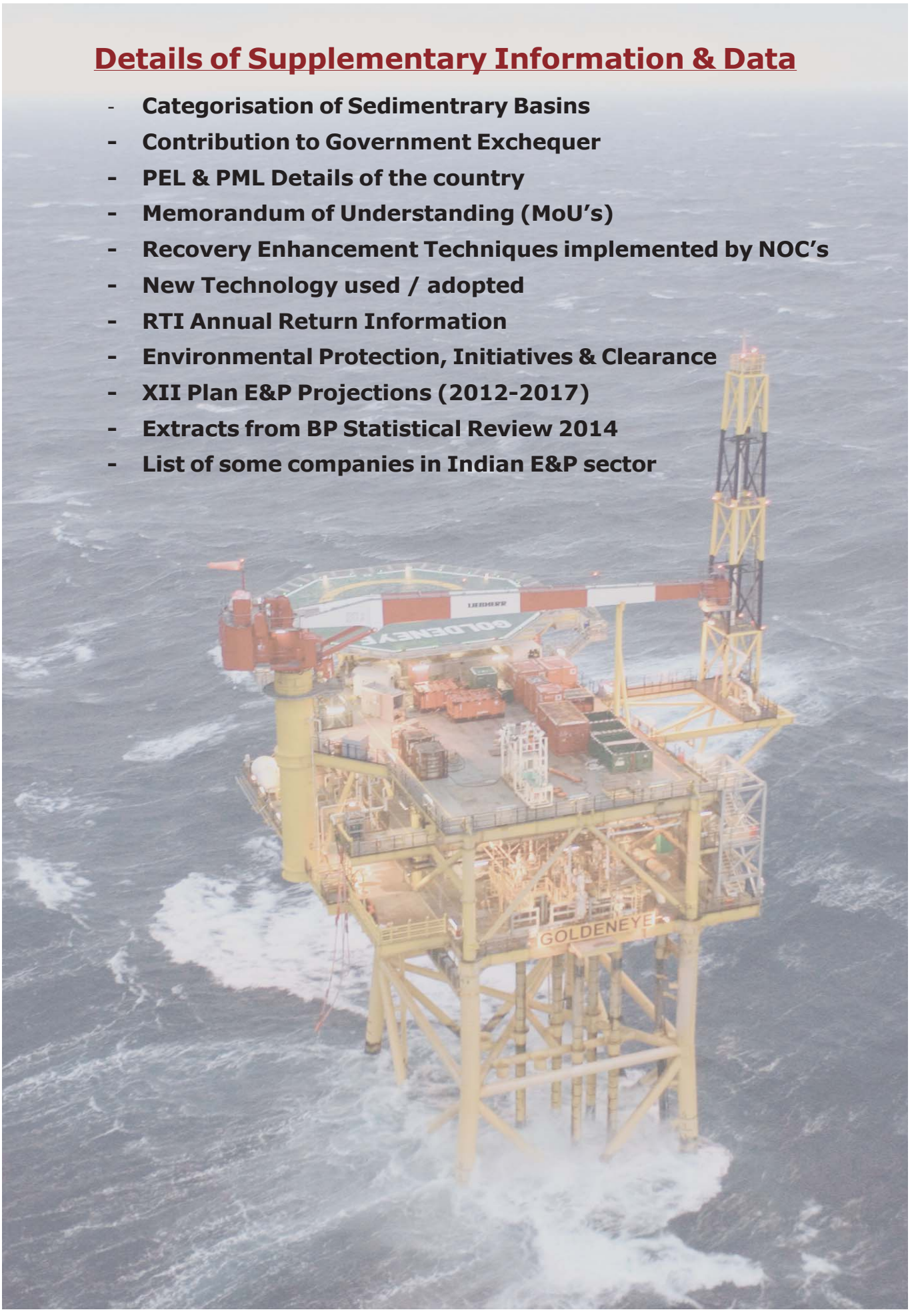
6.10 UNIFORM LICENSING POLICY:

Government of India is considering Uniform Licensing Policy (ULP) to facilitate exploration and exploitation of both conventional and unconventional hydrocarbon resources together, in an awarded block.


Supplementary
Information
& Data

Details of Supplementary Information & Data

- Categorisation of Sedimentrary Basins
- Contribution to Government Exchequer
- PEL & PML Details of the country
- Memorandum of Understanding (MoU's)
- Recovery Enhancement Techniques implemented by NOC's
- New Technology used / adopted
- RTI Annual Return Information
- Environmental Protection, Initiatives & Clearance
- XII Plan E&P Projections (2012-2017)
- Extracts from BP Statistical Review 2014
- List of some companies in Indian E&P sector



DETAILS OF SUPPLEMENTARY INFORMATION & DATA

7.1 CATEGORISATION OF SEDIMENTARY BASINS

So far, 26 basins have been divided into four categories based on their degree of hydrocarbon prospectivity.

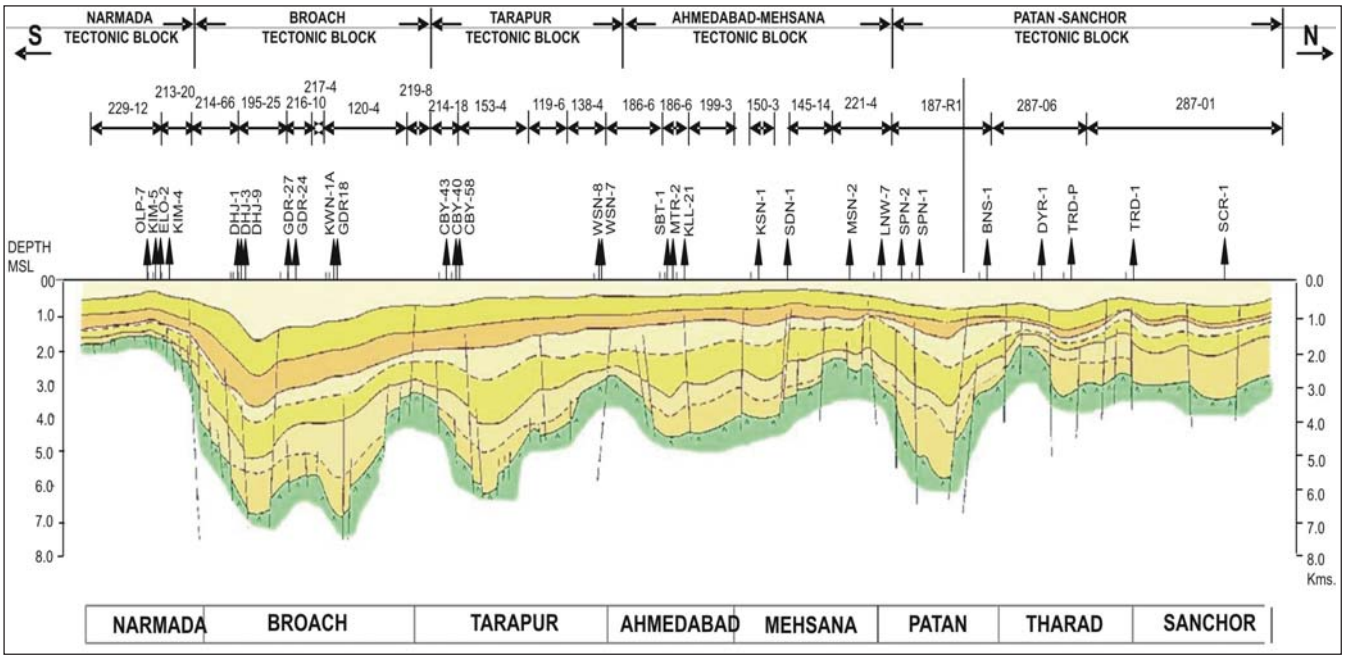
Category – I Basins: Basins with established commercial production. There are seven such basins:

(i) Cambay Basin:

The Cambay rift Basin, a rich Petroleum Province of India, is a narrow, elongated rift graben, extending from Surat in the south to Sanchor in the north. In the north, the basin narrows, but tectonically continues beyond Sanchor to pass into the Barmer Basin of Rajasthan.

The evolution of the Cambay basin began following the extensive outpour of Deccan Basalts (Deccan Trap) during Late Cretaceous covering large tracts of western and central India. It is a narrow half graben trending roughly NNW-SSE filled with Tertiary sediments with rifting due to extensional tectonics. Seismic and drilled well data indicate a thickness of about 8 km of Tertiary sediments resting over the Deccan Traps. Cambay basin is Intracratonic rift graben and it is bounded by well demarcated basin margin step faults. Based on the cross trends, the basin has been divided into five tectonic blocks. From north to south, the blocks are:

- Sanchor – Tharad
- Mehsana – Ahmedabad
- Cambay – Tarapur
- Jambusar – Broach
- Narmada Block.



The Early Tertiary sediments ranging in age from Paleocene to Early Eocene represent syn-rift stage of deposition that was controlled by faults and basement highs in an expanding rift system.

Thick Cambay Shale has been the main hydrocarbon source rock in the Cambay Basin. Transgressive shales within deltaic sequences provided a good cap rock. The peak of oil generation and migration is understood to have taken place during Early to Middle Miocene.

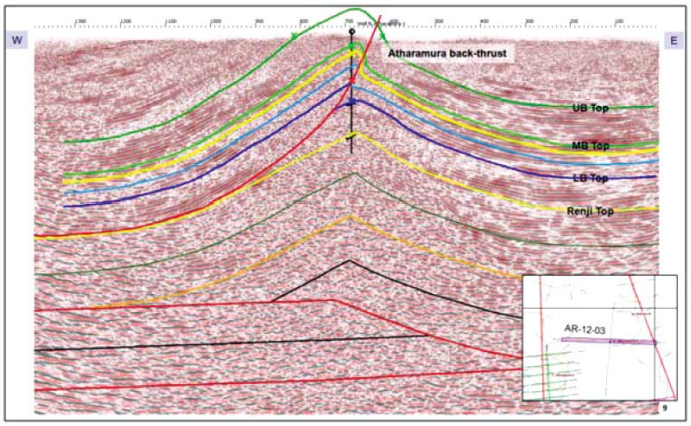
Structural Highs and fault closures & Stratigraphic traps (pinchouts / wedgeouts, lenticular sands, oolitic sands, weathered trap etc.) in Paleocene to Miocene sequences have proved as important plays in Cambay Basin. The Cambay Shale has the potential for both Shale Oil and Shale Gas.

(ii) Assam shelf and (iii) Assam-Arakan fold belt basins:

The Assam shelf and Assam -Arakan fold belt is situated in the North-Eastern part of India.

Major tectonic elements of the basin are:

- Assam Shelf
- Naga Schuppen belt
- Assam-Arakan Fold belt



The Assam shelf and Assam-Arakan fold belt is a shelf-slope-basinal system. The shelf part of the basin spreads over the Brahmaputra valley and the Dhansiri valley, the latter lying between the Mikir hills and the Naga foothills.

Sedimentary sequences ranging in age from Late Mesozoic to Cenozoic are exposed in the Assam shelf and Assam-Arakan fold belt Basins.

The Assam shelf and Assam-Arakan fold belt basins witnessed two major phases of tectonic development. It developed as a composite shelf-slope-basinal system under a passive margin set-up during the period from Early Cretaceous to the close of Oligocene. During the post- Oligocene time, however, different parts witnessed different evolutionary trends, mostly under compressive tectonic forces.

All the oil and gas fields, discovered till date in the Upper Assam shelf, are situated mostly on the south-eastern slope of the Brahmaputra arch.

The important source rock sequences occur within the argillaceous Kopili Formation and Disang Shale (Eocene) and in the Coal-Shale Unit of the Barail Group (Oligocene). The reservoir rocks constitute sands within Barail Main Sand, Barail Coal Shale, Tipam and Girujan Clay formations. The basin has been assessed to have potential for Shale Oil and Shale Gas also.

(iv) Mumbai Offshore Basin:

Mumbai offshore is a pericratonic rift basin situated on western continental margin of India. Towards NNE it continues into the Surat depression. It is bounded in the northwest by Saurashtra peninsula, north by Diu Arch. It's southern limit is marked by east west trending Vengurla Arch to the South of Ratnagiri and to the east by Indian craton.

The age of the basin ranges from Late Cretaceous to Holocene with thick sedimentary fill ranging from 1100-5000 m. Though possibility of occurrence of Mesozoic syn-rift sequences in the deep-water basin have been indicated by the recently acquired seismic data by GXT, it needs to be ascertained by future studies.

Five distinct structural provinces with different tectonic and stratigraphic events can be identified within the basin viz. Surat Depression (Tapti-Daman Block) in the north, Panna-Bassein-Heera Block in the east central part, Ratnagiri in the southern part, Mumbai High-Platform-Deep Continental Shelf (DCS) in the mid western side and Shelf Margin adjoining DCS and the Ratnagiri Shelf.

There are three major depocenters in the basin viz. Surat Depression in the north, Shelf Margin in the west and Central and Vijayadurg Grabens in the south.

Several large oil & gas fields have een discovered in this basin and the presence of hydrocarbons has been established in the multiple pay zones belonging to L-III limestone reservoir of Miocene age (only in Mumbai High), Mukta (Early Oligocene), Bassein (Middle Eocene), Panna (Paleocene to Early Eocene) reservoirs and Daman (Early Miocene - Late Oligocene) & Mahuva (Early Oligocene) formations in Tapti Daman block.

Shale encompassing the coarser clastic facies in the Paleocene section, widespread transgressive shale overlying the Middle Eocene Bassein Formation, alternation of shale and tight limestone over early Oligocene Mukta Formation, widespread intervening shale layers within Early Miocene Mumbai Formation over Mumbai High and in DCS area, post Middle Miocene clay/claystone of Chinchini Formation over parts of Heera etc. had provided effective seal for the underlying hydrocarbon accumulations in the Mumbai offshore basin.

Mumbai offshore basin has been endowed with a wide variety of entrapment situations like- structural closures with independent four way closures, fault closures and faulted closures with effective fault sealing, strati-structural features like Paleogene wedges against rising flanks of paleohighs, mud mounds, carbonate build-ups, unconformity controlled traps, Paleogene and Neogene carbonate wedges against the rising Eastern and Jaygad Homoclines.

(v) Cauvery Basin:

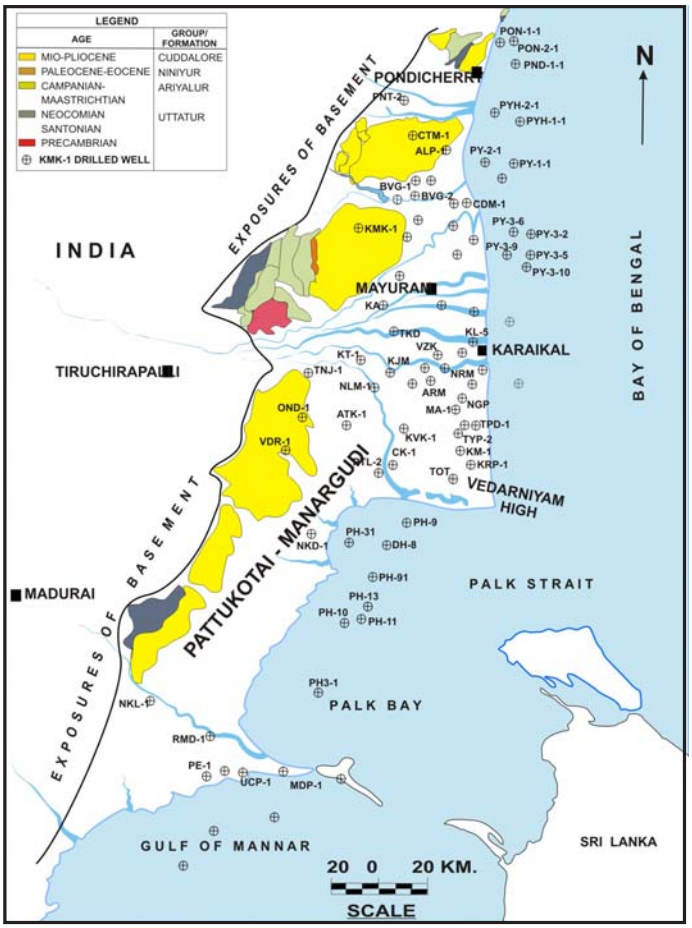
The Cauvery Basin extends along the East Coast of India. Cauvery basin is an intra-cratonic rift basin.

The Geological history of the Cauvery Basin began with the rejuvenation of rifting, i.e., creation of a new rift basin during Late Jurassic and Early Cretaceous times.

Evolution of the Cauvery Basin is understood to have taken place through three distinct stages-

- Late Jurassic - Early Cretaceous Rift and basinal deepening.
- Late Cretaceous-Horst and Graben formation, regressive cycles and Syn-rift deposition
- Post Cretaceous - upliftment ,erosion, basinward tilting and transgression and regression cycles.

The Cauvery Basin is rift basin, divided into a number of sub-parallel horsts and grabens, trending in a general NE-SW direction. The basin came into being as a result of fragmentation of the Gondwana land during drifting of India-Sri Lanka landmass system away from Antarctica/ Australia continental plate in Late Jurassic/Early Cretaceous. The initial rifting caused the formation of NE-SW horst-graben features. Subsequent drifting and rotation caused the development of NW-SE cross faults. The basin is endowed with five to six kilometres of sediments ranging in age from Late Jurassic to Recent (mainly thick shale, sandstone & minor limestone).



Play types:

- Structural and combination traps in Early Cretaceous to Paleocene sequences.
- Stratigraphic traps such as pinch-outs/wedge-outs and lenticular sand bodies in Early to Late Cretaceous sequences.

Source : Sattapadi Shale within Cretaceous– main source Kudavasal Shale within Cretaceous Basal part of Kamalapuram Formation (Paleocene).

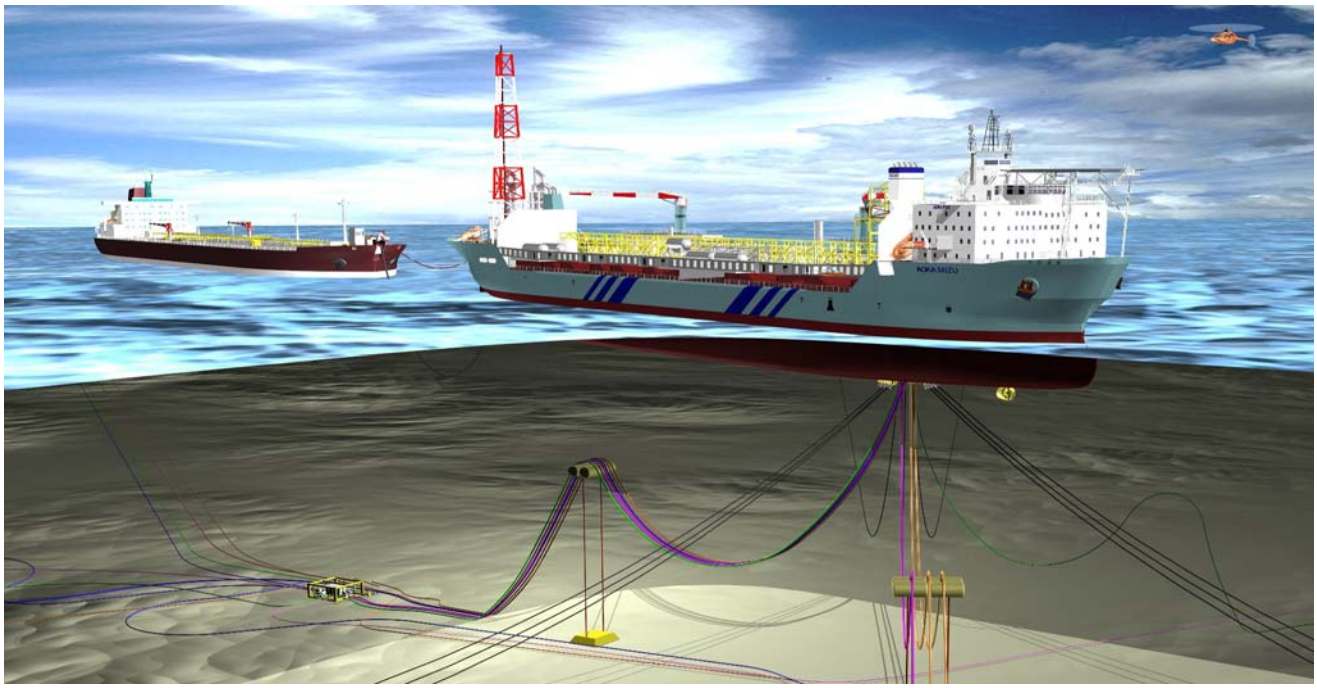
Reservoir : Andimadam, Bhuvanagiri & Nannilam formations within Cretaceous, Kamlapuram and Niravi Formations within Paleocene and Precambrian Fractured Basement

Cap Rock : Sattapadi shale, post unconformity shales like Kudavasal and Kamlapuram.

Entrapment: Structural/ Stratigraphic, Combination traps.

(vi) Krishna Godavari Basin :

Krishna Godavari Basin is a Continental passive margin peri-cratonic basin, located on the East coast of India. The basin came into existence following rifting along eastern continental margin of Indian Craton in Early Mesozoic. The down to the basement faults which define the series of horst and grabens cascading down towards the ocean are aligned NE-SW along Precambrian Eastern Ghat trend. The geological history comprises of following stages:



- Rift Stage
- Syn Rift Stage
- Drift Stage
- Late Drift Stage

The five major tectonic elements of the basin are- Krishna Graben, Bapatla Horst, West Godavari Sub-basin, Tanuku Horst and East Godavari sub- basin. In the north-western and western margins of the basin, outcrops of Achaean crystallines and sediments ranging in age from Late Permian to Pliocene are present. However, major part of the basin is covered by alluvium/sea.

Four distinct depositional systems have been recognized in Krishna Godavari basin. These are - Godavari delta system, Masulipatnam shelf slope system and Nizampatinam shelf slope system and Krishna delta system.

The thickness of the sediments in Krishna Godavari basin ranges from 2500 to 5000+ m. Controlling factor of the thick pile of sediments is presence of long linear Gondwana rift valley. Palaeontological evidences suggest a period of slow sedimentation and subsidence but changes in water depth during deposition.

Krishna-Godavari basin is a proven petroliferous basin with commercial hydrocarbon accumulations in the oldest Permo-Triassic Mandapeta Sandstone onland to the youngest Pleistocene channel levee complexes in deep water offshore. The basin has been endowed with four petroleum systems, which can be classified broadly into two categories viz. Pre-Trappean and Post-Trappean in view of their distinct tectonic and sedimentary characteristics. Seismic imaging of Pre-Trappean section poses problems in terms of data quality.

(vii) Rajasthan Basin :

Rajasthan Basin forms the eastern flank of Indus Geosyncline and comprises the sedimentary tract to the west and northwest of Aravallis upto Indo-Pakistan border. This pericratonic basin also forms a part of the Great Thar Desert ranging in age from Cambrian to Recent.

The tectonic evolution of Rajasthan basin took place in four distinct phases corresponding to

- Precambrian - Triassic plate movement
- Breaking of Indian plate from southern continent during Jurassic
- Collision of Indian plate with the Asian plate from Eocene onwards
- Uplift of Sind-Baluchistan fold belt resulting in filling up of the Indus shelf

The Rajasthan basin has been divided into three sub basins, separated from each other by Basement ridges/faults. These sub basins are :

- Barmer-Sanchor : Tertiary basin
- Bikaner-Nagaur : Paleozoic basin
- Jaisalmer : Mesozoic & Cenozoic basin

Barmer-Sanchor sub-basin

Prominent tectonic elements in this sub-basin are : Devikot-Nachna Uplift with Fatehgarh Fault which marks the northern limit and an east-west trending Tharad Ridge marks the southern limit while separating it from Cambay Basin. Another cross trend along Sarnu Hill Fault divides Barmer-Sanchor Sub-basin into Barmer Depression in the north and Sanchor Depression in the south.

Bikaner-Nagaur sub-basin

The Bikaner-Nagaur sub-basin is an intracratonic basin with the major tectonic element trending in an almost east-west basement ridge, 'the Bikampur Arch.

The Pokhran High separates the Bikaner-Nagaur Sub-basin from Jaisalmer Sub-basin. The 2500 m sedimentary thickness varies from Lower Cambrian to Recent. The Karampur/Badhaura Shale, Upper Carbonate Dolomites, Bilara Shales and Dolomites act as the main source rock of the sub basin. The reservoir formations are mainly Upper Carbonate Dolomites, Nagaur Sandstone, Jodhpur Sandstone and Bilara Dolomites. Moderate to high basement-controlled anticlinal structures and fault closures act as the primary entrapments.

Jaisalmer sub-basin is Pericratonic Basin which is divided into 3 depressions:

- Shahgarh Depression
- Kishangarh Shelf
- Miajlar Depression

The Devikot-Nachna uplift separates Jaisalmer Sub-basin from Barmer-Sanchor Sub-basin. The 5000m sediments in Jaisalmer sub basin ranges from Lower Cambrian to Recent. The Lower Goru, Pariwar, Sembar/Badesar-Baisakhi Shale, Karampur/Badhaura Formation Shale, Bilara Shales and Dolomites are the main source of this sub basin. Reservoirs are the fractured limestones of the Jaisalmer Formation, Lower Bandah Limestone/Khuiala Limestones. Anticlinal closures, Fault related closure/traps, unconfirmity related traps viz., Wedge outs, Lithostratigraphic traps act as the entrapments.

The Western Rajasthan Shelf which forms an integral part of Indus Basin, originated during Pre-Cambrian period. The sediments range in age from Late Proterozoic to Recent with intermittent transgressions and regressions. The Barmar-Sanchor basin, at present, is the biggest producer of hydrocarbons among Indian onland basins.

Category – II Basins: Basins with known accumulation of hydrocarbons but no commercial production as yet. There are three such basins:-

(viii) Kutch Basin :

Kutch Basin forms the north-western part of the western continental margin of India and is situated at the southern edge of the Indus shelf at right angles to the southern Indus fossil rift (Zaigham and Mallick, 2000). It is bounded by the Nagar- Parkar fault in the North, Radhanpur-Barmer arch in the east and North Kathiawar fault towards the south.

The basin is filled up with approx. 1550 to 2500m of Mesozoic sediments and 550m of Tertiary sediments in onland region and upto 4500m of Tertiary sediments in offshore region.

Kutch Basin is contiguous to the hydrocarbon-producing Cambay Basin in the east and southeast, Mumbai Offshore Basin in the south, and the South Indus Basin of Pakistan in the North, where several discoveries of oil and gas have already been made.

The evolution of the western continental-margin basins of India is related to the breakup of eastern Gondwanaland from western Gondwanaland in the Late Triassic/Early Jurassic and the subsequent spreading history of the Eastern Indian Ocean. Kutch basin is the earliest rift basin that initiated as a result of north and northeast drifting coupled with counter clockwise rotation of the Indian plate after its detachment from the Gondwanaland during Late Triassic/or Early Jurassic.

The opening of the Kutch basin to the north of Saurashtra peninsula coincided with the transgressive phase of the sea onto the coastal areas of other parts of Gondwanaland including the western margin of Indian plate during Jurassic-Cretaceous time.

The basin formed the site for westerly deepening epi-continental sea, probably an extension of the Tethys, in which thick pile of sediments, ranging in age from Middle Jurassic to Early Cretaceous, were deposited in shallow marine to deltaic environments. The sediments were deposited in two major cycles - a Middle Jurrasic transgressive cycle and a Late Jurassic-Early Cretaceous regressive cycle.

The structural style of the basin is unique. In the onland part of the basin it is distinguished by highlands that are the area of uplifts and plains that are the areas of depressions between the uplifts.

The uplifts are oriented east-west along five principal faults: -

i. The Nagar Parkar fault
ii. The Island Belt fault
iii. The South Wagad fault
iv. The Kutch Mainland fault
v. The North Kathiawar fault

The most striking feature of the basin is the occurrence of meridional high in the middle of the basin. This First Order Median High controlled the facies and thickness of the sediments.

The stratigraphic succession, ranging in age from Middle Jurassic to Holocene, is exposed in the highlands of the Kutch Basin. Sediments were laid down on a Precambrian granitic basement exposed only in the eastern part of the Nagar Parker-Tharad ridge, which forms the northern limit of the basin.

Kutch Basin is contiguous to the hydrocarbon-producing Cambay Basin in the east and southeast, Mumbai Offshore Basin in the south, and the South Indus Basin of Pakistan in the North, where several discoveries of oil and gas have already been made.

(ix) Mahanadi-NEC Basin :

The Mahanadi-NEC basin, a product of rifting and break up of Gondwana Land is situated on the East Coast of India. The onland part of the basin is limited to north west and west by Pre-Cambrian outcrops belonging to the Indian crystalline Shield. Towards northeast, it merges into North East Coast region (NEC) with Bengal Basin lying further northeast. Onshore Mahanadi Basin is located in the State of Orissa. Geographically, the shallow offshore part of the basin lies off the coast of Andhra Pradesh and Orissa. The 85 degree East Ridge occurring to the south of Lake Chilka forms the approximate south-western limit of the basin. Subsequent to Late Oligocene/Miocene period, Mahanadi-NEC area is so greatly influenced by Bengal deltaic sedimentation system that it's north-eastern boundary with Bengal Basin becomes obscure.

Mahanadi-NEC basin onshore and most significantly the offshore part is endowed with a good combination of source and reservoir facies with potential entrapment situations. The deep offshore part of the basin with the characteristic sediment induced tectonics coupled with the envisaged good reservoir and source facies holds good exploration interest.

(x) Andaman Nicobar Basin :

The Andaman-Nicobar basin is located in the southeastern part of the Bay of Bengal. The Andaman-Nicobar basin represents a typical Island arc system. The basin came into existence as a result of the northward movement and anticlockwise rotation of the Island Plate and it's under thrusting under the Asian plate in Cretaceous. As subduction progressed, the Outer High Arc complex started rising steeply, thereby creating a depression or a Fore Arc basin between Volcanic Arc and the Outer High Arc. Continued thrusting caused uplift and formation of the Andaman Nicobar Ridge as a chain of Islands. The Andaman chain of islands form a part of geotectonic regime; " The Great Indonesian Island Arc System" of the East Indies and it extends upto Burmese Arc i.e. Arakan Yoma fold belt. It is more than 5000 km in length.

A complex system of short spreading rifts and transforms in the central part of the Andaman Sea led to the spreading, with an opening rate of 3.72 cm/yr, since Oligocene. Rifting and extension during Middle Miocene - Early Pliocene followed by sea-floor spreading during since 4 Ma bring out the tectonic evolution of the Back Arc basin. The Back Arc and Fore Arc basin of Andaman contain 7500 m of sediments ranging in age from Late Cretaceous to Recent. The sediments range from fluvio-deltaic through shallow to deep marine including carbonate reefs and clastics

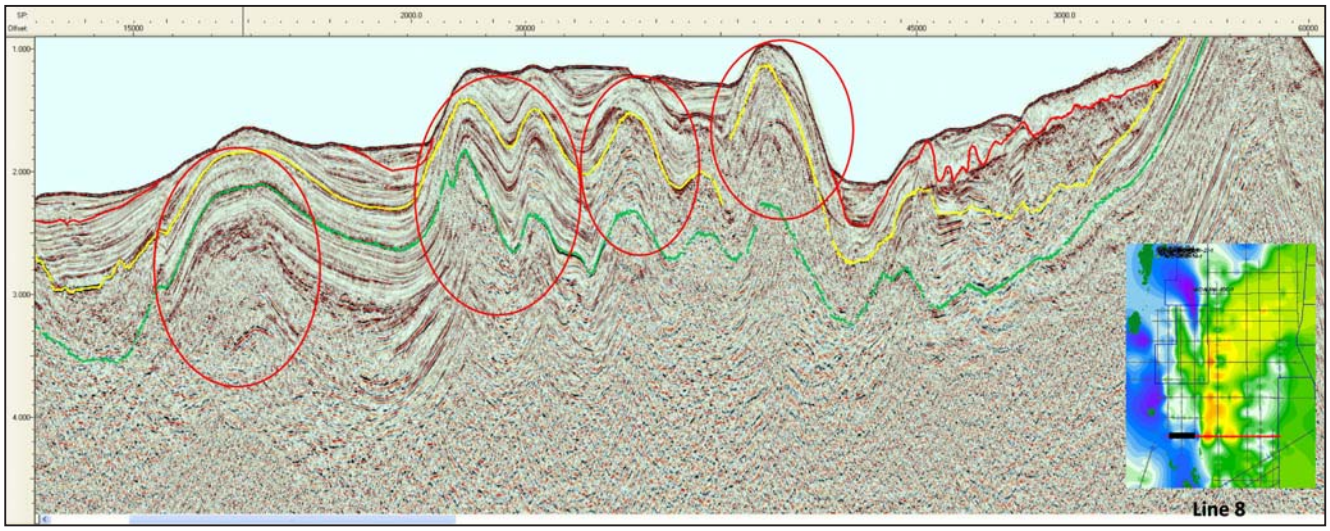
Major Tectonic elements of Andaman-Nicobar region are:

- Andaman Trench/Inner slope
- Outer High/Trench slope break
- Fore Arc Basin
- Volcanic Arc
- Back Arc Basin
- Mergui Terrace

Tectono-sedimentation studies carried out suggest presence of various petroleum systems in Andaman basin :

- Deeply buried thermogenic system in a ponded fore arc.
- Thermally induced petroleum system around the volcanic arc and
- Biogenic/shallow gas system

Basins associated with convergent plate margins are known to have good hydrocarbon potential given sufficient organic carbon content and thermal maturity. The Andaman-Nicobar basin belongs to this category. Mud volcanoes with associated oil and gas are reported from the outcrops of the Baratang Formation over the Middle and South Andaman.



Sedimentary packages, specially in the Fore Arc basin, comprise strata of fluvial, shelf and deep marine regime. Accumulation of significant organic matter is considered a strong possibility. Possible reefal growths within the Neogene section, further enhance the scope of enrichment of organic matter. Proximity of the Fore Arc basin to the Volcanic arc is likely to ensure optimum heat flow for hydrocarbon generation.

The most favorable source rock in the basin appears to be the Baratang Formation of the Late Cretaceous-Late Eocene age, comprising of shale, silt, sand, carbonaceous shale, limestone with minor anhydrite and gypsum deposited in bathyal to shallow marine and open to restrictive euxinic environments. The Pre-Neogene section in well AN-1-1 indicated presence of rich organic matter. The Baratang Formation is in the early phase of maturation and lies within the principal phase of oil generation up to 5,000 m.

Port Blair Formation, which is the main reservoir facies in the basin, shows variable properties. Over the Andaman Islands, the reservoir rock is conglomeratic and pebbly at places, with alternating silty sand and shale or fine to medium grained massive sand stone at other places. Sandstone reservoirs appear to be restricted to the Middle Miocene. Drilling results indicate that the main reservoir is Carbonate. The major Carbonate platform shoal provinces of the Middle and Lower Miocene were generally located in periphery of the Central Uplift. The Paleogene section in the outcrops of the Outer High and in the subcrops of the Fore Arc basins and Inner Slope contains turbidite deposits. The presence of carbonate deposits at higher stratigraphic levels are associated with development of reefal characters in the Sumatra Fore Arc region.

In the Andaman-Nicobar basin, the inner slope has not been probed by much of exploratory drilling so far. A large number of anticlinal structures within the Cretaceous-Oligocene sequence with fairly good source and reservoir facies, form excellent entrapment conditions.

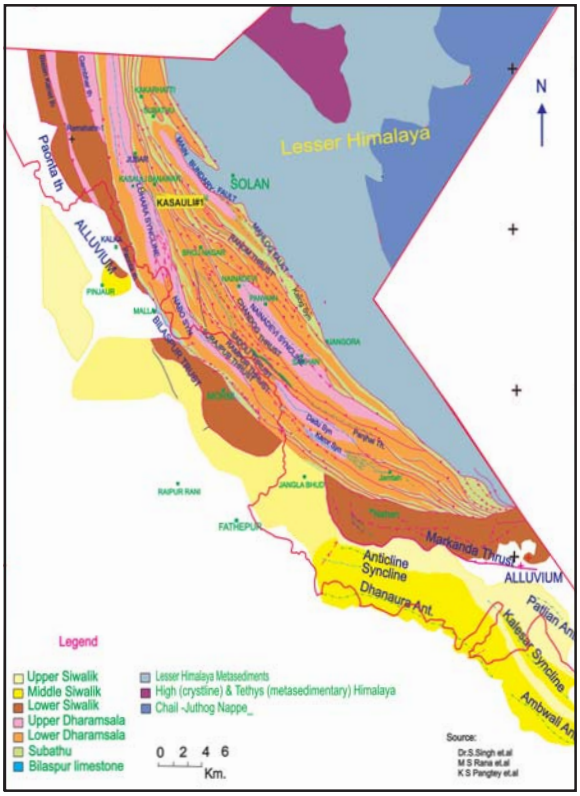
To the east of south Andamans, onlapping sedimentary sequences over the slope of magmatic arc provide ideal entrapment conditions for accumulation of sizeable hydrocarbons deposits. Porous facies in the carbonate section of Neogene is well developed in the northern part of Andaman Fore Arc basin. Southward extension of this element harbours large oil/gas fields in northern Sumatra (Arun gas field). Occurrence of fairly large anticlinal structures provides suitable entrapment conditions for hydrocarbon accumulation.

In the invisible bank area, the onlapping sedimentary sequences on the flanks are ideal locales for pinchout/wedgeout features favouring entrapment.

Anticlinal/Fault related structures are the principal type of traps for accumulation of hydrocarbons – primarily gas in Post Oligocene sediments. Stratigraphic traps like pinchouts, wedgeouts, reefs, turbidites etc. are considered to be potential traps for hydrocarbon accumulations.

Category - III Basins: Basins having hydrocarbon shows that are considered geologically prospective. There are six such basins:

(xi) Himalayan Foreland Basin :



Himalayan Foreland basin is a NW-SE aligned basin located in the NW Himalayan Foothills region. The basin borders with Pakistan to the NW and Nepal to the SE. Northern and southern limits are demarcated by terrain defining faults namely, the Main Boundary Thrust (MBT) and the Himalayan Frontal Fault (HFF).

The Himalayan Foreland is an area in which sequences of the order of 10 km thickness have accumulated. The oldest of these sequences date back to the Palaeocene-Eocene time. The Himalayan Foreland is the product of tectonic processes that have been taking place in the orogenic belt in the Cenozoic Era. Deformation and sedimentation are both active processes in the Himalayan Foreland.

The basin started with a shallow marine environment which changed to estuarine and deltaic with time. By Mid-Miocene, continental sedimentation marked by fluvial environment dominated the scene and this set-up has continued to the Recent with minor modifications.

Subathu sediments are believed to be source rocks of hydrocarbon in this basin. The limestones in the exposures are jointed and fractured and these can act as potential reservoirs in subsurface. Sandstones of Subathu, Dharmsala/Murree and Siwalik can be good potential reservoirs in the basin. Traps of two main types, structural and combination are likely to be present in this basin. The chances of structural entrapment in the subthrust block are considerably high, where the deformation was continuing with the accompanying possible thermal maturation of source rocks and generation of hydrocarbons.

(xii) Ganga Basin :

The Ganga Basin initially came into existence during Mesoproterozoic in an extensional phase and subsequently changed over to a peri-cratonic setup. The basin has a three stage structure with the lower two stages comprising Mesoproterozoic and Early Paleozoic sequences, a northern continuation of the Vindhyan Basin - an interior sag basin (Precambrian to Lower Devonian age), overlain by an upper stage comprising the Himalayan foredeep basin filled with molasse type of deposits of Neogene age.

The Ganga Basin is defined by the extent of the Vindhyan sediments below the Tertiary cover, and as such the basin is limited to the west by the Delhi-Kalka-Simla Ridge and to the east by Mongyr-Saharsa Ridge. The overlying Tertiary cover, however, extends far beyond the subsurface limit of the Vindhyans in the Ganga Basin, both to the west and to the east. In the west the Tertiary cover directly overlies the Precambrian basement in the Punjab shelf, and in the east, it directly overlies Gondwana sequence in Purnea Basin.

(xiii) Kerala-Konkan Basin :

Kerala-Konkan offshore basin forms the southern part of the western continental margin of India and extends from Goa in the north to Cape Comorin in the south. Westward, the basin extends to Arabian Abyssal plain. On the eastern side it is bounded by peninsular shield.

The basin evolved through early rift and post rift phases and contains more than 5 km of Cretaceous to Recent sediments.

The sedimentary sequence is comprised of Mesozoic and Tertiary sediments. A series of regional and local horsts and grabens resulted in response to rifting along the dominant basement tectonic trends. The deposition started with continental environment, changed gradually to paralic and finally to pulsating marine conditions, punctuated by basic lava flows (Deccan Trap) in the terminal stages towards the end of Cretaceous and Early Palaeocene. Towards the end of the early rift phase, most of the rift related grabens and horsts, located in the deeper parts were covered up with sediments and the continental margin became less intricately differentiated. The Deccan Traps (Cretaceous – Early Palaeocene) form the technical basement of the Tertiary Basin.

The source rock is mainly Palaeocene to Eocene shales. Palaeocene to Middle Eocene shales, have fairly high TOC content mainly of type II and III organic matter, and are thermally mature. Eocene to Middle-Miocene carbonates & Palaeocene to Middle Miocene sandstones are the possible reservoirs of Kerala-Konkan. The slope basin transition zone, particularly in front of the major shelfal depressions, is favorable for development of turbidite reservoirs in deep-sea fan complexes. Eocene to Middle Miocene Limestone Bands serve as the cap rock in this basin. The accumulations are mostly related to horst blocks, shale tectonics, normal anticlines, and strati-structural unconformity controlled entrapments. Basement highs in the shelf margin are the sites of carbonate buildup at several places. Pinchouts of Paleogene sequence and wedgeouts against Vengurla arch are also acting as trap.

The depositional models of the initial post-rift and late post-rift phases of basin evolution, suggest that Kerala-Konkan Basin holds promise for hydrocarbons.

(xiv) Saurashtra Basin :

Saurashtra Basin is located in the northern part of western continental margin of India which trends NNW-SSE. The onland part of the basin is also known as Saurashtra Peninsula. This basin lies north of Mumbai Offshore and south of Kutch basin. The onland part of the basin borders with the Cambay Basin on its eastern flanks. The deeper offshore Saurashtra borders with the Indus fan (to the abyssal plain of the Arabian Sea).

The oldest Phanerozoic rocks in this basin are the Mesozoic rocks exposed in the north eastern part (Dharangdhara Formation) of this basin. However major part of the Saurashtra Basin (both onland & offshore) is covered by Deccan Traps which have hindered the exploration of Mesozoic hydrocarbon targets. Rocks of Early Cretaceous are exposed in the onland part of the Saurashtra Peninsula (north eastern part of the basin). The Tertiary sedimentary sequences consisting dominantly of carbonates and fine grained clastics overlying the Deccan Trap Volcanics in the shelfal region have been explored for hydrocarbon prospectivity.

(xv) Vindhyan Basin :

The Vindhyan basin is a Proterozoic intracontinental basin that developed in the central part of the Indian shield along with several other basins such as Cuddapah, Chattisgarh, etc. The strata are exposed in three major sectors: Son valley, Bundelkhand and Rajasthan. Substantially thick Vindhyan rocks have also been recognized under the Gangetic alluvium.

The Vindhyan Basin, containing more than 5000 m thick sequence of sandstones, shales and limestones, extends into the Ganga valley in the north and northeast beneath the Tertiary sediment of the Himalayan foredeep. In the southwest, the Vindhyan rocks are covered by Deccan volcanics.

The basin is bounded by the Son-Narmada geofracture in the south, the Great Boundary Fault in the west, the Monghyr-Saharsa Ridge in the east, and the Bundelkhand Massif and Indo-Gangetic Plains in the north. Bundelkhand Massif divides this basin into two parts – the Son Valley on the south-eastern side and the Chambal Valley.

Surface gas shows in the northeastern part of Jabera and numerous gas shows observed during drilling and testing of well Jabera-1, suggest that hydrocarbons have been generated in this basin. Presence of suitable reservoir rocks in Vindhyan sediments and several structural and stratigraphic traps make the hydrocarbon prospects of Vindhyan Basin as moderate to good.

(xvi) Bengal Basin :

Bengal Basin is situated towards the north-eastern part of Indian Peninsula in the state of West Bengal. Towards south the basin extends into the offshore region of Bay of Bengal.

The formation of the Bengal Basin was initiated during Middle-Upper Cretaceous time with differential subsidence. This episode corresponds with the deposition of the subaerial fluvial clastics of the Bolpur Formation and its facies variant of the shell limestone and shale–sandstone of the Ghatal Formation in the shelf area. Proximal deposition of a portion of the orogenic sediment from the eastern Himalaya and the Indo-Burman Uplifts has built a thick sequence of approximately 20km of deposits in the Bengal basin.

Tectonically, Bengal basin had a polycyclic history. From Carboniferous to Upper Eocene it was a divergent margin basin and was initiated as a response to the breakup of the Gondwanaland along the rifted margin of the Indian plate. It depicts all evolutionary characteristics related to marginal sag basins. Indian plate finally got separated from Gondwanaland during Lower Cretaceous, moved northwards and during upper Eocene had first collision with Eurasian Plate in the north and with Burmese plate in the northeast. Since then, Bengal basin attained the status of convergent margin basin.

The basin shows two distinct phases of development :

- Gondwana phase
- Post–Gondwana phase

During the Gondwana phase, non-marine sediments got deposited within a graben oriented in N-S direction. This initial phase of sedimentation was followed by a period of peneplanation and initiation of a general tilt of the shelf towards east. After the outpouring of Rajmahal lavas, an uninterrupted phase of marine sedimentation in a subsiding basin started in Late Cretaceous. Marine inundation covered practically the whole of the basin up to its western margin. A thick sedimentary prism was deposited during Tertiary.

Following are the main tectonic and structural zones identified in the basin :

- Basin Margin Fault Zone
- Shelf Zone
- Hinge Zone
- Deep Basin

Development of carbonate facies (Kalighat Formation) of Eocene marks a relatively quiet and warm period during which subsidence was slow or partially arrested. Subsequent to the deposition of the Kalighat Limestone, a major phase of clastic sediment deposition started. This is attributed to the initiation of collision of the Indian Plate with the Eurasian Plate towards the end of Eocene. This event also marks the beginning of a marked shift in the direction of drainage system from easterly to southerly, consequent upon the emergence of Himalayas. The Oligo-Miocene sedimentation condition was followed by a strong deltaic environment. Early Miocene-Pliocene epoch is characterised by the deposition of a thick succession of sediments brought by the Brahmaputra-Ganga river system as delta fan deposits over the lower shelf-slope system. Hydrocarbon Plays are as under :

Gondwana **:** Entrapment conditions are expected to exist in basement related structures and stratigraphic wedgeouts in the central, northern and southern parts of the Gondwana graben.

Cretaceous and Paleocene :

- Low amplitude structural highs, broadly in a NE-SW trend through Contai–Ghatal-Jalangi–Karimpur areas.
- Growth fault related low amplitude structural prospects in the depositional low in Krishnanagar–Ranaghat area.

Eocene : Eocene shelf edge forms a favourable locale for the development of carbonate reef prospects.

Oligocene : On-lapping reflectors of good continuity and moderate to high amplitude are observed in the seismic sequence corresponding to the Oligocene section. Velocity analysis suggests that these anomalies correspond to sand-shale alternations within Oligocene and can be target for exploration. The wedge out zones are equally interesting for stratigraphic accumulation.

Mio-Pliocene Prospects : Seismic facies analysis and basin modelling (done by ONGC) indicate development of two types of prospects in the Mio-Pliocene section (a) deltaic, and (b) prospect associated with turbidite facies along the shelf–slope area south of Sunderbans.

Category - IV Basins: Basins having uncertain potential which may be prospective by analogy with similar basins in the world. There are ten such basins :

(xvii) Karewa Basin :

The Karewa basin lies in Tethyan zone in the intermontane valley of Kashmir located between Pir panjal Range in the NW and Zanskar range in the SW. The basin rests over the crystallines of the Salkhala Group.

The envisaged petroleum systems in Karewa basin speculates that the Black shale horizons in Khunamuh and Tindira formations, and Dubjian and Rembiara members (Hirpur Formation) could be the potential source.

The Pir Panjal Volcanics and Pindabol Formation could be suitable reservoir rocks.

For the post panjal Volcanics, the Khunamuh-Tindiara formations, and the sandstones of the Karewa Group could be the possible reservoirs.

The Synclinorium and the small intra anticlines, viz. Shamsabari syncline, Riddi anticline, Madamati anticline and the Lidder valley anticline could act as the entrapments. Borehole gas shows had already been noticed in wells drilled for hydrocarbons in Karewa basin. Gas contains 50-90% methane indicating a marshy source. Also, hydrocarbon gas seepages have been reported from the Karewa, though no oil show has been reported till date.

(xviii) Spiti – Zanskar Basin :

The Tethyan Himalaya made up of the Neoproterozoic-Eocene succession resting as detached synclinoria over the Vaikrita Crystalline or its strike equivalents, commonly and loosely termed as Central Crystallines. The main synclinoria often referred to as basins, from west to east are:

- Kashmir
- Chamba-Bhadarwah-Tandi
- Spiti-Zanskar
- Kinnaur-Kumaon
- Nepal
- Sikkim-Bhutan
- Arunachal

The Spiti Valley, located north of the Pir Panjal Range, exposes an excellent section of Neoproterozoic-Cretaceous rocks in the Tethyan Himalaya of Himachal Pradesh. The Spiti Tethyan rocks towards NW through the Lahaul Valley extend into the Zanskar area where Paleocene-Eocene sequences are also preserved.

(xix) Satpura Basin :

The Satpura basin is located south of Narmada River and extends from Jabalpur to Lokartalai, Mohapani. The lower Gondwana sediments are exposed in a board syncline. Most of the lower Gondwana tracts are concealed by the Upper Gondwana sedimentary cappings. The Satpura basin is spindle-shaped and the shape of the basin is governed by the intersection of the three prominent tectonic trends (i) the ENE-WSW fault parallel to the Narmada-Son lineament in the north, (ii) the NW-SE trend confirming to the Dharwar tectonic grain in the west and (iii) the NE-SW trend parallel to the Eastern Ghat tectonic grain.

(xx) Narmada Basin :

Subsequent to the initial stages of Cambay rifting, activation of the ENE-WSW striking Narmada transform fault opened up the western Narmada rift basin. This rift basin extends offshore, south of Saurashtra. The Narmada rifting was restricted in the western part of mega lineament. The coastal basin formed in the Narmada valley region by this rifting was transgressed by Late Cretaceous sea depositing Bagh and Lameta formations over Early Cretaceous Nimar Group.

(xxi) Deccan Syneclise :

The Deccan Syneclise is located in the western and south-central part of India. The main rock exposures in the basin consist of a number of basaltic lava flows which have been poured on to earth's surface during Cretaceous-Paleocene period, blanketing all pre-existing rocks ranging in age from Precambrian to Cretaceous. It is bounded to the north by the Narmada-Son rift (even though the lava spread extends much north of Narmada river) and to the south and east by the Precambrian sediment and Archaean metamorphic exposures. The western limit may be defined as the longitudinal fissures from which the basaltic lava erupted and is marked by a highly increased thickness of Deccan volcanics, even though the Trap is known to extend upto the shelf margin of Bombay Offshore basin.

Recent surveys, carried out by National Geophysical Research Institute (NGRI) for Directorate General of Hydrocarbons (DGH) have revealed the presence of a few sedimentary basins buried under the lava flows. These sedimentary basins and those on its periphery are believed to hold good hydrocarbon prospects.

Gravity data and DSS profiles reveal several rift basins buried below the Deccan Trap. Two rifts, namely, the Koyna rift (northwest continuation of the Kaladgi basin) and the Kurduvadi rift (northward continuation of the Bhima basin) filled up by low density material, were identified from gravity data under the Trap separated by the Sangola uplift.

(xxii) Bhima –Kaladgi Basin :

The NE trending irregularly sinuous Bhima-Kaladgi basins consists dominantly of limestone. It overlies the granitic basement of Eastern Dharwar craton with a profound unconformity and has faulted contacts at many places.

Bhima basin is overlain by Deccan Trap in the north. The sediments have an aggregate thickness of about 297 to 375 mm. The basin is well known for its large reserves of limestone and the newly discovered uranium occurrence near Gogi.

Kaladgi basin is an E-W trending irregular basin underlain by the basement granitoids (Peninsular Gneiss and Dharwar Batholith) of the Dharwar craton in the south and east and overlain by the Deccan Trap in the north. The basin is made of an older Kaladgi sequence and younger Badami sequence. Kaladgi basin is not marginally deformed, as it is not spatially associated either with mobile belt or with terrane boundaries, instead the deformation is concentrated in the centre of the basin . Kaladgi basin hosts vast resources of limestone and dolomite, as well as building and ornamental stones, besides minor iron ore.

Bhima-Kaladagi Basins are the northern extension of Cuddapah Intracratonic Foreland, evolved due to pulses of thermally driven crustal sagging, punctuated by extensional stretching. Being part of Cuddapah palaeoseas, the basin has experienced three cycles of sedimentation equivalent to Kurnool mega sequences indicating gradual deepening of marine basin followed by gradual regression.

Nearly horizontal to low dipping over large areas, the basin has experienced some tectonic disturbances around faults and Deccan Trap junctions. Alternating clastic and chemogenic sedimentary rocks are exposed on both sides of the Bhima River.

Being truly frontier basins, the exploratory activities in Bheema-Kaladgi Basins are yet to begin. Their geological set up and evolutionary history is poorly understood. It is generally believed that these basins developed as interior sags, however, a first order observation is that these may show significant structural differentiation with characteristics lithological assemblage of tuffs and pyroclastic matter indicating a rift origin. Considering vast areal extent but meagre sedimentary thickness, the basins although appears to be discouraging from exploration point of view, but still the mega sequences south of Deccan Synclinse and concealed by traps may be interesting for exploration.

(xxiii) Cuddapah Basin :

The Cuddapah is a crescent shaped, easterly concave and N-S trending basin in the east central part of Dharwar craton. The basin extends for a length of about 450 km along the arcuate eastern margin with a mean width of 150 km.

Cuddapah basin is characterized by quartzite-carbonate-shale cycles having an aggregate thickness that is estimated to vary between 6 and 12 km. The early sediments of the basin are interspersed with basic volcanics and sills. The basin is well known for its mineral potential in the form of limestones and dolomites, bedded and vein barites, chrysotile asbestos and steatite, besides occurrences of base metals, diamond, phosphorite, uranium and abundant building and ornamental stones.

The Eastern half of the basin is metamorphosed and the western half of the basin is undeformed and consists of four sub-basins, the Papaghni, Kurnool, Srisailam and Palnad. The Papaghni and Kurnool sub-basins are geographically interlinked, but were sites of deposition at different times. The Papaghni sub-basin containing lower Cuddapah sediments and the Kurnool sub-basin containing the younger Kurnool sediments overlie the Cuddapah sequence with a major unconformity. Srisailam sub-basin contains upper Cuddapah sediments and Palnad sub-basin exposes only the younger Kurnool sequence. The eastern half of the Cuddapah basin is occupied by the Nalamallai fold belt consisting of upper Cuddapah sediments. Nallamalai fold belt is demarcated from the undeformed western sub-basins by the prominent fault lineament called the Rudravaram Line.

(xxiv) Pranhita – Godavari Basin :

The NW-SE trending Pranhita-Godavari Valley is unique as it preserves about 3000 m thick sediments deposited in a time span of 200 Ma from late Carboniferous/early Permian to Cretaceous. Generalised lithostratigraphic succession of the Godwana sediments includes Talchir, Barakar, Barren Measures, Kamthi (Lower Godwana Group), Maleri, Kota, Gangapur and Chikiala formations (Upper Gondwana Group).

The Pranhita-Godavari Gondwana basin consists of a series of NNW-SSE grabens and half-grabens. Three prominent fault patterns are identified viz. (i) NNW-SSE trending syndepositional faults that controlled sedimentation and graben/half-graben development, (ii) NW-SE faults that imparted en echelon fabric to southwestern margin and (iii) the NE-SW transverse faults, oriented parallel to the grain of the Eastern Ghat Mobile Belt transecting the Godavari valley basin into different sub-blocks. It is considered that the progressive subsidence of these blocks in a south-easterly direction paved the way for the

deposition of Coastal Gondwana track, a three-armed radial rift system in which the Godavari Valley remained as aborted rift or aulacogen in Early Cretaceous, while drifting about the remaining two arms led to the development of the east coast of India.

(xxv) Bastar Basin :

The Bastar craton in the central India is one of the oldest cratons in the Indian shield and is bounded by two Mesoproterozoic belts of Eastern Ghat mobile belt in the east, Satpura mobile belt in the northwest, the Palaeoproterozoic mobile belt in the northeast, and the Godavari graben in the southwest.

(xxvi) Chhattisgarh Basin :

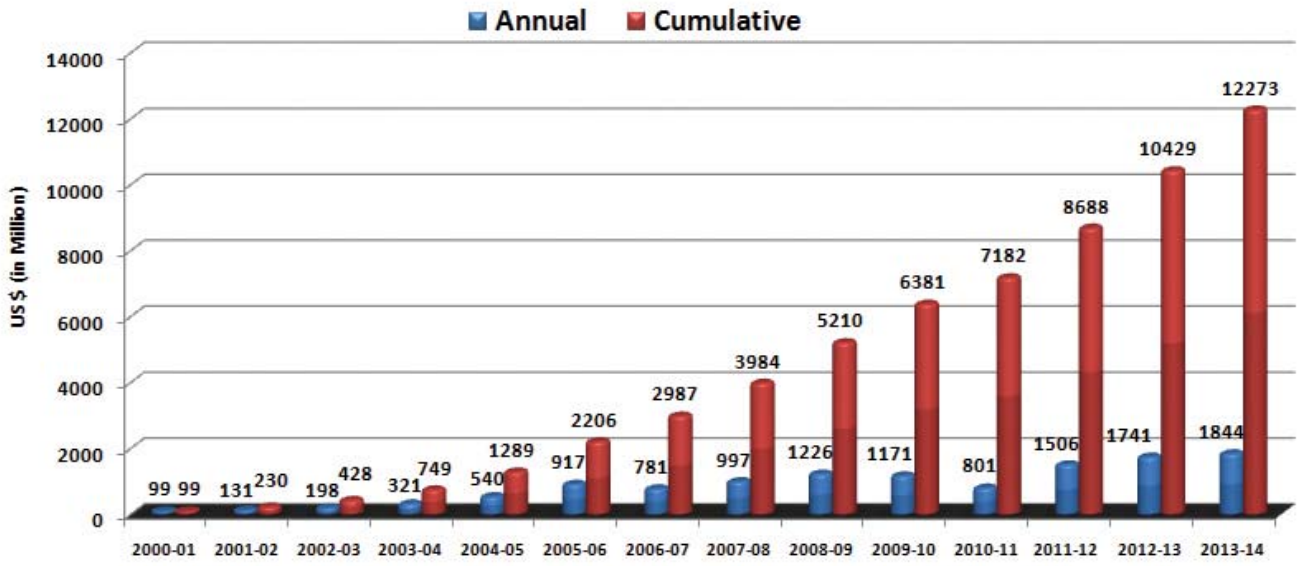
Chhattisgarh basin is situated on the northern edge of Bastar craton. It is bounded by the Kotri-Dongargarh orogen in the west, Satpura mobile belt in the north, Gondwana graben of Mahanadi in the northeast and the Eastern Ghats mobile belt in the southeast. In the south, the basin overlies the basement gneiss enclosing the Sonakhan greenstone belt. Chhattisgarh basin is the third largest basin after the Vindhayan and Cuddapah, and extends for about 300 km in the E-W and 200 km in the N-S directions, with an irregular rectangular configuration. Vast limestone and dolomite resources of the basin feed the Bhilai Steel Plant and the cement factories in the vicinity. The granitic terrain surrounding the basin has been recently found to host a number of kimberlite pipes. The basin contains about 2500 m thick sediments of orthoquartzite-carbonate-pelite suite, deposited in multiple sedimentary cycles, intercalated with minor felsic volcanics and pyroclastics and punctuated by unconformities. Each cycle starts with arenaceous facies and ends up with shale-limestone facies. The basin is divided into two sub-basins, the Hirri in the west and Baradwar in the east separated by the Sonakhan high over the Sonakhan greenstone belt.

7.2 CONTRIBUTION TO GOVERNMENT EXCHEQUER

The following are earnings of Government of India from Profit Petroleum and Royalty.

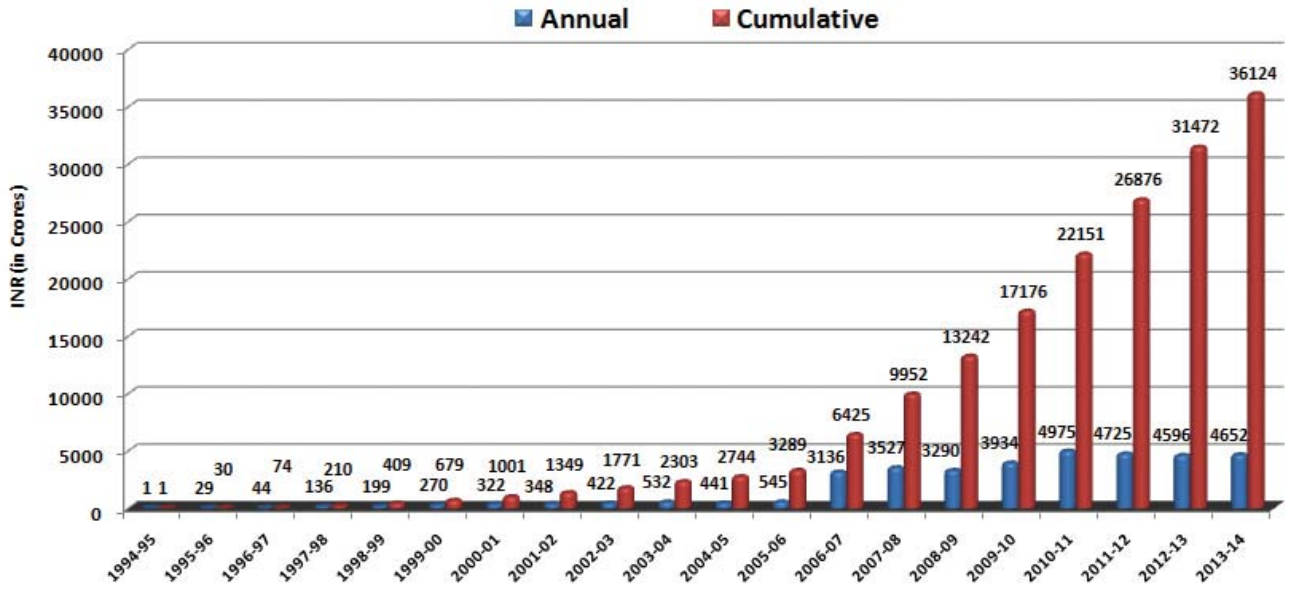
Profit Petroleum

During the Financial Year 2013-14, Profit Petroleum of US $ 1844 Million was contributed to Government Exchequer from the E&P operations under PSC regime. The cumulative Profit Petroleum earned upto 31st. March 2014 was of the order of US $ 12273 Million.



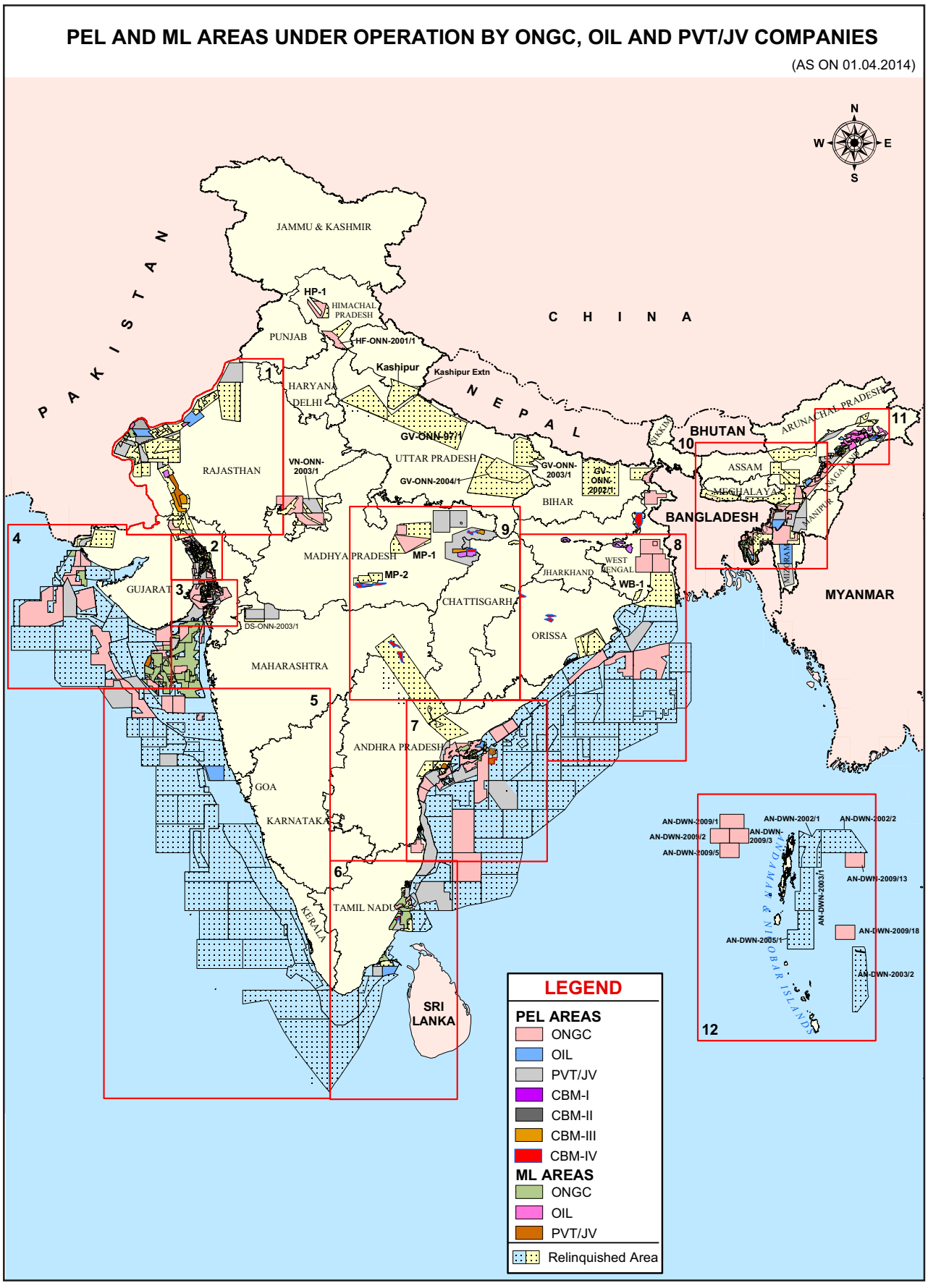
Royalty

During the Financial Year 2013-14, Royalty received by the Central Exchequer was of the order of Rs. 4652 crores. The cumulative Royalty contribution to the Central exchequer till 31.03.2014 amounted to Rs. 36,124 crores.

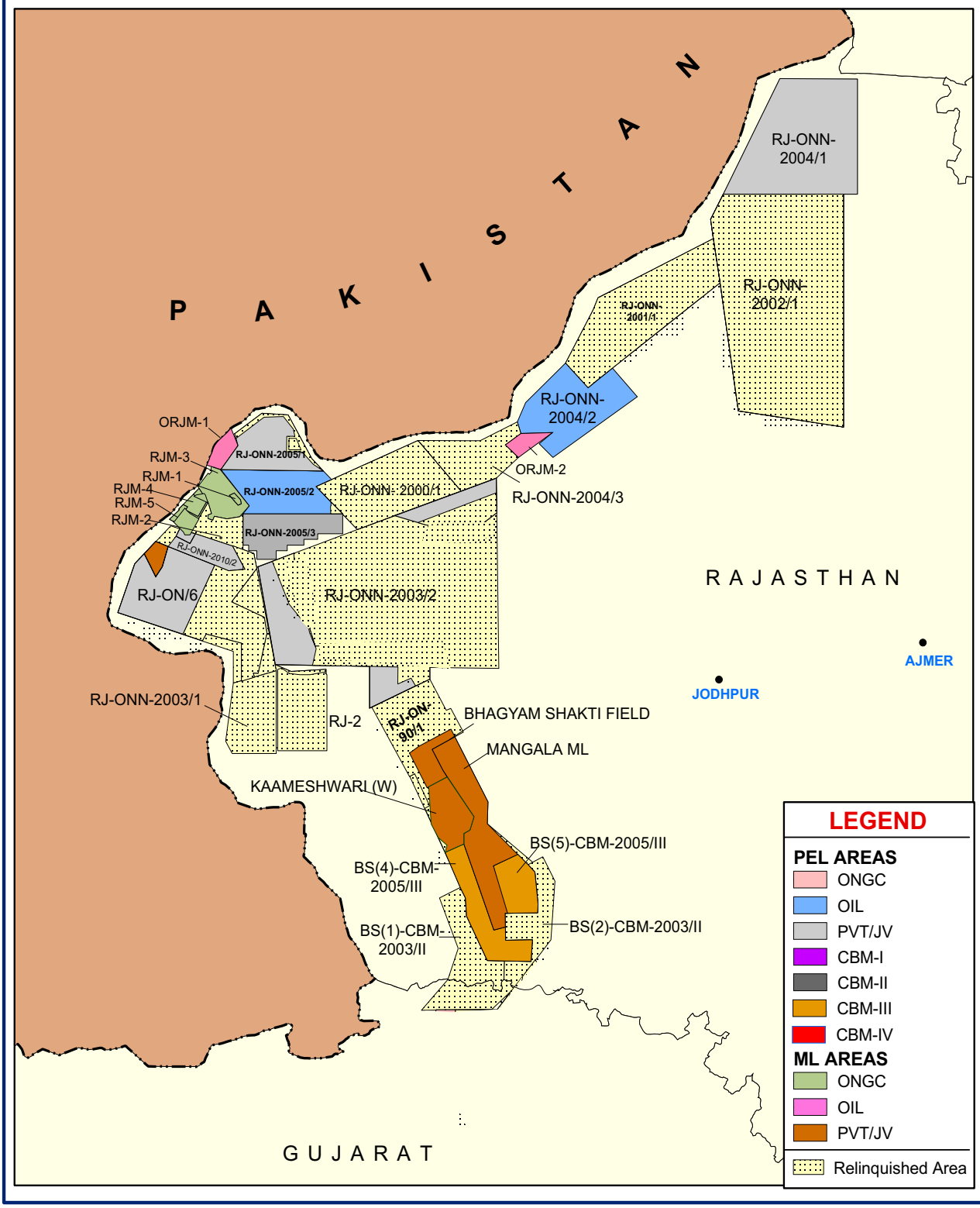


** **Note:** The royalty data of ONGC (nominated blocks) have been incorporated w.e.f. 2006-07.*

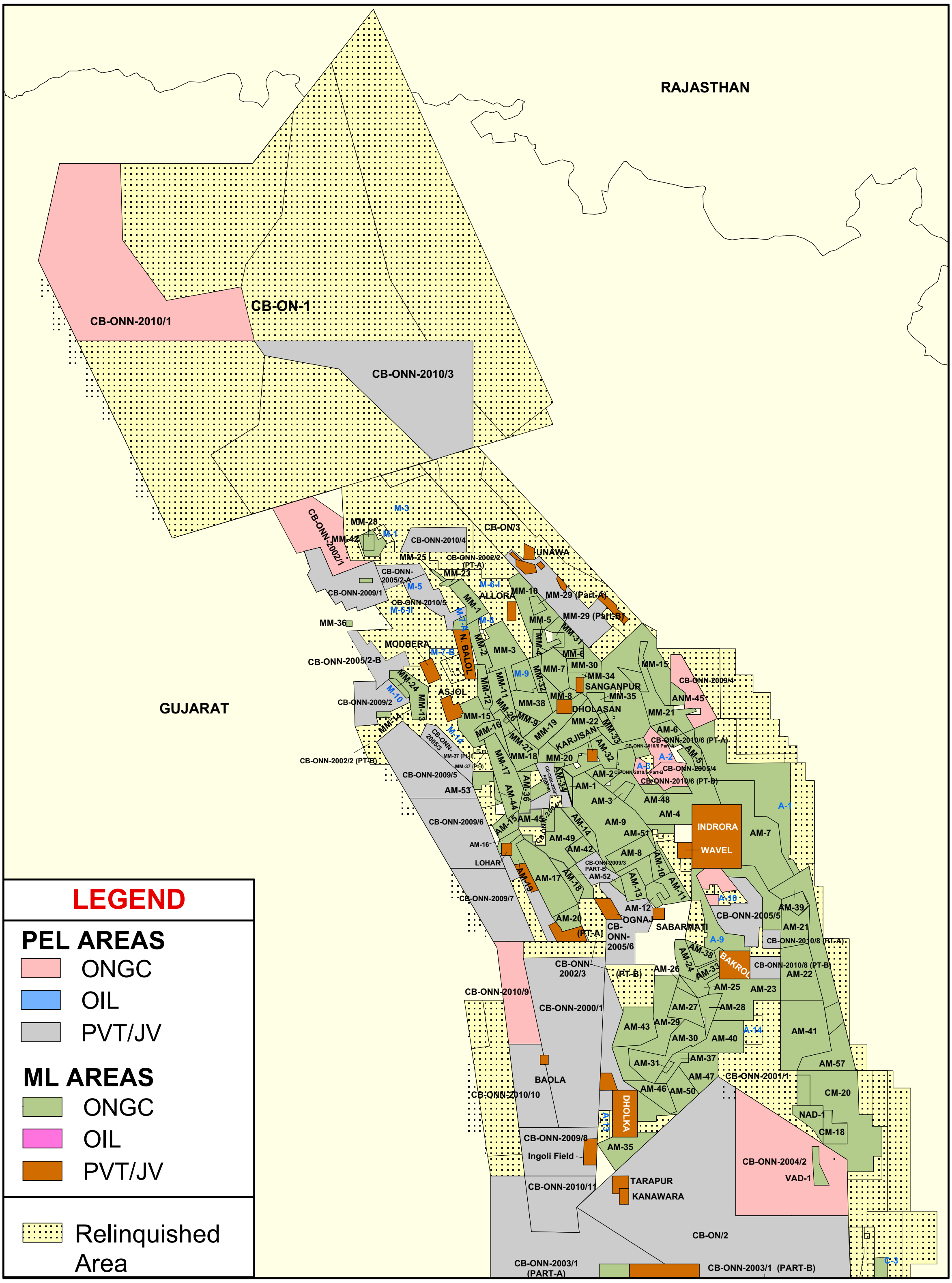
7.3 PEL & PML DETAILS OF THE COUNTRY



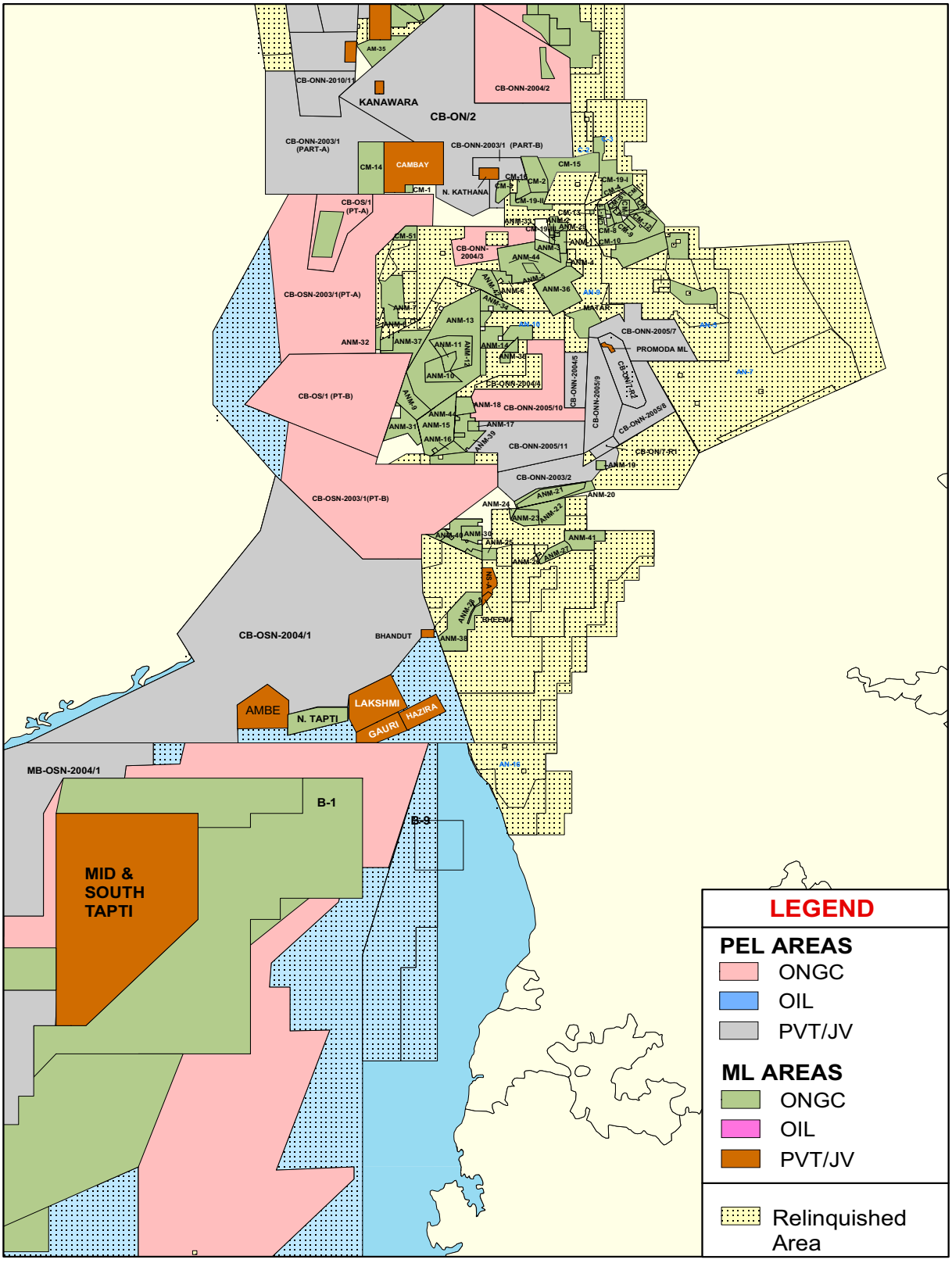
1. RAJASTHAN BASIN



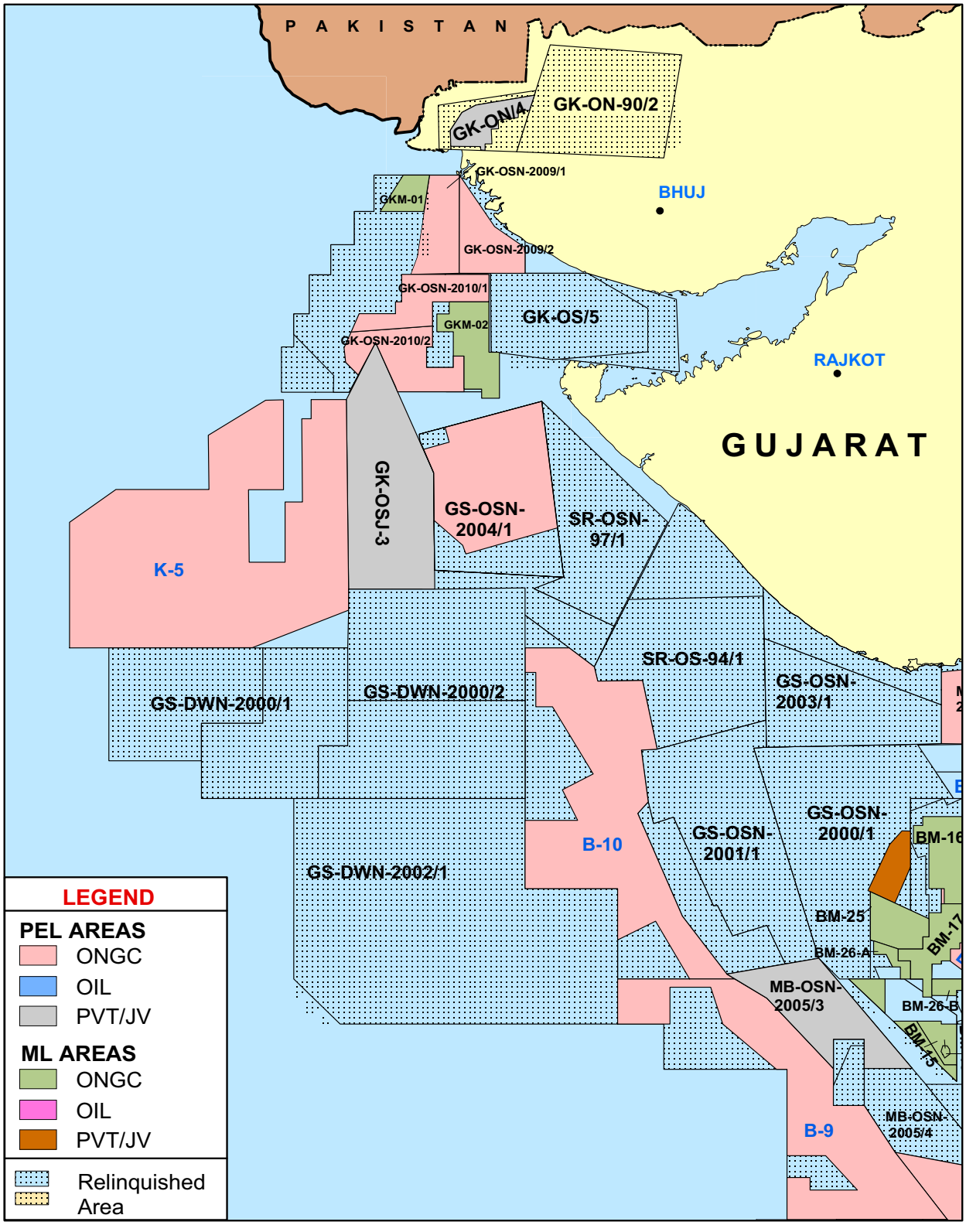
2. NORTH CAMBAY BASIN



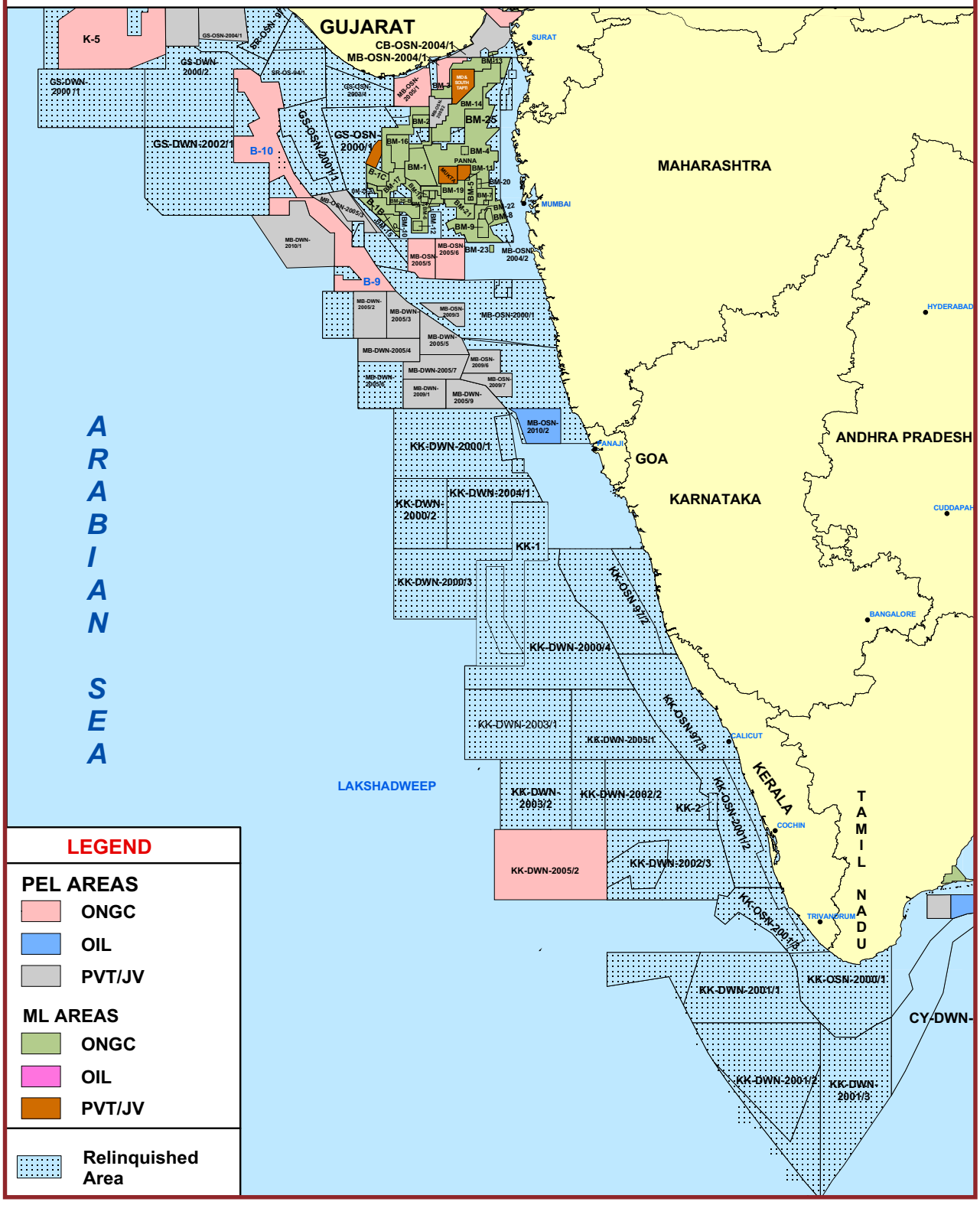
3. SOUTH CAMBAY BASIN



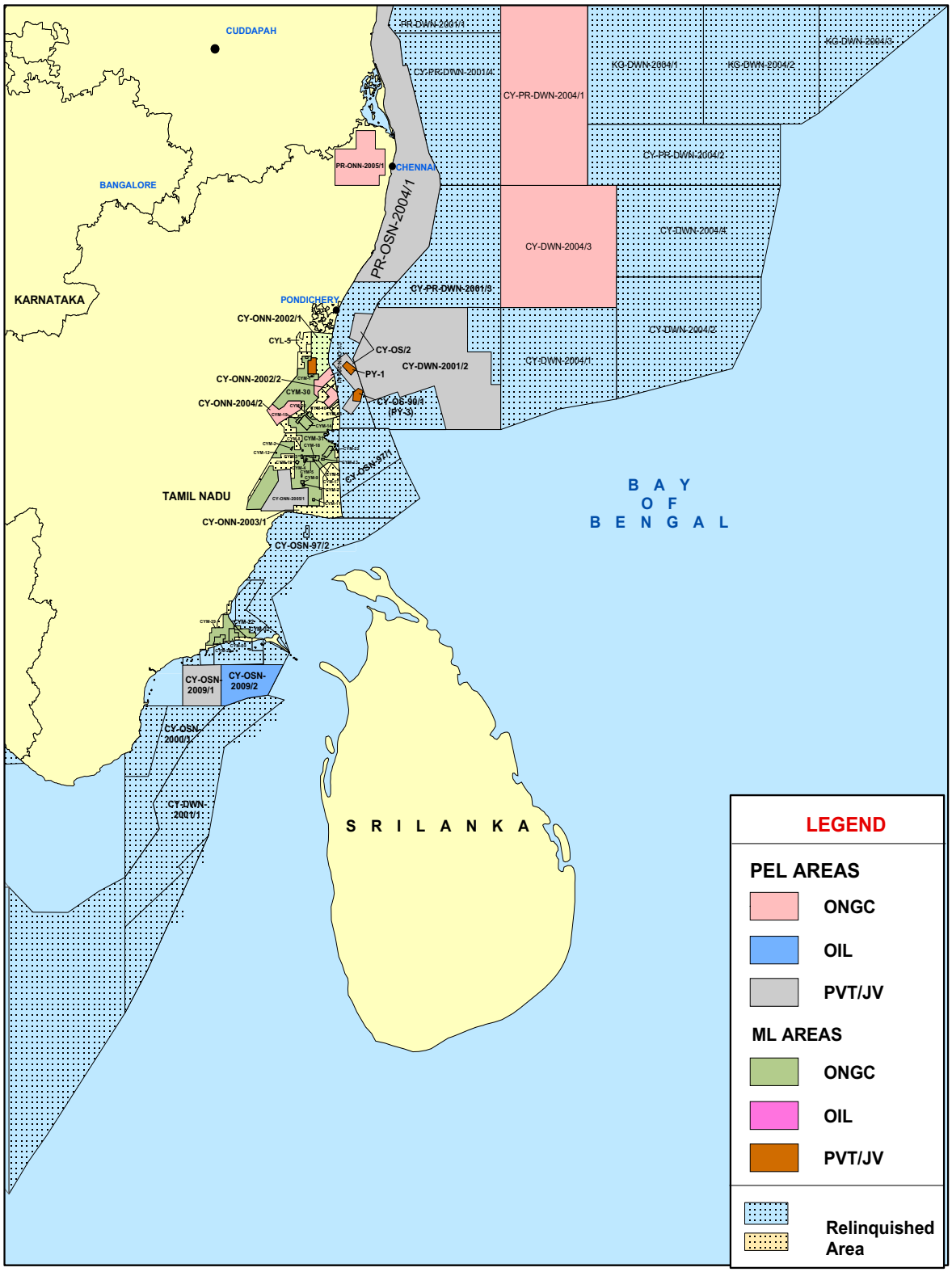
4. KUTCH-SAURASHTRA BASIN



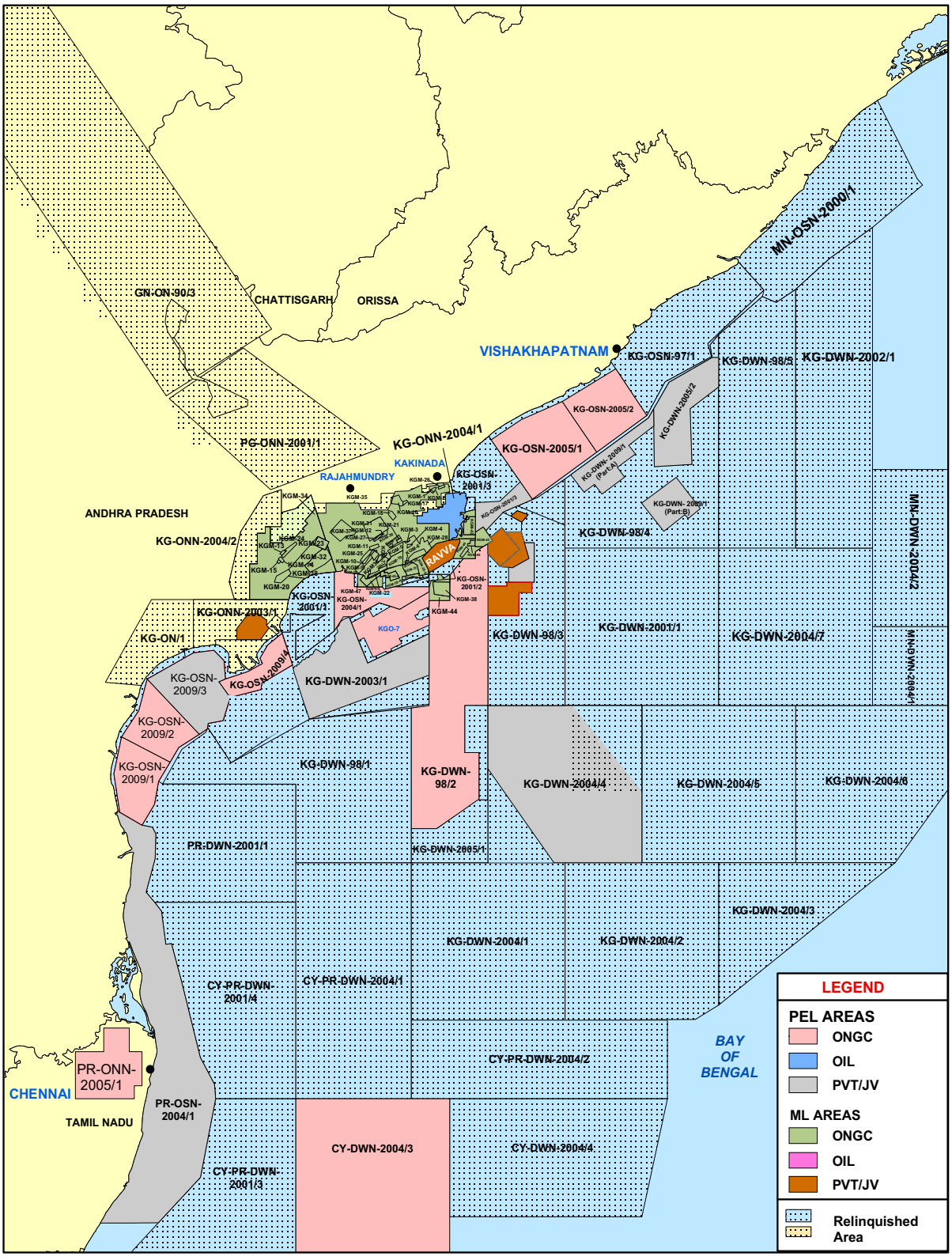
5. MUMBAI OFFSHORE & KERALA - KONKAN BASIN



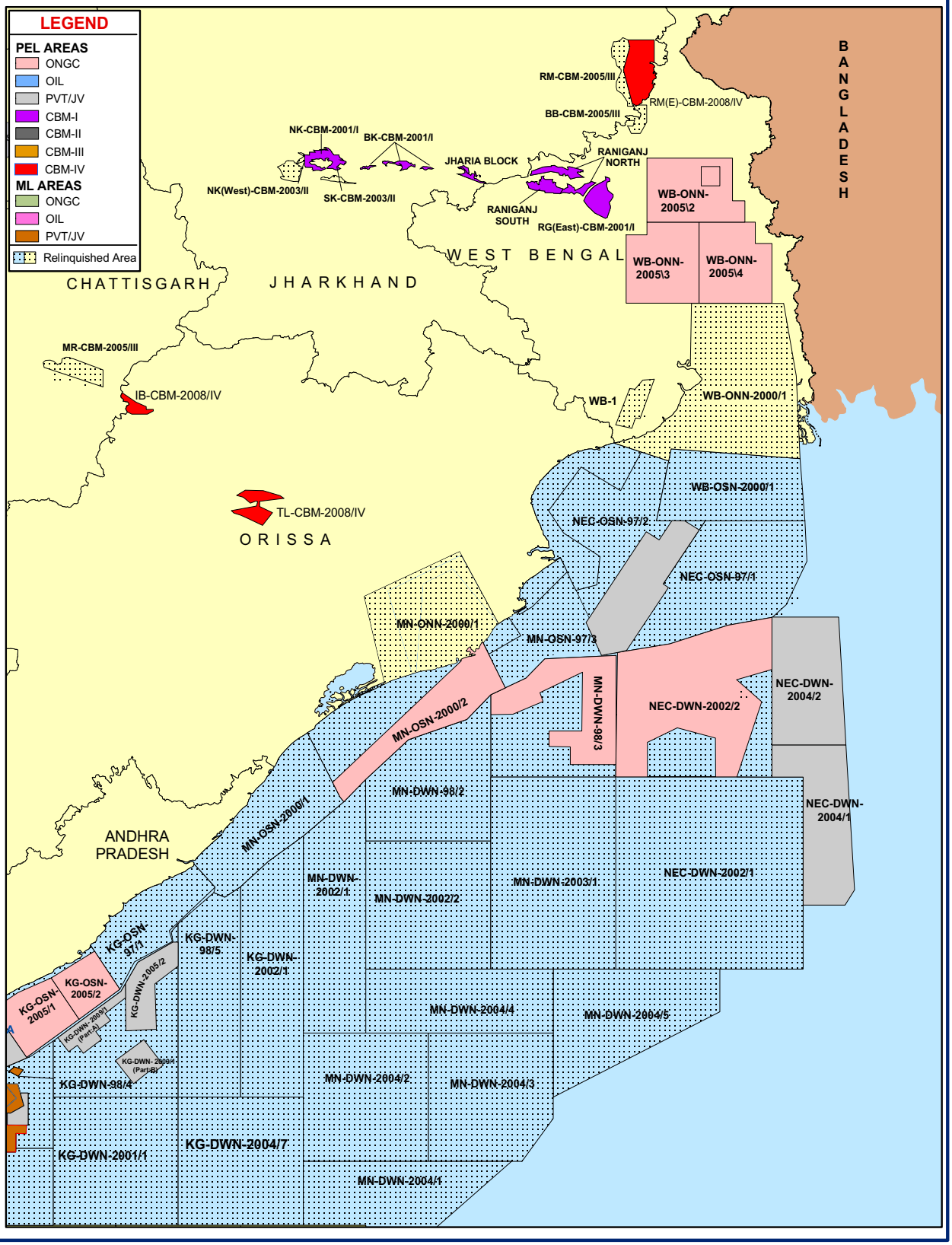
6. CAUVERY BASIN



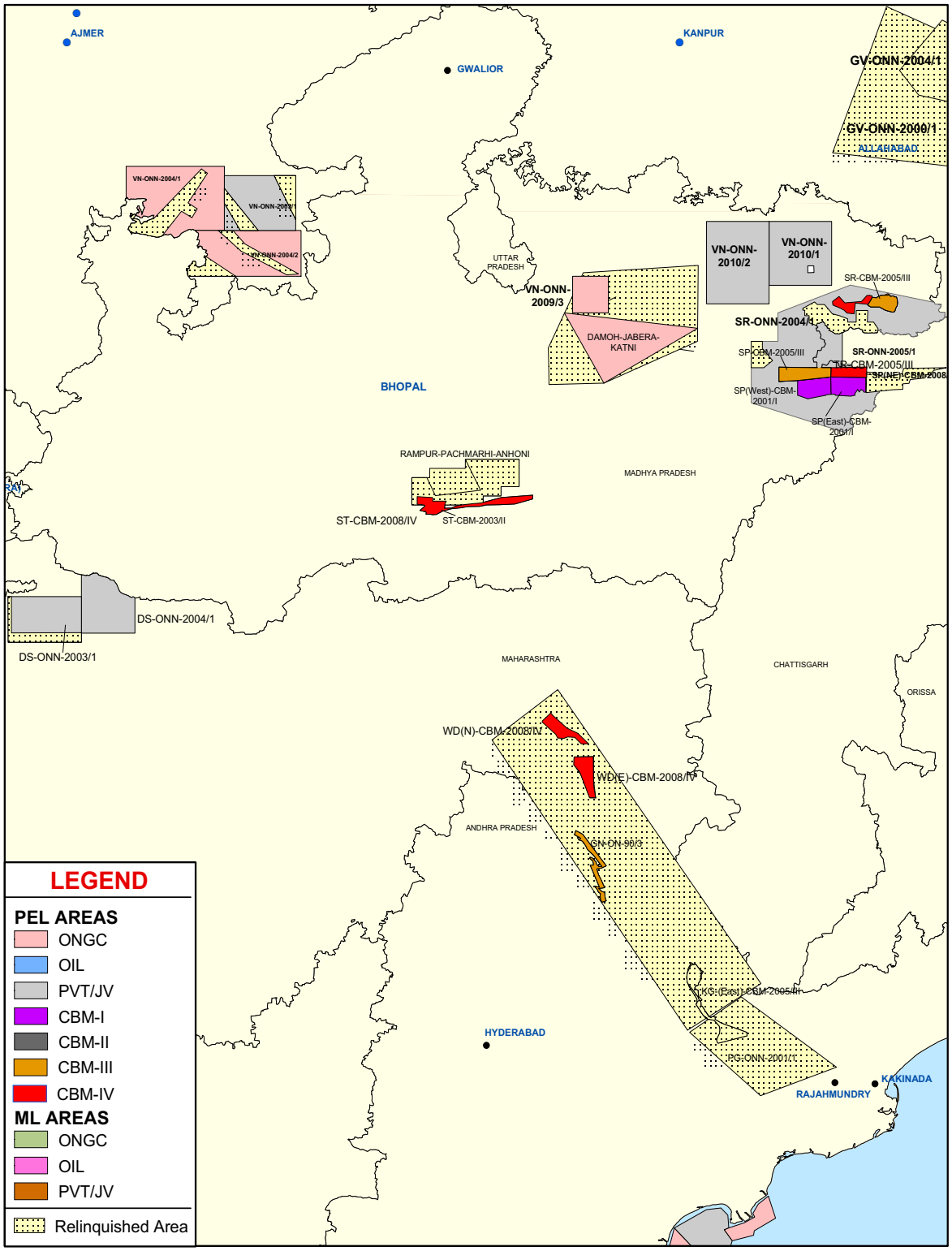
7. KRISHNA-GODAVARI BASIN



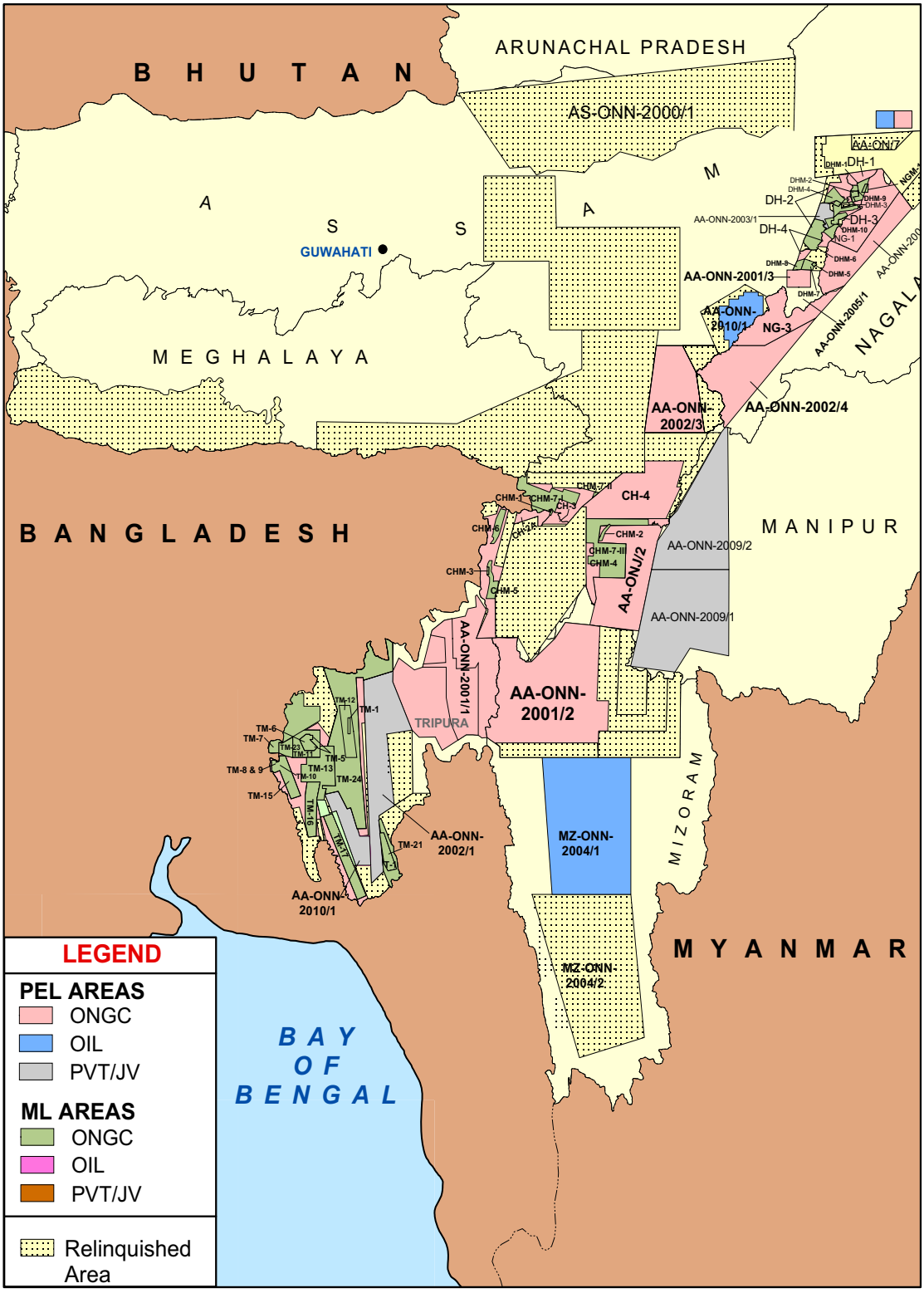
8. MAHANADI - NEC - BENGAL - DAMODAR BASINS



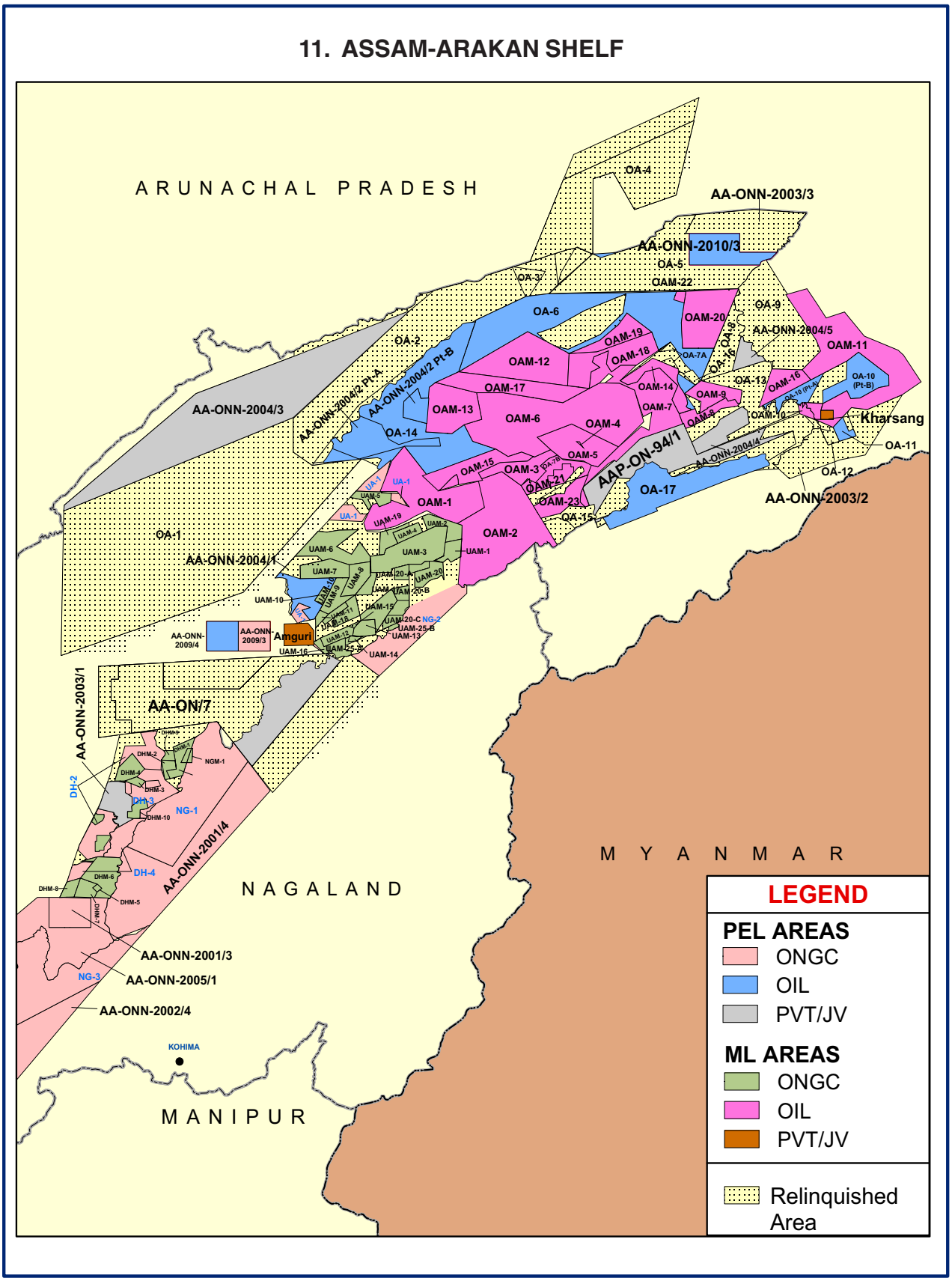
9. SATPURA-PRANHITA GODAVARI BASINS



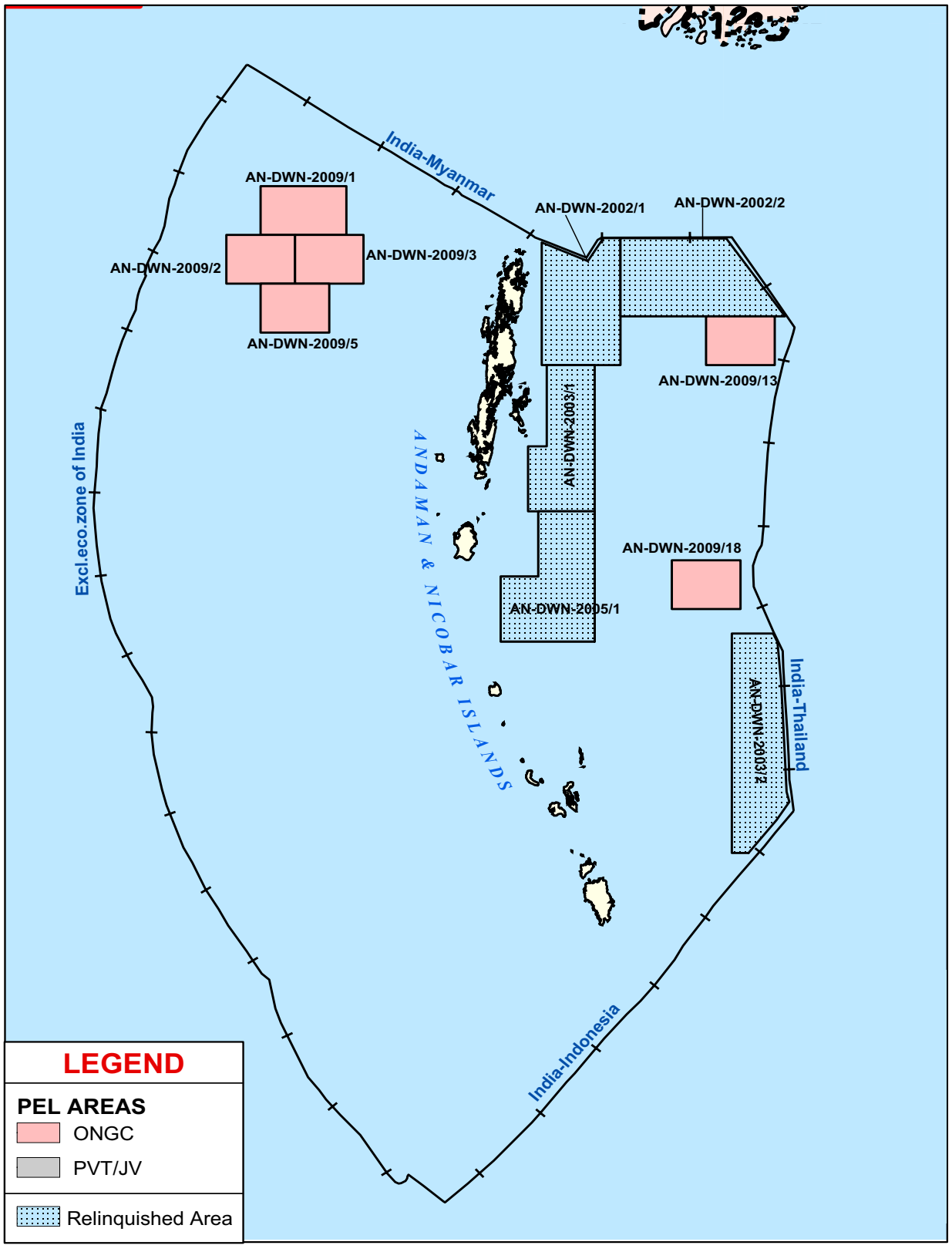
10. ASSAM-ARAKAN FOLD BELT



11. ASSAM-ARAKAN SHELF



12. ANDAMAN-NICOBAR BASIN



PELs OPERATED BY OIL

As on 01.04.2014

Sl. No.	BASIN	BLOCK NAME	REF. NO. ON MAP	EFFECTIVE DATE OF PEL	AREA (Sq. Km.)	TOTAL AREA (Sq. Km.)
NOMINATION BLOCKS						
1	Assam-Arakan	Tinsukia	OA-6	01.04.02	480.00	
2		Dibrugarh	OA-14	01.04.02	427.00	
3		Namchik	OA-10	01.05.05	195.00	
4		Jairampur Extn.	OA-11	01.04.06	23.25	
5		Deomali	OA-17	18.02.05	113.50	**1238.75**
				TOTAL		**1238.75**
PRE-NELP / NELP BLOCKS						
1	Rajasthan	RJ-ONN-2004/2	20	21.01.08	2196.00	
2		RJ-ONN-2005/2	15	22.12.08	1517.00	**3713.00**
3	Assam-Arakan	AA-ONN-2002/3	N-48	05.02.05	1095.00	
4		AA-ONN-2004/2	10	28.06.07	218.00	
5		AA-ONN-2009/4	4	30.06.10	84.00	
6		AA-ONN-2010/2	2	28.03.12	396.00	
7		AA-ONN-2010/3	3	28.03.12	171.00	**1964.00**
8	Mizoram	MZ-ONN-2004/1	7	22.05.07	3213.00	**3213.00**
9	Krishna - Godavari	KG-ONN-2004/1	28	16.02.08	549.00	**549.00**
10	Cauvery	CY-OSN-2009/2	S-20	30.06.10	1621.00	**1621.00**
11	Mumbai	MB-OSN-2010/2	S-4	30.08.12	3411.00	**3411.00**
				TOTAL		**14,471.00**
				GRAND TOTAL		**15,709.75**

PELs OPERATED BY ONGC

As on 01.04.2014

Sl. No.	BASIN	BLOCK NAME	REF. NO. ON MAP	EFFECTIVE DATE OF PEL	AREA (Sq. Km.)	TOTAL AREA (Sq. Km.)
NOMINATION BLOCKS						
1	Assam - Arakan	Sibsagar District	UA-1	01.04.02	87.10	
2		Golaghat District	DH-4	20.01.01	54.40	
3		Sector-V C (Assam)	CH-4	01.04.04	824.00	
4		Bhagty Bhandari	NG-1	28.04.06	620.00	
5		Singphan	NG-2	28.04.06	320.00	
6		Dimapur	NG-3	28.04.06	650.00	**2555.50**
7	Himalayan Foreland	Kangra-Mandi	HP-1	10.11.03	1828.00	**1828.00**
8	Vindhyan	Damoh-Jabera-Katni	MP-1	10.11.03	4208.00	**4208.00**
				TOTAL ONLAND		**8591.50**
9	Gujarat-Kutch Offshore	GK-DW-1	K-5	01.10.04	16557.00	**16557.00**
10	Mumbai Offshore	BB-OS-DW-I	B-9	28.12.04	7537.00	
11		BB-OS-DW-II	B-10	28.12.04	8950.00	**16487.00**
12	K-G Offshore	KG-OS-DW-III	KGO-7	15.05.03	1190.00	**1190.00**
				TOTAL OFFSHORE		**34,234.00**
				TOTAL NOMINATION		**42,825.50**
PRE-NELP / NELP BLOCKS						
1	Cambay	CB-OS/1	6	19.11.06	60.00	
2		CB-ONN-2001/1	N45	19.08.03	26.00	
3		CB-ONN-2002/1	N52	18.10.04	17.00	
4		CB-OSN-2003/1	N57	05.12.05	1795.50	
5		CB-ONN-2004/1	22	20.10.07	9.73	
6		CB-ONN-2004/2	23	28.05.07	423.00	
7		CB-ONN-2004/3	24	17.05.07	113.00	
8		CB-ONN-2005/4	20	22.12.08	31.00	
9		CB-ONN-2005/10	26	22.12.08	270.00	
10		CB-ONN-2009/4	14	30.06.10	58.00	
11		CB-ONN-2010/1	9	28.03.12	782.00	
12		CB-ONN-2010/6	14	28.03.12	39.00	
13		CB-ONN-2010/9	17	30.08.12	120.00	**3744.23**
14	Cauvery Onland	CY-ONN-2002/2	N56	31.08.04	140.00	
15		CY-ONN-2004/1	30	02.05.08	214.00	
16		CY-ONN-2004/2	31	30.05.08	375.00	**729.00**
17	PALAR	PR-ONN-2005/1	28	22.12.08	1807.00	**1807.00**
18	Assam-Arakan	AA-ONJ/2	11	-	1277.00	
19		AA-ONN-2001/1	N39	01.05.03	960.00	
20		AA-ONN-2001/2	N40	29.07.03	2660.00	
21		AA-ONN-2001/3	N41	19.12.03	110.00	
22		AA-ONN-2001/4	N42	28.04.06	645.00	
23		AA-ONN-2002/4	N49	28.04.06	1060.00	
24		AA-ONN-2005/1	1	22.12.08	363.00	
25		AA-ONN-2009/3	3	30.06.10	84.00	**7159.00**
26	Purnea	PA-ONN-2005/1	2	22.12.08	1096.00	
27		PA-ONN-2005/2	3	22.12.08	2552.00	**3648.00**
28	Ganga Valley	GV-ONN-2005/3	10	22.12.08	2227.00	**2227.00**
29	Vindhyan	VN-ONN-2004/1	17	17.01.08	4331.00	
30		VN-ONN-2004/2	18	17.01.08	3346.00	
31		VN-ONN-2009/3	9	30.06.10	1250.00	**8927.00**

PELs OPERATED BY ONGC

Sl. No.	BASIN	BLOCK NAME	REF. NO. ON MAP	EFFECTIVE DATE OF PEL	AREA (Sq. Km.)	TOTAL AREA (Sq. Km.)
32	Gujarat - Kutch -	GS-OSN-2004/1	1	25.04.07	4942.00	
33	Saurashtra Offshore	GK-OSN-2009/1	S-1	30.06.10	1264.00	
34		GK-OSN-2009/2	S-2	30.06.10	1242.00	
35		GK-OSN-2010/1	S-1	28.03.12	1361.00	
36		GK-OSN-2010/2	S-2	28.03.12	1625.00	**10434.00**
37	Mumbai Offshore	MB-OSN-2005/1	S-1	22.12.08	2811.00	
38		MB-OSN-2005/5	S-5	22.12.08	2402.00	
39		MB-OSN-2005/6	S-6	22.12.08	2820.00	**8033.00**
40	Cauvery Offshore	CY-DWN-2004/3	D6	21.05.07	12017.00	**12017.00**
41	Cauvery-Palar Offshore	CY-PR-DWN-2004/1	D8	15.05.07	13451.00	**13451.00**
42	K-G Offshore	KG-DWN-98/2	D2	12.04.00	7295.00	
43		KG-OSN-2004/1	6	25.05.07	1131.00	
44		KG-OSN-2005/1	S-7	22.12.08	2810.00	
45		KG-OSN-2005/2	S-8	22.12.08	1881.00	
46		KG-OSN-2009/1	S-22	30.06.10	1472.00	
47		KG-OSN-2009/2	S-23	30.06.10	1471.00	
48		KG-OSN-2009/4	S-25	30.06.10	835.00	**16895.00**
49	Mahanadi-NEC Offshore	MN-DWN-98/3	D7	19.05.00	4988.00	
50		MN-OSN-2000/2	N24	16.08.01	4061.00	
51		NEC-DWN-2002/2	D32	17.03.04	11586.00	**20635.00**
52	Bengal	WB-ONN-2005/2	5	22.12.08	3792.00	
53		WB-ONN-2005/3	6	22.12.08	4001.00	
54		WB-ONN-2005/4	7	22.12.08	3940.00	**11733.00**
55	Andaman-Nicobar Off.	AN-DWN-2009/1	D-7	30.06.10	4981.00	
56		AN-DWN-2009/2	D-8	30.06.10	3995.00	
57		AN-DWN-2009/3	D-9	30.06.10	3992.00	
58		AN-DWN-2009/5	D-11	30.06.10	4002.00	
59		AN-DWN-2009/13	D-19	30.06.10	4007.00	**20977.00**
60	Kerala Konkan	KK-DWN-2005/2	D-15	22.12.08	19234.00	**19234.00**
				TOTAL		**161,650.23**
				GRAND TOTAL		**204,475.73**

PELs UNDER PRE-NELP & NELP BLOCKS WITH PVT. / JV COMPANIES

As on 01.04.2014

Sl. No.	COMPANY / OPERATOR	BASIN	BLOCK NAME	REF. NO. ON MAP	EFFECTIVE DATE OF PEL	AREA (Sq. Km.)	TOTAL AREA (Sq. Km.)
1	**RELIANCE**	K-G Offshore	KG-DWN-98/3	D3	07.06.00	298.00	
2			KG-DWN-2003/1	D37	05.12.05	3288.00	
3		Cauvery Offshore	CY-DWN-2001/2	D20	03.04.03	10655.00	
4		Mahanadi-NEC Offs.	NEC-OSN-97/2	N15	07.06.00	4640.00	
5		Gujarat-Saurashtra	GS-OSN-2000/1	N18	16.08.01	5890.00	
6		Cambay	CB-ONN-2003/1(A&B)	N66	05.06.06	635.00	**20116.00**
7	**CAIRN**	Rajasthan	RJ-ON-90/1	17	15.05.95	3111.27	
8		Cambay	CB-OS/2	7	-	205.00	
9		Krishna Godavari	KG-ONN-2003/1	N69	08.02.07	315.00	
10			KG-OSN-2009/3	S-24	30.06.10	1988.00	
11		Palar offshore	PR-OSN-2004/1	5	24.04.07	9417.00	
12		Mumbai offshore	MB-DWN-2009/1	D-1	30.06.10	2961.00	**17997.27**
13	**ESSAR**	Cambay	CB-ON/3	19	11.02.03	119.05	
14		Assam-Arakan	AA-ONN-2004/3	11	02.05.08	1252.00	
15			AA-ONN-2004/5	13	02.05.08	46.00	
16		Mumbai offshore	MB-OSN-2005/3	S-3	22.12.08	1685.00	**3102.05**
17	**HOEC**	Assam - Arakan	AAP-ON-94/1	14	28.11.00	305.00	
18		Rajasthan	RJ-ONN-2005/1	14	22.12.08	1424.00	
19		Cambay	CB-ON/7	22	-	7.64	**1736.64**
20	**FOCUS**	Rajasthan	RJ-ON/6	16	21.08.99	4026.16	
21			RJ-ONN-2003/2	N65	28.01.06	2164.00	
22			RJ-ONN-2010/2	8	28.03.12	535.00	
23		Gujarat-Kutch	GK-ON/4	21	30.06.98	775.00	
24		Cambay	CB-OSN-2004/1	2	28.05.07	2616.00	**10116.16**
25	**ACL**	Assam-Arakan	AA-ON/7	13	27.03.01	319.00	**319.00**
26	**GSPC**	Cambay	CB-ON/2	23	23.11.00	1210.00	
27			CB-ONN-2000/1	N29	17.07.01	425.00	
28			CB-ONN-2002/3	N54	29.07.04	39.80	
29			CB-ONN-2003/2	N67	01.04.06	172.00	
30		Krishna Godavari	KG-OSN-2001/3	N38	12.03.03	530.50	
31		Rajasthan	RJ-ONN-2004/1	19	02.03.07	4613.00	
32			RJ-ONN-2005/3	16	22.12.08	1217.00	**8207.30**
33	**JOGPL**	Assam-Arakan	AA-ONN-2002/1	N47	07.04.04	1260.00	
34			AA-ONN-2003/1	N59	-	81.00	
35			AA-ONN-2009/1	1	30.06.10	2217.00	
36			AA-ONN-2009/2	2	30.06.10	1740.00	**5298.00**
37	**PRIZE PETROLEUM**	South-Rewa	SR-ONN-2004/1	16	12.07.07	11821.00	**11821.00**
38	**GAIL**	Cauvery	CY-ONN-2005/1	29	22.12.08	946.00	**946.00**
39	**IOCL**	Cambay	CB-ONN-2005/2	18 A&B	22.12.08	81.00	
40			CB-ONN-2005/7	23	22.12.08	199.00	**280.00**
41	**Adani Welspun**	Mumbai offshore	MB-OSN-2005/2	S-2	22.12.08	1191.00	**1191.00**
42	**Deep Energy**	Satpura-Rewa	SR-ONN-2005/1	11	22.12.08	789.00	**789.00**
43	**Mercator Petr.**	Cambay	CB-ONN-2005/3	19	22.12.08	48.00	
44			CB-ONN-2005/9	25	22.12.08	132.20	**180.20**
45	**Omkar Natural**	Cambay	CB-ONN-2005/5	21	22.12.08	83.00	
46			CB-ONN-2005/6	22	22.12.08	102.00	**185.00**

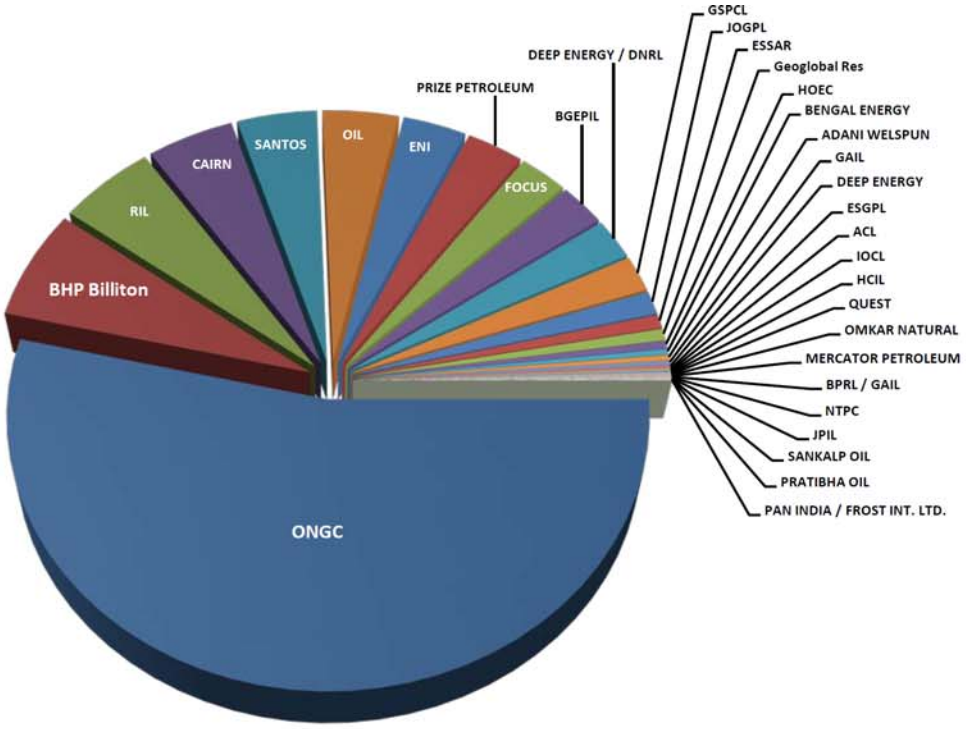
PELs UNDER PRE-NELP & NELP BLOCKS WITH PVT. / JV COMPANIES

Sl. No.	COMPANY / OPERATOR	BASIN	BLOCK NAME	REF. NO. ON MAP	EFFECTIVE DATE OF PEL	AREA (Sq. Km.)	TOTAL AREA (Sq. Km.)
47	**Quest**	Cambay	CB-ONN-2005/11	27	22.12.08	223.87	**223.87**
48	**BGEPIL**	Mumbai	MB-DWN-2010/1	D-2	10.09.12	7963.00	
49		Krishna Godavari	KG-DWN-2009/1	D-6 A&B	30.06.10	1800.00	**9763.00**
50	**Bengal Energy**	Cauvery	CY-OSN-2009/1	S-19	30.06.10	1362.00	**1362.00**
51	**ESGPL**	Cambay	CB-ONN-2009/1	11	30.06.10	113.00	
52			CB-ONN-2009/2	12	30.06.10	68.00	
53			CB-ONN-2009/7	17	30.06.10	144.00	**325.00**
54	**HCIL**	Cambay	CB-ONN-2009/3	13	30.06.10	71.00	
55			CB-ONN-2009/6	16	30.06.10	177.00	**248.00**
56	**NTPC**	Cambay	CB-ONN-2009/5	15	30.06.10	165.00	**165.00**
57	**JPIL**	Cambay	CB-ONN-2009/8	18	30.06.10	136.00	**136.00**
58	**PAN India / Frost Int. Ltd.**	Cambay	CB-ONN-2010/5	13	-	49.00	**49.00**
59	**Pratibha Oil**	Cambay	CB-ONN-2010/4	12	-	61.00	**61.00**
60	**BPRL/ GAIL**	Cambay	CB-ONN-2010/8	16 A&B	-	42.00	
61			CB-ONN-2010/11	19	28.03.12	131.00	**173.00**
62	**SANKALP**	Cambay	CB-ONN-2010/10	18	27.06.2012	122.00	**122.00**
63	**DEEP ENERGY LLC/**	Vindhyan	VN-ONN-2010/2	5	28.03.12	4909.00	
64	**DNRL**	Vindhyan	VN-ONN-2010/1	4	28.03.12	3776.00	
65		Cambay	CB-ONN-2010/3	11	28.03.12	534.00	**9219.00**
66	**ENI**	Andaman	AN-DWN-2003/2	D40	23.09.05	13110.00	**13110.00**
67	**SANTOS**	Mahanadi-NEC	NEC-DWN-2004/1	D22	02.03.07	7790.00	
68			NEC-DWN-2004/2	D23	02.03.07	8706.00	**16496.00**
69	**Geoglobal Res.**	Deccan Synecline	DS-ONN-2004/1	27	02.03.07	2649.00	**2649.00**
70	**BHP Billiton**	Mumbai	MB-DWN-2005/2	D-6	22.12.08	3660.00	
71			MB-DWN-2005/3	D-7	22.12.08	3097.00	
72			MB-DWN-2005/4	D-8	22.12.08	3408.00	
73			MB-DWN-2005/5	D-9	22.12.08	3169.00	
74			MB-DWN-2005/7	D-11	22.12.08	3324.00	
75			MB-DWN-2005/9	D-13	22.12.08	3138.00	
76			MB-OSN-2009/3	S-5	30.06.10	1492.00	
77			MB-OSN-2009/6	S-8	30.06.10	1876.00	
78			MB-OSN-2009/7	S-9	30.06.10	1865.00	**25029.00**
						TOTAL : 161,415.49	

Grand Total of PELs awarded in the country : 381,600.97 Sq.km
(NOC's & Pvt. / JV Companies)

PEL AREAS UNDER OPERATION BY NOC'S AND PVT/JV COMPANIES

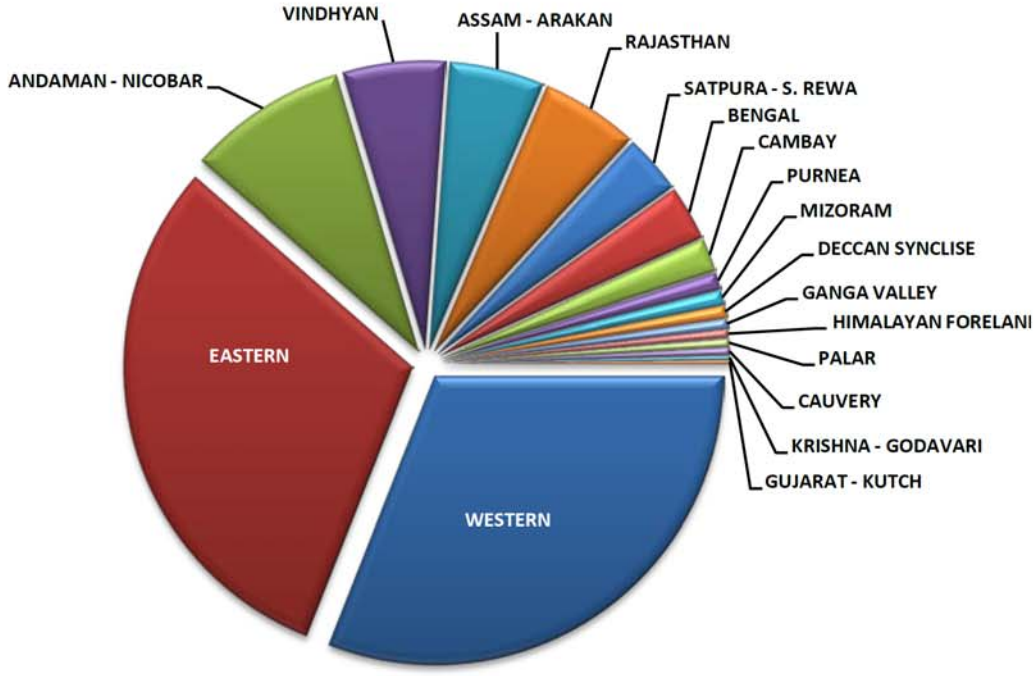
As on 01.04.14



COMPANY / OPERATOR	PEL AREA		COMPANY / OPERATOR	PEL AREA	
	(Sq. Km.)	(%)		(Sq. Km.)	(%)
ONGC	204475.73	53.58	ADANI WELSPUN	1191.00	0.31
BHP Billiton	25029.00	6.56	GAIL	946.00	0.25
RIL	20116.00	5.27	DEEP ENERGY	789.00	0.21
CAIRN	17997.27	4.72	ESGPL	325.00	0.09
SANTOS	16496.00	4.32	ACL	319.00	0.08
OIL	15709.75	4.12	IOCL	280.00	0.07
ENI	13110.00	3.44	HCIL	248.00	0.06
PRIZE PETROLEUM	11821.00	3.10	QUEST	223.87	0.06
FOCUS	10116.16	2.65	OMKAR NATURAL	185.00	0.05
BGEPIL	9763.00	2.56	MERCATOR PETROLEUM	180.20	0.05
DEEP ENERGY / DNRL	9219.00	2.42	BPRL / GAIL	173.00	0.05
GSPCL	8207.30	2.15	NTPC	165.00	0.04
JOGPL	5298.00	1.39	JPIL	136.00	0.04
ESSAR	3102.05	0.81	SANKALP OIL	122.00	0.03
Geoglobal Res	2649.00	0.69	PRATIBHA OIL	61.00	0.02
HOEC	1736.64	0.46	PAN INDIA / FROST INT. LTD.	49.00	0.01
BENGAL ENERGY	1362.00	0.36			
GRAND TOTAL : 381600.97 (100%)					

BASIN WISE DISTRIBUTION OF PEL AREAS

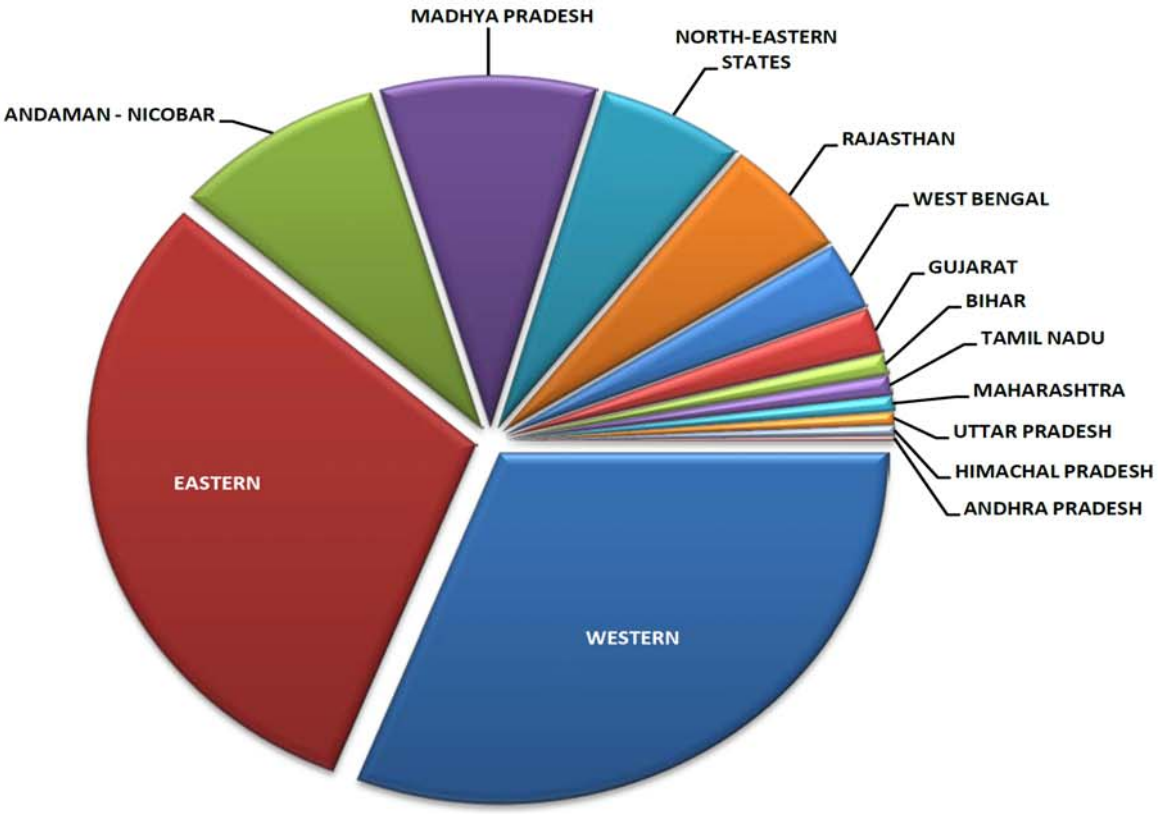
As on 01.04.14



OFFSHORE/BASIN	PEL AREA	
	(Sq. Km.)	(%)
OFFSHORE		
WESTERN	1,18,261.50	30.99
EASTERN	1,16,283.50	30.47
ANDAMAN - NICOBAR	34,087.00	8.93
TOTAL OFFSHORE	**2,68,632.00**	**70.40**
ONLAND		
VINDHYAN	21,820.00	5.72
ASSAM - ARAKAN	20,137.25	5.28
RAJASTHAN	20,803.43	5.45
SATPURA - S. REWA	12,610.00	3.30
BENGAL	11,733.00	3.07
CAMBAY	7,179.29	1.88
PURNEA	3,648.00	0.96
MIZORAM	3,213.00	0.84
DECCAN SYNCLISE	2,649.00	0.69
GANGA VALLEY	2,227.00	0.58
HIMALAYAN FORELAND	1,828.00	0.48
PALAR	1,807.00	0.47
CAUVERY	1,675.00	0.44
KRISHNA - GODAVARI	864.00	0.23
GUJARAT - KUTCH	775.00	0.20
TOTAL ONLAND	**1,12,968.97**	**29.60**
GRAND TOTAL	**3,81,600.97**	**100.00**

STATE WISE DISTRIBUTION OF PEL AREAS

As on 01.04.14



OFFSHORE/STATE	PEL AREA	
	(Sq. Km.)	(%)
OFFSHORE		
WESTERN	1,18,261.50	30.99
EASTERN	1,16,283.50	30.47
ANDAMAN - NICOBAR	34,087.00	8.93
TOTAL OFFSHORE	**2,68,632.00**	**70.40**
STATE		
MADHYA PRADESH	34,430.00	9.02
NORTH-EASTERN STATES	23,350.25	6.12
RAJASTHAN	20,803.43	5.45
WEST BENGAL	11,733.00	3.07
GUJARAT	7,954.29	2.08
BIHAR	3,648.00	0.96
TAMIL NADU	3,482.00	0.91
MAHARASHTRA	2,649.00	0.69
UTTAR PRADESH	2,227.00	0.58
HIMACHAL PRADESH	1,828.00	0.48
ANDHRA PRADESH	864.00	0.23
TOTAL ONLAND	**1,12,968.97**	**29.60**
GRAND TOTAL	**3,81,600.97**	**100.00**

ML AREAS UNDER OPERATION BY NOC's AND PVT/JV COMPANIES

As on 01.04.2014

Sl. No.	COMPANY / OPERATOR	BASIN	BLOCK NAME	REF. NO. ON MAP	EFFECTIVE DATE OF ML	AREA (Sq. Km.)	TOTAL AREA (Sq. Km.)
1	ONGC	Rajasthan	Manhera Tibba Field	RJM-1	01.05.14	24.00	
2			Bakriwala	RJM-2	10.01.01	1.00	
3			Ghotaru Ext. - I	RJM-3	10.01.01	564.60	
4			Chinnewala Tibba	RJM-4	15.10.03	114.86	
5			South Kharatar (Part A & B)	RJM-5	25.03.11	180.39	**884.85**
6		Cambay	Lanwa	MM-1	09.12.02	30.00	
7			Balol	MM-2	25.05.10	24.00	
8			Jotana Ext.-I	MM-3	28.11.06	57.70	
9			West Sobhasan	MM-4	23.04.03	9.60	
10			Mehsana City	MM-5	08.08.96	8.85	
11			Mehsana City Ext.-II	MM-6	18.07.95	7.58	
12			Sobhasan	MM-7	20.08.13	35.89	
13			Geratpur	MM-8	20.08.13	18.31	
14			Linch Ext.-II	MM-9	24.03.07	13.35	
15			North Sobhasan Ext.-I	MM-10	12.03.01	56.85	
16			Jotana	MM-11	26.07.00	39.50	
17			Santhal	MM-12	09.06.14	19.46	
18			Bechraji	MM-13	31.08.11	37.11	
19			Bechraji Ext.-I	MM-14	29.03.04	3.06	
20			Charada Mansa	MM-15	23.10.12	187.50	
21			N. Kadi Ext.-I New	MM-16	03.05.13	61.43	
22			Kadi	MM-17	18.08.08	64.49	
23			Linch Ext.- I	MM-18	18.03.07	34.25	
24			Linch	MM-19	16.10.13	43.73	
25			Nandasan Ext.-I	MM-20	18.07.95	26.39	
26			Mansa	MM-21	26.07.95	58.72	
27			Nandasan - Langnaj	MM-22	27.04.06	61.90	
28			Chanasma	MM-23	28.09.96	2.81	
29			Dedana (ML)	MM-24	04.11.96	5.44	
30			Lanwa Ext.-I	MM-25	16.12.96	2.15	
31			Jotana Ext.-II	MM-26	16.06.97	0.87	
32			Jakasna(ML)	MM-27	02.06.01	9.80	
33			South Patan	MM-28	16.06.97	6.99	
34			N. Sobhasan Pt. A+B	MM-29	25.01.99	12.05	
35			East Sobhasan	MM-30	28.06.02	22.42	
36			North Sobhasan Ext.-II	MM-31	17.11.01	23.00	
37			West Mewad(ML)	MM-32	11.10.00	13.20	
38			Langhnaj-Wadasma	MM-33	05.02.01	13.84	
39			Sanganpur ML	MM-34	05.06.02	6.97	
40			Langhnaj ML	MM-35	23.07.02	17.92	
41			Chandrora	MM-36	16.02.04	1.39	
42			Kadi Asjol	MM-37	28.08.03	0.72	
43			Jotana-Warosan	MM-38	24.06.05	38.05	
44			Charada Mansa Extn.-I	MM-39	20.09.08	12.50	
45			Jotana South	MM-40	10.03.08	23.00	
46			Kamboi	MM-41	25.12.07	2.35	
47			Patan-Tharad	MM-42	04.09.13	13.62	
48			Rajpur	AM-1	26.06.95	6.76	
49			Wadu	AM-2	26.05.10	15.41	
50			Kalol North-East	AM-3	15.03.10	9.44	
51			Paliyad-Kalol-Limbodra	AM-4	26.06.95	161.48	
52			Limbodra	AM-5	21.12.05	15.75	
53			Limbodra Ext.-I	AM-6	25.03.98	14.96	
54			Halisa	AM-7	30.01.98	143.44	
55			Kalol (Main)	AM-8	13.05.04	35.84	
56			Kalol Ext.-I	AM-9	04.08.06	159.92	

ML AREAS UNDER OPERATION BY NOC's AND PVT/JV COMPANIES

Sl. No.	COMPANY / OPERATOR	BASIN	BLOCK NAME	REF. NO. ON MAP	EFFECTIVE DATE OF ML	AREA (Sq. Km.)	TOTAL AREA (Sq. Km.)
57	ONGC	Cambay	Kalol Ext.-II	AM-10	11.04.09	15.50	
58			Motera Ext.-II	AM-11	25.03.98	26.02	
59			Motera	AM-12	14.08.96	15.69	
60			Motera Ext.-I	AM-13	25.03.97	23.65	
61			Wamaj	AM-14	25.03.97	19.44	
62			Viraj	AM-15	26.07.00	17.49	
63			Lohar	AM-16	16.11.04	8.29	
64			Sanand	AM-17	10.05.09	81.36	
65			Sanand Ext.-I	AM-18	30.04.13	18.51	
66			Sanand Ext.-II	AM-19	23.03.99	10.37	
67			Sanand Ext.-III	AM-20	11.11.11	19.30	
68			Gamij	AM-21	13.10.94	39.16	
69			Gamij Ext.-I	AM-22	25.03.97	81.22	
70			Hirapur	AM-23	24.10.97	87.92	
71			Ahmedabad-Bakrol	AM-24	05.08.09	30.16	
72			Ahmedabad Ext.-I	AM-25	22.02.01	17.29	
73			Ahmedabad Ext.-II	AM-26	29.07.08	5.98	
74			Ahmedabad Ext.-III	AM-27	11.11.11	34.75	
75			Nandej East	AM-28	26.06.95	20.92	
76			Nandej	AM-29	25.03.97	90.18	
77			Nawagam Main	AM-30	28.03.07	72.23	
78			Nawagam Ext.-I	AM-31	21.03.03	2.77	
79			Wadu Ext.-I	AM-32	19.05.97	55.17	
80			Ahmedabad Ext.-IV	AM-33	08.10.98	10.21	
81			Rajpur Ext.-I	AM-34	02.02.99	8.70	
82			Asmali ML	AM-35	15.06.98	43.26	
83			Kadi Ext-III	AM-36	02.02.99	16.07	
84			Nawagam Ext.-II	AM-37	26.11.99	14.66	
85			Ahmedabad Ext-V	AM-38	08.05.00	17.75	
86			Gamij Ext.-III ML	AM-39	08.02.02	15.41	
87			Nandej Ext.-I	AM-40	08.02.02	56.18	
88			Gamij Ext. - II	AM-41	04.04.01	116.22	
89			South Wamaj ML	AM-42	28.06.02	18.29	
90			Nawagam Ext. - III	AM-43	31.08.00	56.00	
91			Kalol West Extn.-I	AM-44	03.02.06	54.25	
92			Kalol West ML	AM-45	21.11.03	14.53	
93			Nawagam South Ext.-I	AM-46	21.11.03	30.88	
94			Nawagam South Ext.-II	AM-47	21.11.03	43.94	
95			Rupal	AM-48	29.10.04	14.06	
96			Kadi Extn.-IV	AM-49	13.11.03	5.28	
97			Nawagam South Ext.-III	AM-50	13.12.05	53.71	
98			Valod	AM-51	07.11.07	8.58	
99			Kalol West Ext.-II	AM-52	20.09.07	20.00	
100			Balasar	AM-53	08.06.09	12.00	
101			Varsoda Halisa Extn.-I	AM-54	21.11.10	169.00	
102			Kadi Extn.-V	AM-55	22.11.10	13.00	
103			Valod Extn.-I	AM-56	22.11.10	110.00	
104			Varsoda Halisa	AM-57	29.08.08	155.00	
105			Cambay	CM-1	14.12.04	2.60	
106			Siswa	CM-2	12.02.00	37.78	
107			Kathana	CM-3	20.11.08	16.95	
108			Padra Ext.-II	CM-4	03.09.13	14.50	
109			Padra Ext.-I	CM-5	11.04.11	8.42	
110			Padra Main	CM-6	18.09.06	1.25	
111			Padra Ext.-III	CM-7	12.05.94	0.38	
112			Padra Ext.-IV	CM-8	14.03.96	6.37	

ML AREAS UNDER OPERATION BY NOC's AND PVT/JV COMPANIES

Sl. No.	COMPANY / OPERATOR	BASIN	BLOCK NAME	REF. NO. ON MAP	EFFECTIVE DATE OF ML	AREA (Sq. Km.)	TOTAL AREA (Sq. Km.)
113	ONGC	Cambay	Padra Ext.-V	CM-9	03.02.97	3.58	
114			Padra Ext.-VI	CM-10	28.01.99	83.95	
115			Padra Ext.-VII	CM-11	26.04.00	7.11	
116			Padra Ext.-VIII	CM-12	08.11.00	15.68	
117			Padra Ext.-IX	CM-13	10.03.04	21.00	
118			Akholjuni	CM-14	27.07.00	81.25	
119			Anklav Ext.-I	CM-15	15.02.02	61.00	
120			Kathana Ext.-I	CM-16	15.03.04	16.99	
121			Padra Ext.-X	CM-17	15.01.08	10.00	
122			Chaklasi-Rasnol	CM-18	06.12.07	42.00	
123			Vasad Kathol Extn.-III	CM-19	08.07.11	103.18	
124			Chaklasi Rasnol Extn.-I	CM-20	16.11.10	168.00	
125			Dabka Ext.-I	ANM-1	23.08.08	12.85	
126			Dabka Ext.-II	ANM-2	30.06.09	0.56	
127			Dabka	ANM-3	01.05.93	21.67	
128			Umera	ANM-5	10.08.07	8.44	
129			Umera Ext.-I	ANM-6	19.10.94	9.93	
130			Malpur (ML)	ANM-7	04.06.07	1.00	
131			Nada	ANM-8	19.02.09	9.85	
132			Gandhar Ext.-IV	ANM-9	30.08.94	36.75	
133			Gandhar Ext.-I	ANM-10	08.10.06	32.75	
134			Gandhar	ANM-11	07.01.05	11.78	
135			Gandhar Ext.-II (Denwa)	ANM-12	08.07.06	54.30	
136			Gandhar Ext.-III	ANM-13	24.02.07	235.38	
137			Gandhar Ext.-V	ANM-14	22.03.96	29.43	
138			Dahej Ext.-I	ANM-15	17.04.94	90.90	
139			Dahej	ANM-16	06.02.05	18.52	
140			Pakhajan(ML)	ANM-17	21.08.07	6.25	
141			Pakhajan Ext.-I	ANM-18	10.01.95	18.00	
142			Kasiyabet	ANM-19	12.09.09	5.06	
143			Ankleshwar Ext.-I	ANM-20	26.05.05	17.43	
144			Ankleshwar (Main)	ANM-21	15.08.01	38.98	
145			Motwan	ANM-22	04.07.99	42.20	
146			Sanaokhurd	ANM-23	30.12.96	23.29	
147			Kudara	ANM-24	28.06.02	2.60	
148			Elav	ANM-25	30.03.90	10.37	
149			Kharach	ANM-26	23.03.95	0.72	
150			Kosamba	ANM-27	03.01.08	19.17	
151			Olpad (A)	ANM-28	24.11.02	2.75	
152			Dabka Ext.-IV (D#6)	ANM-29	20.02.97	1.00	
153			Kim(ML)	ANM-30	10.03.97	18.33	
154			Gandhar Ext.-VI (G#388)	ANM-31	22.01.97	44.47	
155			Nada Ext.-I	ANM-32	03.09.98	6.12	
156			Dabka Ext.-V (D#38)	ANM-33	29.06.99	2.00	
157			Gandhar Ext.-VII(G#155)	ANM-34	24.04.99	25.82	
158			Gandhar Ext.-VIII	ANM-35	16.08.00	7.23	
159			Kural (ML)	ANM-36	03.04.01	83.49	
160			Gandhar Ext. - IX	ANM-37	20.08.02	40.91	
161			Olpad - Dandi Ext. - I	ANM-38	01.01.04	94.40	
162			Pakhajan Extn. - II	ANM-39	16.09.02	38.50	
163			Kim Ext. - I	ANM-40	04.01.02	56.11	
164			Kosamba Extn.-I	ANM-41	01.03.03	39.00	
165			Umra Extn.-II	ANM-42	13.03.03	34.43	
166			South Dahej	ANM-43	12.11.08	27.00	
167			Jambusar-Dabka	ANM-44	25.03.08	101.50	
168			Charada	ANM-45	06.10.09	10.60	

ML AREAS UNDER OPERATION BY NOC's AND PVT/JV COMPANIES

Sl. No.	COMPANY / OPERATOR	BASIN	BLOCK NAME	REF. NO. ON MAP	EFFECTIVE DATE OF ML	AREA (Sq. Km.)	TOTAL AREA (Sq. Km.)
169	ONGC	Cambay	Matar	ANM-46	01.10.09	66.50	
170			Balol Extn.-I	ANM-47	26.12.08	5.83	
171			Gandhar Extn.-X	ANM-48	19.06.09	9.00	
172			Gandhar Extn.-XI	ANM-49	19.06.09	7.20	
173			Gandhar Extn.-XII	ANM-50	19.06.09	29.00	
174			Degam	ANM-51	25.03.08	15.47	**5788.93**
175		Cauvery Onland	Greater Bhuvanagiri	CYM-1	15.12.07	14.00	
176			Mattur	CYM-2	04.05.14	3.00	
177			Nannilam-I	CYM-3	26.04.13	4.70	
178			Kamalapuram-II	CYM-4	04.05.14	3.50	
179			Kamalapuram-I	CYM-5	27.05.99	23.50	
180			Adiyakka Mangalam	CYM-6	27.05.99	17.80	
181			Greater Kovilkalappal	CYM-7	15.05.07	33.61	
182			Nannilam-II	CYM-8	27.05.99	1.00	
183			Perungulam-Periyapattinam	CYM-9	15.07.97	75.00	
184			Tulsapatnam	CYM-10	27.05.99	3.70	
185			Pundi	CYM-11	27.05.99	1.00	
186			Kizhavalur	CYM-12	27.05.99	3.60	
187			Kuthalam	CYM-13	01.06.01	91.00	
188			Kuthalam-13	CYM-14	12.02.04	12.00	
189			Kali	CYM-15	01.06.01	19.00	
190			Vijayapuram #13	CYM-16	03.11.02	2.00	
191			Greater Kamalapuram	CYM-17	26.12.04	22.00	
192			Kuthanallur	CYM-18	26.02.04	6.25	
193			Kali-6	CYM-19	01.01.04	1.60	
194			Kanjirangudi	CYM-20	13.10.03	68.00	
195			Greater Narimanam	CYM-21	27.01.06	54.00	
196			PBS-1-1	CYM-22	01.10.03	9.00	
197			Adichapuram	CYM-23	13.04.07	2.30	
198			Neyveli	CYM-24	15.03.08	3.84	
199			Karaikal	CYM-25	10.09.08	2.00	
200			Vadatheru	CYM-26	31.12.07	15.18	
201			Tiruvarur-19	CYM-27	12.02.04	2.00	
202			Greater Kali	CYM-28	21.07.10	36.00	
203			Ramanathpuram	CYM-29	21.11.12	493.21	
204			L-I	CYM-30	31.12.12	948.16	
205			L-II	CYM-31	31.12.12	1542.02	**3513.97**
206		K-G Onland	Endamuru-I	KGM-1	03.04.12	3.00	
207			Endamuru-4	KGM-2	30.04.03	6.00	
208			Pasarlapudi-9	KGM-3	23.07.12	6.60	
209			Pasarlapudi-8	KGM-4	27.06.12	5.50	
210			Tatipaka-Pasarlapudi	KGM-5	14.02.14	62.00	
211			Kesanapalli-I	KGM-6	18.07.12	3.70	
212			Mori-5	KGM-7	02.06.94	1.56	
213			Mori-1	KGM-8	07.04.11	6.50	
214			Razole-1 & 2	KGM-9	23.01.08	18.85	
215			Elamanchali	KGM-10	21.02.11	6.00	
216			Medapadu-1	KGM-11	08.07.12	16.60	
217			Penumadam-1	KGM-12	03.04.12	9.60	
218			Lingala	KGM-13	21.12.09	7.60	
219			Kaikalur-3	KGM-14	10.09.06	9.00	
220			Vadali	KGM-15	20.04.10	4.00	
221			Mandapeta	KGM-16	22.08.95	40.00	
222			Mandapeta-19	KGM-17	01.05.98	6.00	
223			Mandepeta West	KGM-18	01.06.04	20.00	
224			Addvipalem-Ponnamanda	KGM-19	30.07.96	95.00	

ML AREAS UNDER OPERATION BY NOC's AND PVT/JV COMPANIES

Sl. No.	COMPANY / OPERATOR	BASIN	BLOCK NAME	REF. NO. ON MAP	EFFECTIVE DATE OF ML	AREA (Sq. Km.)	TOTAL AREA (Sq. Km.)
225	ONGC	KG Onland	Nandigama	KGM-20	31.01.00	55.00	
226			Enugupalli	KGM-21	06.07.00	7.00	
227			Kesavadasupalem	KGM-22	30.07.02	26.50	
228			Suryaraopeta	KGM-23	30.07.02	56.00	
229			Lingala Ext. & Kaikalur-12	KGM-24	30.07.02	30.00	
230			Lakshmaneswaram	KGM-25	30.07.02	23.50	
231			Endamuru-7&9	KGM-26	19.05.03	7.30	
232			Penumadam-2	KGM-27	01.07.04	3.20	
233			Srikatpalli	KGM-28	30.07.02	163.00	
234			Turputallu	KGM-29	28.11.13	39.58	
235			Achanta	KGM-30	28.11.08	14.10	
236			Kavitam	KGM-31	12.10.07	156.35	
237			Bantumilli Extn.	KGM-32	05.01.09	155.67	
238			Manapalli Extn.	KGM-33	12.11.09	10.00	
239			West Godavari	KGM-34	01.01.13	1278.32	
240			Godavari Onland	KGM-35	01.01.13	2176.00	
241			Chintalapalli Extn.	KGM-36	12.11.09	18.56	
242			Mahadevapatnam	KGM-37	28.11.08	138.89	
243			Malleswaram	KGM-38	22.11.11	241.18	**4927.66**
244		Assam-Arakan	Sonari	UAM-1	01.08.09	30.00	
245			Banamali	UAM-2	17.12.02	50.00	
246			Lakwa	UAM-3	29.09.08	172.49	
247			Laipling-Gaon	UAM-4	13.10.03	26.00	
248			Panidihing	UAM-5	19.05.04	34.00	
249			North Rudrasagar	UAM-6	30.01.06	149.00	
250			Rudrasagar	UAM-7	30.05.09	70.50	
251			Charali	UAM-8	20.03.99	51.64	
252			Charali Ext.-I	UAM-9	20.05.98	45.00	
253			West Charali	UAM-10	23.03.12	12.00	
254			Changmaigaon	UAM-11	07.02.04	10.00	
255			Namti	UAM-12	09.11.07	35.55	
256			Geleki	UAM-13	16.08.90	27.94	
257			Geleki Ext.-I	UAM-14	23.11.09	5.01	
258			Geleki Ext.- II	UAM-15	14.12.01	2.65	
259			SE Geleki	UAM-16	30.01.06	20.50	
260			Mekeypore-Santak-Nazira	UAM-17	30.01.06	77.00	
261			Changmaigaon East	UAM-18	30.01.06	15.00	
262			Lip Gaon Extn.	UAM-19	26.09.11	30.45	
263			Charaideo-Nahorhabi	UAM-20	30.01.06	14.00	
264			Mekeypore-Santak-Nazira Bihupur Extn.	UAM-21	26.09.11	50.00	
265			East Changmaigaon Extn.	UAM-22	01.12.11	35.00	
266			SE Geleki Extn.	UAM-23	26.09.11	28.00	
267			Charaideo-Nahorhabi Extn.	UAM-24	26.09.11	41.00	
268			Changpang ML	NGM-1	14.03.07	12.00	
269			Borholla	DHM-1	17.06.98	32.12	
270			Mekrang	DHM-2	19.09.97	16.00	
271			East Lakhibari	DHM-3	23.07.03	8.50	
272			East Lakhibari Extn.	DHM-4	27.01.06	49.00	
273			Khoraghat	DHM-5	27.07.09	3.00	
274			Khoraghat Ext. - I	DHM-6	17.07.00	83.00	
275			Namber	DHM-7	05.09.99	26.00	
276			Namber Extn.	DHM-8	27.01.06	20.00	
277			Kalyanpur	DHM-9	13.04.07	40.00	
278			Badarpur	CHM-1	01.08.09	2.30	
279			Banaskandi	CHM-2	21.07.97	15.00	
280			Adamtila	CHM-3	24.11.09	4.00	

ML AREAS UNDER OPERATION BY NOC's AND PVT/JV COMPANIES

Sl. No.	COMPANY / OPERATOR	BASIN	BLOCK NAME	REF. NO. ON MAP	EFFECTIVE DATE OF ML	AREA (Sq. Km.)	TOTAL AREA (Sq. Km.)
281	ONGC	Assam-Arakan	Bhubandar	CHM-4	22.12.02	6.00	
282			Adamtila Extn.	CHM-5	03.03.12	63.00	
283			North Patharia	CHM-6	30.03.12	60.00	
284			Cachar Distt.	CHM-7	04.01.13	732.00	
285			Baramura Field (BRM-1,10,11,12)	TM-1	01.10.13	10.75	
286			Agartala Dome (AD-1)	TM-5	01.05.09	15.75	
287			Agartala Dome (AD-4)	TM-6	01.01.98	32.58	
288			Konaban Field	TM-7	19.03.14	33.00	
289			Manikya Nagar (RO-15)	TM-8	01.01.98	0.80	
290			Rokhia (RO-2)	TM-9	14.11.08	5.04	
291			Rokhia (RO-19)	TM-10	26.02.12	0.58	
292			Agartala Dome Extn.-II	TM-11	01.02.06	160.86	
293			Baramura Extn.-IV	TM-12	01.02.06	150.25	
294			Sundulbari-Agartala Dome	TM-13	13.12.10	301.00	
295			Manikyanagar-Sonamura Extn-I	TM-15	01.02.06	138.55	
296			Tichna block	TM-16	07.02.06	195.41	
297			Gojalia block	TM-17	07.02.06	271.17	
298			Kunjaban	TM-18	14.07.08	288.00	
299			Titabar	TM-19	24.12.08	10.00	
300			Kasomarigaon	TM-20	09.12.09	76.00	
301			Tulamura	TM-21	20.11.09	83.75	
302			Golaghat Extn. II-A	TM-22	09.12.09	85.00	
303			Agartala Dome Extn.-III	TM-23	30.03.11	60.00	
304			West Tripura	TM-24	04.01.13	1327.58	**5450.72**
305		Mumbai Off.	Single PML MH Field	BM-1	24.10.10	1953.83	
306			Extn. of NW-Mumbai High	BM-2	17.11.08	2480.00	
307			C-37 (BOFF I, II & III)	BM-3	12.09.07	469.17	
308			B-55	BM-4	30.06.99	135.85	
309			South Bassein	BM-5	01.10.07	743.00	
310			B-119 / B-121	BM-6	15.05.97	113.40	
311			B-173A	BM-7	01.06.98	51.95	
312			Neelam	BM-8	14.11.09	213.00	
313			Heera	BM-9	20.11.04	448.05	
314			D-1 Field	BM-10	31.07.05	25.60	
315			Bassein Field Extn. (SB-II)	BM-11	15.06.05	22.55	
316			D-18	BM-12	01.01.05	194.00	
317			North Tapti Field	BM-13	09.01.06	68.14	
318			C-Series Fields	BM-14	01.04.06	3620.00	
319			Around D-1 Field	BM-27	14.09.09	1167.00	
320			Mumbai High NW	BM-16	01.04.06	1567.67	
321			Mumbai High-SW	BM-17	01.04.06	1064.71	
322			Mumbai High-South	BM-18	09.01.06	801.54	
323			West of Bassein	BM-19	01.04.06	835.00	
324			Vasai East	BM-20	10.04.06	103.69	
325			S&E of Bassein	BM-21	01.04.06	1447.31	
326			North Heera	BM-22	04.12.07	121.00	
327			Ratna (R-12) field	BM-23	11.02.01	67.93	
328			D-33 (BOFF I, III, SWBH)	BM-24	05.09.06	603.00	
329			BOFF	BM-25	03.01.13	11595.00	
330			SW-BH Extn.	BM-26	03.01.13	482.00	**30394.39**
331		K-G Off.	GS-15 & 23	KGM-37	04.09.98	80.00	
332			G-1 Field	KGM-38	05.09.03	105.00	
333			Vainateyam	KGM-39	20.09.08	221.00	
334			GS-29	KGM-40	30.10.09	35.00	
335			GS-49	KGM-41	22.10.09	52.50	
336			Yanam	KGM-42	19.11.09	268.50	

ML AREAS UNDER OPERATION BY NOC's AND PVT/JV COMPANIES

Sl. No.	COMPANY / OPERATOR	BASIN	BLOCK NAME	REF. NO. ON MAP	EFFECTIVE DATE OF ML	AREA (Sq. Km.)	TOTAL AREA (Sq. Km.)
337	ONGC	KG Off.	Godavari	KGM-43	24.01.08	111.50	
338			Vasistha	KGM-44	15.02.08	119.00	
339			Vainateyam Extn.	KGM-45	11.01.11	78.00	
340			GS-29 Extn.	KGM-46	07.12.11	137.62	
341			GS-49 Extn.	KGM-47	06.09.13	77.68	**1285.80**
342		Cauvery Off.	PBS-1-1 Extn.	CYM-32	10.04.09	96.83	**96.83**
343		Gujarat-Kutch	KD Field	GKM-1	01.04.11	430.00	
344			GK-28	GKM-2	10.10.11	1242.50	**1672.50**
						ONGC TOTAL	**54015.66**
345	OIL	Rajasthan	Dandewala (Jaisalmer)	ORJM-1	01.01.06	250.00	
346			Baghewala	ORJM-2	30.05.03	210.00	**460.00**
347		Assam-Arakan	Moran	OAM-1	01.11.06	429.42	
348			Moran Extn.	OAM-2	10.01.91	560.00	
349			Dum-Duma BK-A	OAM-3	26.11.09	98.42	
350			Nahorkatiya	OAM-4	04.02.04	1.42	
351			Nahorkatiya Extn.	OAM-5	10.01.91	165.76	
352			Hugrijan	OAM-6	10.01.01	725.20	
353			Dum-Duma BK-B	OAM-7	26.11.09	311.96	
354			Digboi	OAM-8	14.10.01	49.33	
355			Dum-Duma BK-C	OAM-9	26.11.09	85.47	
356			Dum-Duma BK-D	OAM-10	26.11.09	10.36	
357			Ningru	OAM-11	27.11.03	540.67	
358			Tinsukia	OAM-12	02.08.01	250.00	
359			Dibrugarh	OAM-13	06.08.01	186.00	
360			Borhapjan	OAM-14	07.08.01	87.00	
361			Dholiya	OAM-15	02.08.01	131.00	
362			Ningru Extension	OAM-16	04.06.03	75.00	
363			Chabua	OAM-17	12.06.02	189.00	
364			Tinsukia Extension	OAM-18	17.05.03	185.00	
365			Baghjan	OAM-19	14.05.03	75.00	
366			Mechaki	OAM-20	19.05.03	195.00	
367			Sapkaint (Murkong-NF)	OAM-21	24.12.07	105.00	
368			Mechaki Extension	OAM-22	06.07.10	9.00	
369			Borhat	OAM-23	13.08.13	81.00	**4546.01**
						OIL TOTAL	**5006.01**
370	CAIRN	K-G Off.	Ravva	—	28.10.94	331.26	
371		Gulf of Cambay	Lakshmi	—	07.07.98	121.06	
372			Gauri	—	—	50.70	
373			Ambe	—	—	107.47	
374			CBX	—	—	33.30	
375		Rajasthan	Mangala (RJ-ON-90/1)	—	21.06.05	1859.00	
376			Bhagyam-Shakti	—	15.11.06	430.17	
377			Kaameshwari West	-	27.10.09	822.00	**3754.96**
378	BG-RIL-ONGC	Mumbai Off.	Mid & South Tapti	—	22.12.94	1471.00	
379			Panna	—	22.12.94	430.00	
380			Mukta	—	22.12.94	777.00	**2678.00**
381	GEOENPRO	Assam-Arakan	Kharsang	—	21.10.97	10.00	**10.00**
382	CANORO	Assam-Arakan	Amguri	—	01.11.03	52.75	**52.75**
383	HOEC	Cambay	Asjol	—	09.04.96	15.00	
384			N. Balol	—	21.03.02	27.30	
385			Pramoda & Palej	—	21.09.05	7.64	
386		Cauvery Off.	PY-1	—	06.10.95	75.00	**124.94**
387	INTERLINK	Cambay	Baola	—	12.12.96	4.00	
388			Modhera	—	19.05.07	12.70	**16.70**

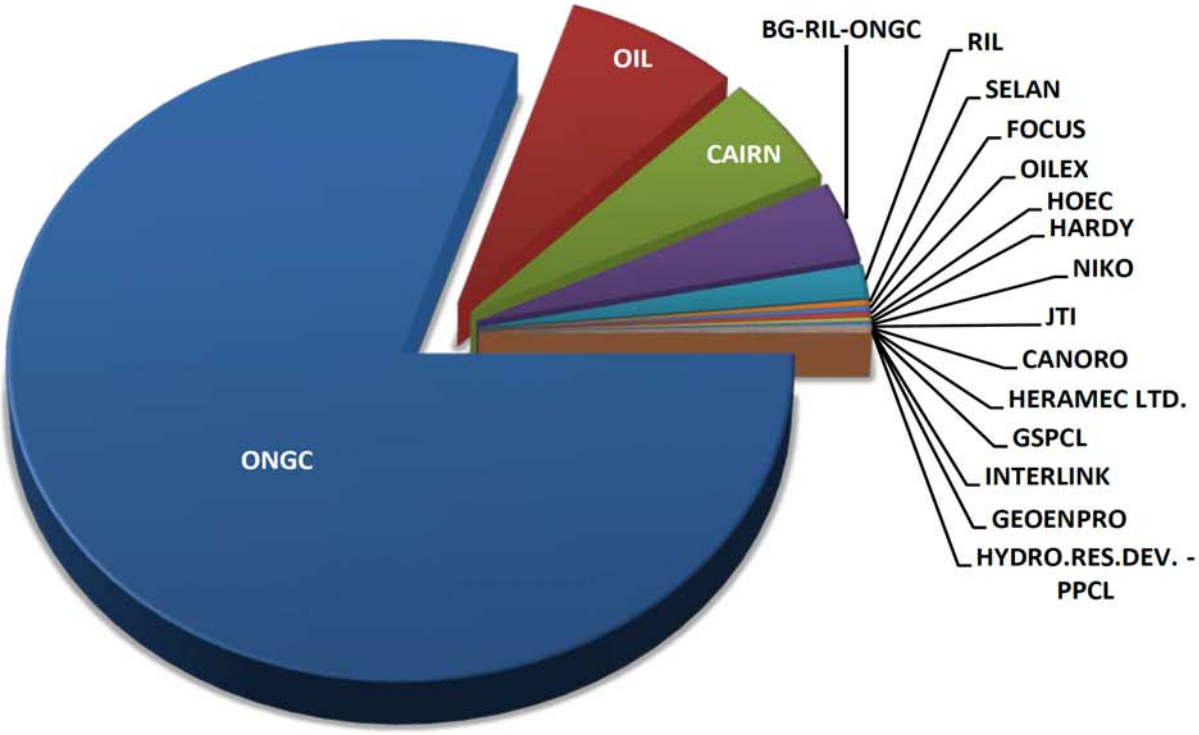
ML AREAS UNDER OPERATION BY NOC's AND PVT/JV COMPANIES

Sl. No.	COMPANY / OPERATOR	BASIN	BLOCK NAME	REF. NO. ON MAP	EFFECTIVE DATE OF ML	AREA (Sq. Km.)	TOTAL AREA (Sq. Km.)
389	JTI	Cambay	Wavel	—	20.02.95	9.00	
390			Dholka	—	20.02.95	48.00	**57.00**
391	NIKO	Cambay	Hazira	—	23.09.94	50.00	
392			NS-A	—	01.05.04	20.22	
393			Bheema	—	29.09.04	4.03	**74.25**
394	SELAN	Cambay	Lohar	—	13.03.95	5.00	
395			Indrora	—	13.03.95	130.00	
396			Bakrol	—	13.03.95	36.00	
397			Karjisan	—	23.11.05	5.00	
398			Ognaj	—	05.08.08	13.65	**189.65**
399	Heramec	Cambay	Kanawara	—	04.02.03	6.30	
400			Dholasan	—	27.02.03	8.80	
401			Allora	—	16.05.03	6.85	
402			N. Kathana	—	11.06.03	12.20	**34.15**
403	HYDROCARBON-RES. DEV.-PPC	Cambay	Sanganpur	—	27.02.02	4.40	**4.40**
404	OILEX	Cambay	Cambay	—	23.09.94	161.00	
405			Sabarmati	—	23.09.94	5.80	
406			Bhandut	—	23.09.94	6.00	**172.80**
407	GSPCL	Cambay	Unawa	—	19.05.03	5.65	
408			Ingoli Field (CB-ONN-2001/1)	—	—	15.71	**21.36**
409	FOCUS	Rajasthan	RJ-ON/6 (SGL)	—	—	176.00	**176.00**
410	HARDY	Cauvery Off.	CY-OS-90/1 (PY-3)	—	20.07.98	81.00	**81.00**
411	RIL	KG Off.	KG-DWN-98/3(D-1&3)	—	02.03.05	339.40	
412			KG-DWN-98/3 (D-26)	—	17.04.08	49.72	
413			KG-DWN-98/3 (D-2,6,19&22)	—	21.06.12	229.00	
414			KG-DWN-98/3 (D-34)	—	30.09.13	530.00	**1148.12**
						Pvt./JV TOTAL	**8596.08**
						GRAND TOTAL	**67617.75**

Grand Total of MLs awarded in the country : 67617.75 Sq.km
(NOC's & Pvt. / JV Companies)

ML AREAS UNDER OPERATION BY NOC'S AND PVT/JV COMPANIES

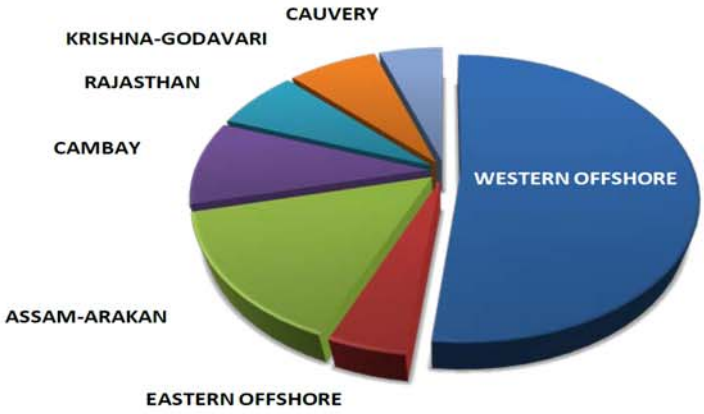
As on 01.04.14



COMPANY / OPERATOR	ML AREA	
	(Sq. Km.)	(%)
ONGC	54,015.66	79.88
OIL	5,006.01	7.40
CAIRN	3,754.96	5.55
BG-RIL-ONGC	2,678.00	3.96
RIL	1,148.12	1.70
SELAN	189.65	0.28
FOCUS	176.00	0.26
OILEX	172.80	0.26
HOEC	124.94	0.18
HARDY	81.00	0.12
NIKO	74.25	0.11
JTI	57.00	0.08
CANORO	52.75	0.08
HERAMEC LTD.	34.15	0.05
GSPCL	21.36	0.03
INTERLINK	16.70	0.02
GEOENPRO	10.00	0.01
HYDRO.RES.DEV. - PPCL	4.40	0.01
TOTAL	**67,617.75**	**100.00**

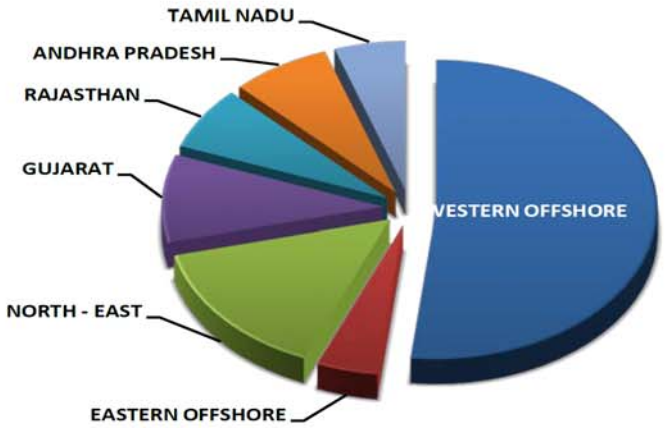
BASIN WISE DISTRIBUTION OF ML AREAS

As on 01.04.14



OFFSHORE/BASIN	ML AREA	
	(Sq.km)	(%)
OFFSHORE		
WESTERN	35,057.42	51.85
EASTERN	3,018.01	4.46
TOTAL OFFSHORE	**38,075.43**	**56.31**
ONLAND		
ASSAM - ARAKAN	10,059.48	14.88
CAMBAY	6,409.18	9.48
RAJASTHAN	4,632.02	6.85
KRISHNA-GODAVARI	4,927.66	7.29
CAUVERY	3,513.97	5.20
TOTAL ONLAND	**29,542.32**	**43.69**
GRAND TOTAL	**67,617.75**	**100.00**

STATE WISE DISTRIBUTION OF ML AREAS



OFFSHORE/BASIN	ML AREA	
	(Sq.km)	(%)
OFFSHORE		
WESTERN	35,057.42	51.85
EASTERN	3,018.01	4.46
TOTAL OFFSHORE	**38,075.43**	**56.31**
ONLAND		
NORTH - EASTERN STATES	10,059.48	14.88
GUJARAT	6,409.18	9.48
RAJASTHAN	4,632.02	6.85
ANDHRA PRADESH	4,927.66	7.29
TAMIL NADU	3,513.97	5.20
TOTAL ONLAND	**29,542.32**	**43.69**
GRAND TOTAL	**67,617.75**	**100.00**

7.4 Memorandum of Understanding (MoU's)

Sr. No.	MOU Signed Between	MOU Signed on	Valid upto	Objectives
1	Lebniz Institute of Marine Sciences (LIFM- Geomar) of Germany & DGH	30th August 2010	29th August 2015	Joint Research in Marine Gas Hydrates, Research and Development
2	GFZ German Research Centre for Geosciences & DGH	17th April 2012	16th April 2017	Collaborative research in Gas Hydrate Laboratory studies
3	Japan Oil, Gas Metals National Corporation (JOGMEC) & DGH	16th February 2007	15th February 2015	Exchanges of technical knowledge and information, workshops, meetings on Gas Hydrates Research and Development.
4	U.S. Geological Survey (USGS) of the Department of Interior of the United States of America & DGH	16th December 2008	Open ended	Resource exploration hazards and environmental issues associated with Gas Hydrates; Field studies & research for Gas hydrate
5	Department of Energy of United States of America & MOPNG, India	4th April 2008	3rd April 2013 (Under process of renewal)	Enhance & accelerate Gas Hydrate exploration
6	The Minerals Management Service of the Department of the Interior of the United States of America & DGH	21st August 2009	20th August 2014 (extension of MoU is underway)	Leasing/tendering programs, Resource estimation and Methane Hydrate R&D activities and human resource development.
7	Department of State (DoS), USA & MOPNG, India	6th November 2010	Open ended	Exchange of knowledge and expertise in the areas concerning Shale Gas resource characterization and assessment in India
8	Norwegian Petroleum Directorate & DGH	21st September 2012	20th September 2017	Petroleum Resource Management; Human Resource Development; Petroleum related R&D and technology sharing
9	IOCL & DGH	3rd January 2013	2nd January 2016	Oil Shale related studies

7.5 RECOVERY ENHANCEMENT TECHNIQUES IMPLEMENTED BY NOCs

Information as provided by ONGC

IOR/EOR

ONGC has taken various actions for augmenting/maintaining the crude oil and natural gas production. In addition to focus on repair of existing wells, artificial lift and stimulation of wells, following various efforts are being made / planned for enhancing crude oil, natural gas and Value Added Products (VAP) production in the fields being operated by ONGC in the Offshore and Onshore areas of the country:

OFFSHORE:

I. Improved Oil Recovery (IOR) Schemes

The components of IOR include augmentation of production facilities, drilling of additional in-fill wells to reduce the well spacing, rehabilitation of old wells by approaching new/ extended area to reach inter platform areas for production and drilling of additional wells through clamp-on structures on existing well platforms.

Completed Projects

1. **Additional development of Heera Part-I** was completed in November 2003. The scheme envisages an incremental oil and gas production of 3.19 MMT and 0.55 BCM respectively by the year 2020.
2. **IOR at Neelam field** has been completed in June 2005. The scheme envisages an incremental oil and gas production of 2.06 MMT and 1.24 BCM respectively by the year 2020.
3. **Redevelopment project of Mumbai High North (MHN) L-III** reservoir envisages an incremental oil and gas production of 23.25 MMT and 6.1 BCM respectively by the year 2030. The project was completed in December 2006.
4. **Redevelopment project for Mumbai High South (MHS) L-III** reservoir envisages an incremental oil and gas production of 33.85 MMT and 10.26 BCM respectively by the year 2030. The project was completed in May 2007.
5. **Redevelopment of Heera& South Heera Fields** in Western Offshore. The project envisages an incremental oil and gas production of 10.685 MMT and 2.265 BCM respectively by the year 2030. The project was completed in November 2011.
6. **Mumbai High South Redevelopment Project Phase-II:** The project envisages an incremental Oil & gas production of 18.31 MMT and 2.70 BCM respectively by 2029-2030.The project was completed on 30.04.2014.
7. **Mumbai High North Redevelopment Project Phase-II:** The project envisages an incremental Oil & gas production of 17.354 MMT and 2.987 BCM respectively by 2029- 2030. The project was completed on 30.04.2014.

Projects under Implementation

- **Redevelopment of Heera and S Heera Fields Phase-II**: The project was approved on 07.03.2012. The scheme envisages incremental oil gain of 13.361 MMT and 1.665 BCM of gas by 2034-35. The total project, including drilling is expected to be completed by May 2015.

II. Enhanced Oil Recovery (EOR) Schemes–Under implementation

- **Pilot project of Simultaneous Water and Gas injection (SWAG)** in Mumbai High South (SH#1Z). Facilities completed in August 2008. Performance of identified production wells is being monitored for evaluation of impact of SWAG injection. Improved productivity observed in few SWAG wells and further monitoring is in progress.
- In NH Asset, SWAG surface facility completed. SWAG started in HE #4. The scheme is in operation and optimization of injection rates are in progress.

ONSHORE:

In ONGC onshore areas, most of the major producing fields (Kalol, Jhalora, Nawagam, Viraj, Sanand, Sobhasan, Jotana, Santhal, Ankleshwar etc. in Gujarat and Lakwa, Geleki, Rudrasagar in Assam) are old. These fields have crossed their plateau period of production and have entered the declining phase (a natural process in the production life of oil fields). It may also be noted that more than 85% of the crude oil production is coming from 32 fields (Major and Medium) which have an average age of over 30 years and have an average natural decline in production of 7-8%. In some of the fields it is as high as 15%. Globally accepted rate of production decline from matured fields is about 7-8%. However, ONGC has been able to restrict decline in production to less than global benchmark

Various activities such as work over jobs, well stimulation, artificial optimization, reservoir monitoring and reservoir pressure maintenance are being carried out on routine basis to limit the base decline. Notwithstanding the constraints of mature fields and sharp decline in base production, all out efforts are being made to increase crude oil production. Some of the initiatives taken/ being taken to enhance production from onshore fields are as under:

I. Improved Oil Recovery (IOR)/ Enhanced Oil Recovery (EOR) Schemes:

Completed Projects

1. **Lakwa-Lakhmani IOR Scheme** was completed in September 2013.The scheme envisages an incremental oil production of 3.061 MMT and gas production of 0.36 BCM by 2023-24.
2. **Geleki IOR Scheme** was completed in October 2013**.**The scheme envisages an incremental Oil & gas production of 4.761 MMT and 1.589 BCM (revised) respectively upto 2023-24.
3. **Rudrasagar IOR Scheme** was completed in February 2014. The scheme envisages an incremental Oil & gas production of 2.507 MMT and 0.393 BCM (revised) respectively up-to 2023-24.

II. Development Projects–Under implementation

1. **Ahmedabad Redevelopment Project:** The project envisages an incremental Oil & gas production of 5.855 MMT and 0.858 BCM respectively by 2024-25. Revamping of old surface facilities is under tendering and drilling of all 211 wells completed. The total project, including drilling is expected to be completed by December 2016.
2. **Mehsana Redevelopment Project:** The project envisages an incremental Oil production of 19.793 MMT by 2024-25. Revamping of old surface facilities is under tendering and drilling of balance wells is in progress. The total project, including drilling is expected to be completed by March 2017.
3. **Ankleshwar Redevelopment Project:** The project envisages an incremental Oil & gas production of 2.483 MMT and 6.034 BCM respectively by 2024-25. Revamping of old surface facilities is under tendering and drilling of all 75 wells completed. Production profile is under review and tendering has been put on hold for the time being.

Microbial EOR:

- As a part on patenting the R&D efforts in basic research arena, a Canadian Patent (Patent No. 2,531,963) for “A process for Enhanced Recovery of crude oil from oil wells using novel microbial consortium” has been granted jointly to IRS & TERI, Delhi by Canadian Intellectual Property Office.
- Besides, a Patent on ‘Process for Enhanced Recovery of Crude oil from oil wells at 91°C or higher temperatures using hyperthermophilic indigenous or injected microorganisms/ consortia.’ has been filed jointly by IRS and Agharkar Research Institute (ARI), Pune in March 2014.
- Collaborative work for development of microbial system for treatment of oil field produced water to make it suitable for reinjection into the oil reservoir is in progress. Bacterial consortium B12 which are nonpathogenic has been developed which has shown maximum Total Petroleum Hydrocarbon

(TPH) reduction. A maximum of 97.87% reduction in TPH and Chemical Oxygen Demand (COD) removal efficiency of 79.17% has been achieved under lab conditions with retention time of 24 hours indicating suitability for reinjection.

- Laboratory studies of using MEOR process sequentially for recovery of heavy oil in Lanwa Field carried out. The success of the jobs in terms of reduction in water cut and decrease in viscosity was confirmed. Laboratory studies and core flood displacement studies of biodegradation of oil by new cultures from TERI e.g. Lanwa#137, Viraj#35, Bechraji#90, Linch#63 & Limbodra#146 were carried out for application in various fields of ONGC.
- Using S2 consortium, incremental oil gain of ~ 4330 m^3 was achieved in 12 wells of Ankleshwar Asset in 2013-14. Positive response has been observed in terms of either increased withdrawal rate or decrease in water cut resulting into higher oil rate after MEOR job in most of the wells. The success of the jobs is 75%. So far, MEOR job using in-house developed S2 consortium have been done in 125 wells of various fields of ONGC with oil gain of approximately 30,000m^3 resulting in average oil gain per job of around 250m^3.
- Paraffin mitigation jobs have been implemented in 193 wells of ONGC and five wells of Oil India Limited so far. More than 80 % of the jobs have successfully mitigated the deposition of thick layers of wax. Besides preventing wax deposition, the treatment has also showed improvement in oil gain in some of wells. The average scrapping free period achieved after the job has been found to be around 5-6 months against the scrapping requirement of daily/alternate day/weekly etc. PDB job has also been successful for wells flowing from high temperature reservoirs as in Gandhar and Ankleshwar fields.
- Laboratory studies on Microbial EOR in Water Flood Mode in K-V sand of Wadu-Paliyad Field of Ahmedabad Asset carried out on core and sand column of K-V sand of KLL#546. Before going for flood mode, Microbial EOR jobs planned in huff-n-puff mode in one/ two wells in the proposed pilot area.

Chemical EOR:

ASP pilot in Kalol field (sand XII) was commissioned in January 2014. Baseline parameters of producer wells have been established for the monitoring of pilot. Concentration of chemicals, Injection rate and turbidity are being maintained in line with the recommended parameters.

Thermal EOR:

Simulation of Cyclic Steam Stimulation (CSS) through well bore modelling has been carried out for the first time in ONGC for production enhancement and improvement of recovery of Lanwa Field. To enhance production from the Lanwa field, 28 development locations including 12 CSS locations on the basis of IRS simulation study have been identified for drilling. The total incremental oil envisaged from two cycles of CSS in 12 wells is around 0.2 MMm3 in a period of 3 ½ years.

Information as provided by OIL

IOR/EOR

- Currently pressure maintenance, i.e. water injection is being carried out in 13 reservoirs in the fields of Greater Nahorkatiya, Moran, Greater Jorajan, Greater Shalmari and Central Small Oilfields for improved oil recovery. The terminal water injection rate for 2013-14 was 9124 klpd and the cumulative water injection was 3,330,302 kls.
- Water injection has been initiated for the first time in an Eocene reservoir in Kamkhat-1 Block on a pilot scale from September 2013. Moreover, with recommendations from reservoir simulation studies, actions have been taken to begin water injection in Makum – North Hapjan (Barail) and Dikom (Eocene) reservoirs.

- OIL is also currently in the process of initiating a Joint Industry Project (JIP) with Herriot-Watt University, Edinburgh, UK on 'Improved Oil Recovery by Carbonated Water Injection (CWI)'. The three year research project will study the applicability of carbonated (CO2-enriched) water injection which suggests to be a promising and cost-effective alternative EOR method.
- In order to strategically manage increasing volumes of produced water and to reduce the volumes of fresh water from shallow aquifer, an initiative to carry out Produced Water Re-injection (PWRI) to achieve targeted voidage replenishment ratios is being envisaged.
- The well Uriamguri-1 has been selected for a pilot-project for heavy/HPP oil production.
- Studies have also been undertaken for possible implementation of Alkaline Surfactant Polymer flooding (EOR) for which two reservoirs have been shortlisted.
- Introduction of Horizontal Drilling technology in gas cusping/water coning prone reservoirs have also resulted in 2-3 times oil and gas production potential over conventional vertical wells, which has also aided in arresting sand ingress problems resulting in improved Ultimate Recoveries.
- Reservoir simulation study to formulate optimum depletion strategy (including feasibility of implementation of IOR/EOR) in all the major producing fields/assets is being conducted as a continuous process.
- The Microbial Enhanced Oil Recovery ("MEOR") method is planned to be implemented in a few wells.
- Possibility of fit-for-purpose technologies like Radial Drilling, Extended Reach Drilling as well as Multilaterals are also being examined to drain hydrocarbon potential from the hitherto inaccessible reserves.
- Various other production enhancement techniques in order to obtain sustained levels of productivity viz., Gravel Pack/Sand Screens to mitigate sand ingress, Tubing Conveyed Perforations (TCP) in underbalanced condition, Hydraulic Fracturing to improve flow characteristics, Water Shut-offs to reduce offending produced water have also been initiated.
- A study has also been initiated with IOGPT, ONGC to examine optimization of artificial lift techniques and de-bottlenecking of surface network facilities

7.6 NEW TECHNOLOGY USED/ADOPTED

Information as Provided by ONGC

To remain abreast with the latest technology, ONGC has been organizing Technology Expositions, sponsoring its executives to various International Conferences/ Symposia and undertaking rigorous in-house technology scouting. A number of such new technologies have been inducted in recent past for better subsurface imaging, enhancing in-house processing capacity software and hardware up gradation to fulfill intensive data processing requirements, induction of new interactive work stations for data integration and interpretation with latest volume visualization software and skill improvement of its G&G personnel. **The new technology adopted and its usefulness is given below :**

- **Radial 3D Saturn Probe:** This technology was used for the first time in the **well B-192-8-P1** to obtain pressure measurements, downhole fluid analysis and fluid sampling in extremely low mobility reservoir sections. The use of Saturn probe has overcome the limitations of MDT and dual packer formation tester
- **Radial Cutter Torch (RCT):** This technology was deployed for the first time in the well **NBP-D4** of Mumbai Offshore, to retrieve the 3 ½" tubing which is clamped with ESP cable in 9 5/8" casing. Due to the clamping of ESP cable and internal clearance less than 2 inches in this well, the conventional circular cutters could not be deployed. The RCT tool which is 1.75" in diameter uses neither explosives nor dangerous chemicals for cutting. The thermal Generator System initiates the RCT tool and directs the molten plasma for cutting the pipe.
- **Multi sample porosimeter-Permeameter KEYPHI:** This equipment will be used for measurement of petrophysical parameters at variable confining pressure.
- **UV-Vis Spectrophotometer Lambda-35 (PerkinElmer)** is used for analysis of petroporphyrins and other polycyclic aromatic compounds. These analyses are useful in the genetic correlation, depositional environment and maturity of crude oils and source sequences.
- **Thermo Fisher Nicolet iS5 FT-IR Spectrophotometer** used for the study of structural group analysis of complex hydrocarbon mixtures, genetic correlation of crude oils &bitumens and oil shale &kerogen analysis. The technology is rapid, economical & non-destructive analytical method.
- **AVS-700:**This equipment measures the mechanical parameters of rocks, like- Young's, Bulk, Shear moduli, and Poisson ratio which is a very vital at drilling and production stage of a reservoir rock. Studies of the rock samples from wells of Western onshore and KG-PG Basin were successfully completed and with this equipment and technology is completely absorbed.
- **Total Scanning Fluorescence Spectrophotometer,Hitachi-7000:** The instrument has been adopted geochemical analysis of surface soil samples which can detect the presence of petroleum related hydrocarbons in soil/sediment extracts. This equipment has been used for evaluating the liquid range hydrocarbons in near surface soil samples for geochemical prospecting.

Technology developed in house and absorbed during the year for EOR processes :

- Application of bacterial consortium using S_2 consortium: During 2013-14, this technology was applied in 12 wells of Ankleshwar Field and incremental oil gain of ~ 4330 m^3 was achieved. So far, oil gain of about 30,000m^3has been achieved from 125 wells. Of various fields of ONGC. Positive response has been observed in terms of either increased oil rate or decrease in water cut after MEOR job and the average success of these jobs is about 75%.
- Mitigation of paraffin deposition in well tubulars by application of Paraffin Degrading Bacteria (PDB) jobs were carried out in fields of Mehsana.The average scrapping free period achieved after the job has been found to be around 5-6 months against the scrapping requirement of weekly/fortnightly etc. PDB job has also been successful in wells of high temperature reservoirs as in Gandhar and Ankleshwar fields.

- Collaborative work for development of microbial system for treatment of oil field produced water to make it suitable for reinjection into the oil reservoir has been carried out and the process is planned to be field tested in Limbodra GGS-II.
- Studies for using MEOR process for recovery of heavy oil was carried out and has been field tested in Lanwa Field. The success of the jobs in terms of reduction in water cut and decrease in viscosity has been obtained. Incremental oil gain from MEOR jobs in heavy oil of Lanwa field is ~400m^3 in FY 2013-14.
- Studies for scale removal and treatment design for effluent lines of Kalol field were carried out and the recommended formulations were successfully applied in GGS-VII of Kalol field.
- An incremental oil gain of about 51000 m^3 and reduction in water production (effluent) by about 60000 m^3 was achieved through water control and profile modification jobs carried out during past two years (2012-14) using in house chemical formulations in fields of Ahmedabad, Ankleshwar and Cauvery with 70% average success ratio of jobs.
- Development of Lanwa field by application of Cyclic Steam Stimulation (CSS) under current reservoir conditions was studied. Study indicates total incremental oil about 0.2 MMm^3 in a period of 3 ½ years through CSS in 12 wells.
- Hybrid EOR: The Cyclic Steam Stimulation (CSS) followed by In-Situ Combustion(ISC) has been applied in combination with infill wells of South Lanwa and North Balol field. This has indicated potential higher recovery of oil from the wells.

New technology adopted to enhance Production

- ESP installation is being done in the wells of NBP (D1) field of Western offshore and as on date 15 nos. of ESP's have been installed.
- **CesiumFormate based completion fluid:** This is for the first time this specialized completion fluid has been used in Mumbai Offshore in C-24 and C-39 cluster wells and is useful in successful gravel pack completion.
- **Expandable sand screen**: Carried out Successful Sand control job in North Tapti with Expandable Sand Screen (ESS) in lower Mahim pay.
- **Stimulation of long drain-holes :**Effective Stimulation of long-drain holes in heterogeneous carbonate reservoirs is being done by designing acid treatment jobs with diversion ability.
- **H_2S Adsorber/H_2S removal system**: Commissioned H_2S Adsorber/H_2S removal system augmenting the existing IUG system for Gas Sweetening at VSEA Offshore Unmanned Platform for ensuring safety.
- **Surface Controlled Auto Gas Lift System (SCAGL):** The system provided variation of GLV opening from surface control for activating the well with required gas quantity initially. This has helped in early activation of wells and also enables to sustain production through optimization of required gas injection quantity.
- **External cementation packer** was used in well casing of Vasai East: The equipment not only saved the well with good cementation behind casing but also saved Rig Time and ensured successful completion of the well.
- **Inflow Control Device (ICD)**: State-of-the–art technology was provided by the Statoil, Norway. The technology was introduced on trial basis in pilot study of thin Oil Rim wells of Bassein formation.
- **CO_2 tracer survey:** New technologies for Gas lift surveillance "**CO_2 tracer survey"** from M/s. Weatherford introduced in Mumbai Offshore. This technology provides a simple, more efficient, non-interving method for trouble shooting a gas lift well system
- **StethoScope 825 :** A new technology **i.e "StethoScope 825"** a new generation FPWD tool introduced in Mumbai offshore which allows optimising the mud weight to ensure safe and efficient drilling and in turn the well bore stability.
- **Hollow glass sphere** mud for drilling through sub-hydrostatic sections.

- **Periscope** for proper placement of horizontal drain hole in thin sub-layers of the reservoir.
- **Multi-lateral level-II completion** technology has been successfully implemented in the wells for different sub layers of Heera field.
- **Acid diversion using ball sealers**: Implementation in high water cut wells in Mumbai high field has shown significant oil gain.
- **Finite Element Analysis** of tubular joints of offshore jacket platforms. With the help of this higher level analysis, under water joint inspection of offshore jackets can be optimized.
- In Mehsana Asset, open hole GP (Gravel Pack) completions in 8 ½" and 12 ¼" holes are done in Lanwa (1 well), Bechraji (3 wells) and Santhal (5 wells) fields which has resulted in oil gain. This reduces drawdown and restrict preferential movement of water due to adverse mobility in heavy oil fields.
- Sandface chemical dozing is being done for improved flow assurance in Mehsana Asset to produce heavy viscous crude oil from heavy fields with encouraging results.
- Switched over lift mode from SRP (Sucker Rod Pumps) to PCP (Progressive Cavity Pumps) for lifting of viscous and heavy oil effectively from wellbore in Mehsana Asset. As on 01.04.2014, 28 wells are on production in viscous reservoirs using PCP lifting method.
- Auto gas lift method utilizing HP gas directly from wells is under implementation in Nandasan field of Mehsana Asset. 10 wells have been completed on auto gas lift utilizing the high pressure gas from wells in the same field without compression of the gas.
- VFD (Variable Frequency Drive) installed for the 1st time to control SPM of SRP as per the productivity of well. The use of VFD will result in substantial reduction of power consumption in SRPs along with reduction in maintenance and consumption of V-belts.
- Automatic intermittent gas lift system installed and integrated with SCADA at Kalol GGS-II in the Ahmedabad Asset.
- Plunger lift commissioned successfully in 5 wells in Kalol field, Ahmedabad Asset for improving productivity of intermittent gas lift wells.
- Electrical Submersible Pump (ESP) commissioned in 5 wells of Ahmedabad Asset.
- LWD (Logging While Drilling) and periscope inducted for first time in Mehsana Asset for proactive geo-steering and optimal well placement of horizontal wells. The technology has been used in placement of 13 horizontal wells, for exploitation of viscous oil in areas of adverse mobility and also flue gas saturated regions of ISC fields.
- Periscope technology was deployed for the first time in Assam Asset in horizontal well LKFR_H. The technology was used for precise placement of the drain-hole in TS-3.
- A horizontal well RSDP in Rudrasagar field of Assam Asset drilled and completed.
- Periscope technology was introduced in Ahmedabad Asset in well KLPK (K#682) to place the drain hole section within the desired sweet zone.
- Inducted Rotary Steerable System (RSS) tool with LWD (Logging While Drilling) system and successfully completed three high drift directional wells in Tripura Asset.
- Sucessfully drilled and completed well RO#58 with dual string in 2 zones.
- KCL-PHPA Polymer mud system is being used in 12 ¼" and 8 ½" phases which has helped in reducing the well complications in Tripura asset.
- In Cambay Sub-asset three high drift high angle (nearly horizontal) wells drilled using Logging While Drilling(LWD) tool as these wells were falling under town or industrial area.
- Under a unique technological partnership between WSS, Ahmedabad & M/s Schlumberger a contract was signed for taking up hydro-fracturing of tight sand oil wells of Western Onshore Assets. Well AM#146 was successfully hydro-fractured with improved production.

- Hydraulic fracturing jobs are being carried out to improve productivity of tight sands in Cauvery Asset by WSS, Ahmedabad. 4 wells were successfully hydro fractured in phase-I with substantial oil gain.
- Ultrasound stimulation treatment was implemented in 7 identified wells in Nandasan, North Kadi & Jotana fields of Mehsana Asset as per Contract agreement with M/S Quantum Application Hydrocarbon Mumbai. Production from all stimulated wells is under observation for incremental benefits.
- Microbial Enhanced Oil Recovery (MEOR) job was implemented in 2 wells each Rig-less and with rig in Lanwa field under joint co-operation with IRS and OTBL. Also, action plan for MEOR job for exploitation of heavy oil in Charada NELP field is firmed up for field implementation.
- Rational deployment of CHFR logs (Cased Hole Formation Resistivity) and RMT logs (Reservoir Monitoring Tool) for exploitation of un-drained and by-passed oil from wells in matured fields of Mehsana Asset has paid rich dividends. During the last 3 years, 97 such jobs were carried out with substantial oil gain.
- In Cambay Sub-asset a Mobile ETP was installed at Akhol EPS and subsequently commenced effluent treatment from 18.02.2014.
- Assam Asset has commissioning a Sand Trap at R#78 well manifold in RDS Field to mitigate issue of flow of fine sands in the wells of the field.
- Cyclone separator along with modified filter scrubber installed for supplying clean gas to OTPC, Palatana in Tripura.
- Effective MPBT job (Mechanical Plug Back Tool) for water shut-off carried out in 2 gas wells in Rajahmundry Asset resulted in substantial gas gain.
- Pilot project of Bi-fuel technology was implemented in Rajahmundry Asset, for utilization of associated gas from the cluster well to run drilling rig power packs (in other cluster well) thereby also avoiding gas flaring.

Information as Provided by OIL

Following are the new technology used / or being adopted during the year for exploration / development with their benefits.

Technology used

i. Oil Field Manager (OFM):

OFM license was recently acquired and installed in Reservoir Monitoring & Management Section. OFM software enables early detection and diagnosis of production problems for any asset type (conventional, unconventional, thermal, etc.). The multiple visualization canvases (charts, reports, and maps) and fast filtering capabilities enable improved field surveillance by promptly identifying the well or wells where intervention is required to increase production.

ii. SCAL:

SCAL helps to transform the laboratory data into relative permeability and capillary pressure curves suitable for input into simulators such as ECLIPSE and assign these curves to grid cells (according to a set of user defined rules, for example as a function of porosity, rock types etc.). The relative permeability curves generated using SCAL can directly be exported into Petrel RE/ Eclipse to be used in a simulation run.

iii. GEOLOG software:

GEOLOG software (Image log interpretation module) license was updated to GEOLOG-7.

Benefits: Image log processing and interpretation with drag and drop data loading facility from various format log files, which significantly reduce data loading time and improves accuracy.

iv. Mechanical Plug- Back Tool (MPBT):

MPBT is an anchored elastomeric plug which is run through tubing and set in casing to plug off fluid flow in the casing below the plug.

Benefits: Can be used without rig through tubing re-completions, using a mast or a crane in live conditions.

The plug is drillable and can be set in open hole and at gravel pack screens. Saves rig time, when the tubing or the production string cannot be pulled out.

New Technology being adopted:

i. New Reservoir Engineering Software:

Acquisition process for 03 (Three) numbers of Reservoir Engineering software, viz. MEPO, PVT SIM, and PROSPER is nearing completion. The said softwares will help Reservoir Engineers in various analytical as well as numerical studies.

Acquisition of 03 (Three) add-on module of Petrel RE and a Composition Simulator software is also under progress.

Hydrofracturing in low permeability sands.

ii. Compact Combo Logging Tool:

Reservoir delineation, hydrocarbon saturation determination and imaging, movable-hydrocarbon determination, location of porous and permeable zones, gas detection, porosity analysis, lithology determination, well-to-well correlation, thin-bed analysis

iii. Quick Formation Pressure Tester (QFPT):

Pressure measurements and fluid mobilities in a fraction of the time required by multifunction formation testers, increase survey efficiency with minimized setting and retracting times, save time and cost with the elimination of additional wireline runs solely for acquiring pressure measurement data, reduced risk of sticking, reduced overall expenditure for pressure testing.

iv. Flow Scan Imager/ MAPS:

Unambiguous flow profiling in non vertical wells regardless of phase mixing or recirculation, More accurate flow measurements than possible with conventional logging tools in highly deviated and horizontal wells, three-phase flow rates computed in real time using dedicated algorithm.

v. Multi-Frequency Dielectric Scanner (DS):

This tool gives direct measurement of water volume independent of water resistivity (Rw), dielectric dispersion analysis for In situ measurement of rock texture using multiple frequencies in both invaded and non invaded zones, continuous Archie M-N exponent log from rock texture measurements for determining saturations beyond the invaded zone and continuous C.E.C log for shaly sand analysis using multi frequency dielectric dispersion analysis.

vi. TECHLOG software:

Techlog is a Windows based software platform intended to aggregate all the wellbore information. It allows the user to interpret any log and core data. It addresses the need for a single platform able to support all the wellbore data and interpretation integration workflows, reducing the need for a multitude of highly specialized tools. By bringing the whole workflow into a single platform risk and uncertainty can be assessed throughout the life of the wellbore.

vii. Motorized Tractor Services:

Conveyance of logging tools in highly deviated and horizontal wells, conveyance of logging tools in perforated casing, slotted liners, and gravel-pack screens and conveyance of logging tools in in-gauge barefoot completions.

viii. Elemental Capture Spectroscopy Logging (ECS/ GEM):

Integrated petro-physical analysis, clay fraction independent of gamma ray, spontaneous potential, and density neutron; matrix density and matrix neutron values for more accurate porosity calculation, mineralogy-based permeability estimates, coalbed methane bed delineation, producibility, and in situ reserves estimation.

New Technology adopted by PVT. / JV Operators under PSC Regime

CAIRN :

i) HPHT Drilling : The following technologies have been adopted **:**

a. Managed Pressure Drilling Equipment

b. WARP (micronized barite)

ii) For rig positioning at RC Platform : Real time positioning technology adopted which involved the following.

a. Sector Scan Sonar to measure distances online

b. Blue view Sonar to give continuous live moving images

c. USBL WSM beacons on the pipeline reflectors to show continuously the position of the pipeline & Mudmat.

BG INDIA :

I) Broadband Seismic Technology

Broadband Seismic Technology adopted for acquiring 2D seismic in MB-DWN-2010/1 block which will help in obtaining full bandwidth seismic frequencies from 2-300 Hz. This technology is aimed at improving imaging below Deccan basalts in deepwaters of Mumbai offshore basin. If successful, this technology can be used to explore a new play deeper in the Western Offshore.

II) Wells stimulation using "Green Fluid"

Matrix stimulation was done in Panna (PL wells) with a new stimulation fluid called GLDA (glutamic acid N, N-diacetic acid), known by its trade name Dissolvine Stimwell. It has several advantages over traditional acid treatments including its :

- tendency to penetrate the formation rather than waste itself on face dissolution at higher temperatures (potential increase in productivity index over HCl)
- status as a non-hazardous chemical
- low-toxicity chemical requiring no special handling; and
- simple treatment recipe (water is the only additive)

RIL :

3D Broadband seismic acquisition and processing over the MJ (D55) discovery area to aid in the appraisal and development of the MJ Discovery (D55). The broadband data will make available the low as well as the high frequency ranges required in order to resolve reservoir flow unit details and support inversion studies to describe and model MJ reservoir.

Year : 2013-2014

Sr.No	Ministry/Department/ Organisation	Quarter	Opening balance of Requests (as on start of Quarter)	No.of Requests Received during Quarter	Total no.of Requests (Column 3+4)	No.of Requests transferred to other PAs	Decisions where Applications for information rejected	Number of cases where disciplinary action taken against any officer in respect of administration of RTI Act	Total amount collected (fee+addl. Charges+penalty) (Rs.)	No. of times various Provisions were invoked while Rejecting Requests														
										Relevant Sections of RTI Act 2005														
										Section 8 (1)										Other Sections			
										(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(9)	(11)	(24)	(Others)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(27)
1	Ministry of Petroleum & Natural Gas																						
1.1	Directorate General of Hydrocarbons	1st Quarter (Apr 13-Jun13)	1	10	11	0	0 (0%)	0	280	0	0	0	0	0	0	0	0	0	0	0	2	0	1
		2nd Quarter (July 13-Sept 13)	11	35	46	2	0 (0%)	0	2420	0	0	0	0	0	0	0	0	0	0	0	2	0	0
		3rd Quarter (Oct 13-Dec13)	44	27	71	3	0 (0%)	0	20	0	0	0	0	0	0	0	0	0	0	0	3	0	0
		4th Quarter (Jan 14-Mar14)	68	21	89	1	0 (0%)	0	50	0	0	0	5	0	0	0	1	0	0	0	0	0	0

7.8 ENVIRONMENTAL PROTECTION, INITIATIVES & CLEARANCE

The steadfast growth of hydrocarbon exploration and development is inextricably linked with the timely grant of environment related clearances. In recent years, significant progress has been made in addressing key issues on environment related clearances for expeditious exploration and development of hydrocarbon to boost nation's energy need.

Ministry of Environment and Forest is working on the online environment clearance mechanism for industrial and infrastructure projects which will go fully online from July 1, 2014. This is a most encouraging step as it would expedite objectivity to the process of clearance and ensure timely implementation of projects. For facilitating preparation of EIA study, Ministry of Environment & Forests has published a technical EIA guideline manual for offshore and onshore Oil and Gas exploration, development and production incorporating standardized TORs.

The Portal address is: *environmentclearance.nic.in*

Further, Ministry of Environment and Forest is launching a similar e-window platform for forest-related approval from July 1. 2014 under Forest Conservation Act,1980. The online forest clearance portal will handle 'prior approval' of any project for diversion of forest land for non-forest purpose.

The Portal address is: *forestsclearance.nic.in*

As a step in simplifying the forest clearances, MOEF had drafted a proposal for simplification of procedure for obtaining approval under the Forest Conservation Act, 1980 for undertaking prospecting activities in forest land. DGH discussed the draft proposal of MOEF with the Association of Oil & Gas Operators (AOGO) and other E&P Operators and provided inputs of the sector to MOEF. Many of the DGH suggestions have been incorporated in the final Notification issued by MOEF on 14th March 2014 which is called "the Forest (Conservation) Amendment Rules, 2014. Processes of Forest Clearance as such have been simplified and made it time specific in respect to the recent MOEF Notification.

The highlights of this notification are as below:

I. Application to obtain prior approval under the Forest (Conservation) Act, 1980 for undertaking prospecting activities in the forest land will be submitted in the simplified form-C.

II. Keeping in view that only a small fraction of area located within a prospecting block is utilized for exploration activities, site inspection by concerned Regional Office of MoEF will be insisted only if the actual area of the forest land proposed to be utilized for construction of new roads/paths and for drilling of bore holes/sample collection pits etc. is more than 100 hectares

III. As the prospecting operations involve use of forest land for a very short period, area of forest land which is likely to experience temporary change in land use is exempted from the requirement of compensatory afforestation and payment of NPV. The forest land which experience permanent change in the land use due to prospecting activity shall only be considered for the purpose of compensatory afforestation and NPV.

IV. The proposals seeking prior approval under the Forest (Conservation) Act, 1980 for prospecting in forest land are exempted from the requirement of the submission of documentary evidence in support of settlement of rights in accordance with the provisions of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 stipulated in the circular dated 3rd August 2009 issued by the Ministry of Environment and Forests.

The promise of energy security is a challenge worth pursuing. It is a critical imperative for an economy of the nation that visions it. A dream is realizable only when the country starts exploring and producing hydrocarbons. To keep balance between conservation and development with utmost regard to environment, the environmental clearances should never be treated as an impediment to growth. These steps by the Govt. of India will lead for a rapid exploitation of hydrocarbon resources in the country to address the energy security in India.

Contribution to ecological restoration and environmental remediation by NOC's

Information as provided by ONGC

Bioremediation: Accidental oil spillages and the tank bottom sludge generated during the routine operations do pose threat to the environment. ONGC hence decided to look for environmental friendly options for the disposal and treatment. ONGC explored the biotechnological option i.e. bioremediation wherein the indigenous micro-organisms are isolated and enriched and harnessed on mass scale for application in the field. ONGC collaborated with The Energy and Resources Institute (TERI, India) for supplying necessary technology and resources for carrying out the project on bioremediation. In the year 2013-14, 25000 MT of oily waste was treated through this technique in ONGC.

Recycling of waste papers from ONGC offices

The paper waste generated from several ONGC offices is being recycled through NGOs like Bochansanwasi Shri Akhsar Purushottam Swaminarayan Sansthan (BAPS), Mumbai and CHINTAN, New Delhi.

Oil Spill Management

ONGC has tier-1 capability of combating oil spills of upto 700 tons. For combating oil spills of higher magnitude (Tier-III), membership of international response agency Oil Spill Response Limited (OSRL), U.K has been taken by ONGC.

ONGC is having MoU for pooling of resources with British Gas Explorations & Production (India) Ltd. (BGEPIL) in the west coast.

At East Coast, MoU is signed among operators, viz. RIL, Cairn & GSPC for pooling of resources in case of oil spill.

The MoU for acquiring Tier-I facility at MbPT has been signed between ONGC and other Participating Oil Companies (POC). ONGC is the major shareholders in this MoU with about 43% contribution. Participating Oil Companies (POC) include BPCL (Coordinator), IOCL, HPCL, ALL, RIL, Tata Power, CTTL, in addition to ONGC.

Information as provided by OIL

- Noise and illumination level measurement was carried at various installations as per OISD-GDN-166 & EP Act, 1986 guidelines.
- In order to prevent migration of drilling effluent to outside surrounding, OIL is putting up HDPE (High Density Poly Ethylene - Used as effluent pit lining) for Hazardous oil/waste/effluent disposal.
- Gen sets with acoustic enclosures were installed at various locations.
- The formation water produced along with crude oil are scientifically treated with oil soluble demulsifiers to separate oil and water. Settling time in the tanks was increased. The separated formation water is disposed off into selected disposal wells specially drilled for the purpose. Such wells have impermeable layers to prevent any vertical migration of disposed formation water to the surface. The water samples from the monitoring water wells in the vicinity of the disposal wells are regularly monitored.

- For abatement of noise pollution from Power Houses at drilling rigs, Oil Collecting Stations etc., noise barrier walls around the machinery generating noise are constructed.
- The public pollution complaints received were systematically attended and resolved amicably.
- Time to time ambient air quality monitoring are carried out in and around OIL's operational areas and other vulnerable places with the help of a mobile Air Quality Monitoring Van procured by OIL and also by engaging third parties.
- OIL was instrumental in carrying out the Bioremediation project in fields in collaboration with TERI.
- Environment audits were carried out in five major installations as per MoU.
- OIL was instrumental in bringing a system of e-waste management in the company which is being done for the first time.
- The municipal solid waste is being disposed as per Municipal solid waste (Management & Handling rules, 2000).

DGH Foundation Day Tree Plantation

7.9 XII PLAN E&P PROJECTIONS (2012-2017)

Extracts from "12th Five Year Plan (2012-17) Economic Sectors- Vol-II" published by Planning Commission, Government of India

Table A- Projection of Crude oil production in 12th Plan

(Figs. in MMT)

Company	2012-13*	2013-14*	2014-15	2015-16	2016-17	Total
ONGC	22.561	22.24	28.002	26.286	25.456	124.545
OIL	3.66	3.46	4.06	4.16	4.20	19.54
Pvt./JV	11.64	12.08	12.70	12.10	11.50	60.02
Total	**37.861**	**37.78**	**44.762**	**42.546**	**41.156**	**204.105**

* as per actual

Table B- Projection of Natural Gas production in 12th Plan

(Figs. in BCM)

Company	2012-13*	2013-14*	2014-15	2015-16	2016-17	Total
ONGC	23.55	23.28	26.7	28.2	38.7	140.43
OIL	2.64	2.62	4.0	4.1	4.2	17.56
Pvt./JV	14.49	9.50	16.5	18.5	21.0	79.99
Total	**40.68**	**35.4**	**47.2**	**50.8**	**63.9**	**237.98**
Total MMSCMD	**111.45**	**97**	**129**	**139**	**175**	**—**

* as per actual

The above projections of natural gas production in 12th plan are as revised vide MoPNG OM no Q-26012/3/2010-ED (Vol II) dated 4 May, 2012- "Revised Estimates of Domestic Natural Gas Production- 12th Plan"

TABLE - SUMMARY OF 12TH FIVE YEAR PLAN

ACTIVITY	UNIT	ONGC	OIL	Private/JV	Total
Seismic Surveys 2D	Kilometer	28170	6850	103954	**138974**
Seismic Surveys 3D	Sq. Km	24163	8364	49961	**82488**
Exploration Wells	Nos.	611	174	525	**1310**
Reserves Accretion IIH	MMTOE	1080	78.14	728	**1886.14**
Ultimate Hydrocarbon Reserves Accretion	MMTOE	360	26	341	**727**

7.10 BP GLOBAL STATISTICAL REVIEW 2014

OIL PROVED RESERVES

Source:http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy.html

Thousand million barrels	1993	2003	2012	2013	2013 Share of Total
US	30.2	29.4	44.2	44.2	2.6%
Canada	39.5	180.4	174.3	174.3	10.3%
Mexico	50.8	16.0	11.4	11.1	0.7%
Total North America	**120.5**	**225.8**	**229.9**	**229.6**	**13.6%**
Argentina	2.2	2.7	2.4	2.4	0.1%
Brazil	5.0	10.6	15.3	15.6	0.9%
Colombia	3.2	1.5	2.2	2.4	0.1%
Ecuador	3.7	5.1	8.4	8.2	0.5%
Peru	0.8	0.9	1.4	1.4	0.1%
Trinidad & Tobago	0.6	0.9	0.8	0.8	◆
Venezuela	64.4	77.2	297.6	298.3	17.7%
Other S. & Cent. America	0.9	1.5	0.5	0.5	◆
Total S. & Cent. America	**80.7**	**100.4**	**328.6**	**329.6**	**19.5%**
Azerbaijan	n/a	7.0	7.0	7.0	0.4%
Denmark	0.7	1.3	0.7	0.7	◆
Italy	0.6	0.8	1.4	1.4	0.1%
Kazakhstan	n/a	9.0	30.0	30.0	1.8%
Norway	9.6	10.1	9.2	8.7	0.5%
Romania	1.0	0.5	0.6	0.6	◆
Russian Federation	n/a	79.0	92.1	93.0	5.5%
Turkmenistan	n/a	0.5	0.6	0.6	◆
United Kingdom	4.5	4.3	3.0	3.0	0.2%
Uzbekistan	n/a	0.6	0.6	0.6	◆
Other Europe & Eurasia	61.8	2.3	2.1	2.2	0.1%
Total Europe & Eurasia	**78.3**	**115.5**	**147.4**	**147.8**	**8.8%**
Iran	92.9	133.3	157.0	157.0	9.3%
Iraq	100.0	115.0	150.0	150.0	8.9%
Kuwait	96.5	99.0	101.5	101.5	6.0%
Oman	5.0	5.6	5.5	5.5	0.3%
Qatar	3.1	27.0	25.2	25.1	1.5%
Saudi Arabia	261.4	262.7	265.9	265.9	15.8%
Syria	3.0	2.4	2.5	2.5	0.1%
United Arab Emirates	98.1	97.8	97.8	97.8	5.8%
Yemen	2.0	2.8	3.0	3.0	0.2%
Other Middle East	0.1	0.1	0.3	0.3	◆
Total Middle East	**661.9**	**745.7**	**808.7**	**808.5**	**47.9%**
Algeria	9.2	11.8	12.2	12.2	0.7%
Angola	1.9	8.8	12.7	12.7	0.8%
Chad	-	0.9	1.5	1.5	0.1%
Rep. of Congo (Brazzaville)	0.7	1.5	1.6	1.6	0.1%
Egypt	3.4	3.5	4.2	3.9	0.2%
Equatorial Guinea	0.3	1.3	1.7	1.7	0.1%
Gabon	0.7	2.3	2.0	2.0	0.1%
Libya	22.8	39.1	48.5	48.5	2.9%
Nigeria	21.0	35.3	37.1	37.1	2.2%
South Sudan	-	-	3.5	3.5	0.2%
Sudan	0.3	0.6	1.5	1.5	0.1%
Tunisia	0.4	0.6	0.4	0.4	◆
Other Africa	0.6	0.6	3.7	3.7	0.2%
Total Africa	**61.2**	**106.2**	**130.6**	**130.3**	**7.7%**
Australia	3.3	3.7	3.9	4.0	0.2%
Brunei	1.3	1.0	1.1	1.1	0.1%
China	16.4	15.5	18.1	18.1	1.1%
India	**5.9**	**5.7**	**5.7**	**5.7**	**0.3%**
Indonesia	5.2	4.7	3.7	3.7	0.2%
Malaysia	5.0	4.8	3.7	3.7	0.2%
Thailand	0.2	0.5	0.4	0.4	◆
Vietnam	0.6	3.0	4.4	4.4	0.3%
Other Asia Pacific	1.1	1.4	1.1	1.1	0.1%
Total Asia Pacific	**38.8**	**40.5**	**42.1**	**42.1**	**2.5%**
Total World	**1041.4**	**1334.1**	**1687.3**	**1687.9**	**100.0%**

NOTE: ◆ Less than 0.05% & ^ Less than 0.05

OIL PRODUCTION

Thousand barrels daily	1993	2003	2012	2013	2013 share of Total
US	8583	7362	8892	**10003**	10.8%
Canada	2189	3003	3740	**3948**	4.7%
Mexico	3115	3795	2911	**2875**	3.4%
Total North America	**13887**	**14160**	**15543**	**16826**	**18.9%**
Argentina	630	900	665	**656**	0.7%
Brazil	664	1548	2149	**2114**	2.7%
Colombia	458	541	944	**1004**	1.3%
Ecuador	353	420	505	**527**	0.7%
Peru	127	89	107	**104**	0.1%
Trinidad & Tobago	134	175	120	**118**	0.1%
Venezuela	2592	2868	2643	**2623**	3.3%
Other S. & Cent. America	83	149	140	**146**	0.2%
Total S. & Cent. America	**5040**	**6691**	**7274**	**7293**	**9.1%**
Azerbaijan	207	308	919	**931**	1.1%
Denmark	168	368	204	**178**	0.2%
Italy	96	116	112	**116**	0.1%
Kazakhstan	507	1111	1724	**1785**	2.0%
Norway	2377	3264	1917	**1837**	2.0%
Romania	144	124	83	**87**	0.1%
Russian Federation	7119	8602	10643	**10788**	12.9%
Turkmenistan	92	203	222	**231**	0.3%
United Kingdom	2135	2296	949	**866**	1.0%
Uzbekistan	94	151	68	**63**	0.1%
Other Europe & Eurasia	597	495	390	**398**	0.5%
Total Europe & Eurasia	**13537**	**17037**	**17231**	**17281**	**20.3%**
Iran	3712	4002	3751	**3558**	4.0%
Iraq	455	1344	3116	**3141**	3.7%
Kuwait	1945	2370	3165	**3126**	3.7%
Oman	785	822	918	**942**	1.1%
Qatar	460	949	1966	**1995**	2.0%
Saudi Arabia	8962	10141	11635	**11525**	13.1%
Syria	566	652	171	**56**	0.1%
United Arab Emirates	2443	2722	3399	**3646**	4.0%
Yemen	209	451	180	**161**	0.2%
Other Middle East	53	48	183	**208**	0.2%
Total Middle East	**19591**	**23501**	**28484**	**28358**	**32.2%**
Algeria	1329	1826	1537	**1575**	1.7%
Angola	504	870	1784	**1801**	2.1%
Chad	-	24	101	**94**	0.1%
Rep. of Congo (Brazzaville)	185	208	289	**281**	0.4%
Egypt	941	750	715	**714**	0.8%
Equatorial Guinea	5	291	316	**311**	0.4%
Gabon	305	274	245	**237**	0.3%
Libya	1402	1485	1509	**988**	1.1%
Nigeria	2024	2233	2417	**2322**	2.7%
South Sudan	-	-	31	**99**	0.1%
Sudan	2	262	103	**122**	0.1%
Tunisia	99	68	67	**62**	0.1%
Other Africa	166	141	233	**211**	0.3%
Total Africa	**6961**	**8431**	**9349**	**8818**	**10.1%**
Australia	572	664	489	**416**	0.4%
Brunei	175	214	159	**135**	0.2%
China	2892	3406	4155	**4180**	5.0%
India	**590**	**802**	**894**	**894**	**1.0%**
Indonesia	1588	1176	918	**882**	1.0%
Malaysia	645	760	670	**657**	0.7%
Thailand	96	244	450	**459**	0.4%
Vietnam	128	361	348	**350**	0.4%
Other Asia Pacific	274	192	285	**260**	0.3%
Total Asia Pacific	**6961**	**7819**	**8370**	**8232**	**9.5%**
Total World	**65978**	**77639**	**86251**	**86808**	**100.0%**

NATURAL GAS : PROVED RESERVES

Trillion Cubic Metres	1993	2003	2012	2013	2013 share of Total
US	4.6	5.4	8.7	9.3	5.0%
Canada	2.2	1.6	2.0	2.0	1.1%
Mexico	2.0	0.4	0.4	0.3	0.2%
Total North America	**8.8**	**7.4**	**11.1**	**11.7**	**6.3%**
Argentina	0.5	0.6	0.3	0.3	0.2%
Bolivia	0.1	0.8	0.3	0.3	0.2%
Brazil	0.1	0.2	0.5	0.5	0.2%
Colombia	0.2	0.1	0.2	0.2	0.1%
Peru	0.3	0.2	0.4	0.4	0.2%
Trinidad & Tobago	0.2	0.5	0.4	0.4	0.2%
Venezuela	3.7	4.2	5.6	5.6	3.0%
Other S. & Cent. America	0.2	0.1	0.1	0.1	◆
Total S. & Cent. America	**5.4**	**6.8**	**7.7**	**7.7**	**4.1%**
Azerbaijan	n/a	0.9	0.9	0.9	0.5%
Denmark	0.1	0.1	0.0	0.0	◆
Germany	0.2	0.2	0.1	0.0	◆
Italy	0.3	0.1	0.1	0.1	◆
Kazakhstan	n/a	1.3	1.5	1.5	0.8%
Netherlands	1.7	1.4	0.9	0.9	0.5%
Norway	1.4	2.5	2.1	2.0	1.1%
Poland	0.2	0.1	0.1	0.1	0.1%
Romania	0.4	0.3	0.1	0.1	0.1%
Russian Federation	n/a	30.4	31.0	31.3	16.8%
Turkmenistan	n/a	2.3	17.5	17.5	9.4%
Ukraine	n/a	0.7	0.6	0.6	0.3%
United Kingdom	0.6	0.9	0.2	0.2	0.1%
Uzbekistan	n/a	1.2	1.1	1.1	0.6%
Other Europe & Eurasia	35.6	0.4	0.3	0.2	0.1%
Total Europe & Eurasia	**40.5**	**42.7**	**56.5**	**56.6**	**30.5%**
Bahrain	0.2	0.1	0.2	0.2	0.1%
Iran	20.7	27.6	33.6	33.8	18.2%
Iraq	3.1	3.2	3.6	3.6	1.9%
Kuwait	1.5	1.6	1.8	1.8	1.0%
Oman	0.2	1.0	0.9	0.9	0.5%
Qatar	7.1	25.3	24.9	24.7	13.3%
Saudi Arabia	5.2	6.8	8.2	8.2	4.4%
Syria	0.2	0.3	0.3	0.3	0.2%
United Arab Emirates	5.8	6.0	6.1	6.1	3.3%
Yemen	0.4	0.5	0.5	0.5	0.3%
Other Middle East	0.0	0.1	0.2	0.2	0.1%
Total Middle East	**44.4**	**72.4**	**80.3**	**80.3**	**43.2%**
Algeria	3.7	4.5	4.5	4.5	2.4%
Egypt	0.6	1.7	2.0	1.8	1.0%
Libya	1.3	1.5	1.5	1.5	0.8%
Nigeria	3.7	5.1	5.1	5.1	2.7%
Other Africa	0.7	1.0	1.2	1.2	0.7%
Total Africa	**10.0**	**13.9**	**14.4**	**14.2**	**7.6%**
Australia	1.0	2.4	3.8	3.7	2.0%
Bangladesh	0.3	0.4	0.3	0.3	0.1%
Brunei	0.4	0.3	0.3	0.3	0.2%
China	1.7	1.3	3.3	3.3	1.8%
India	**0.7**	**0.9**	**1.3**	**1.4**	**0.7%**
Indonesia	1.8	2.6	2.9	2.9	1.6%
Malaysia	1.8	2.5	1.1	1.1	0.6%
Myanmar	0.3	0.4	0.3	0.3	0.2%
Pakistan	0.7	0.8	0.6	0.6	0.3%
Papua New Guinea	^	^	0.2	0.2	0.1%
Thailand	0.2	0.4	0.3	0.3	0.2%
Vietnam	0.1	0.2	0.6	0.6	0.3%
Other Asia Pacific	0.3	0.5	0.3	0.3	0.2%
Total Asia Pacific	**9.3**	**12.7**	**15.2**	**15.2**	**8.2%**
Total World	**118.4**	**155.7**	**185.3**	**185.7**	**100.0%**
of which: OECD	14.6	15.3	18.7	19.2	10.3%
Non-OECD	103.8	140.4	166.6	166.5	89.7%
European Union	3.7	3.2	1.6	1.6	0.8%
Former Soviet Union	35.3	36.9	52.8	52.9	28.5%

NOTE: ◆ Less than 0.05% & ^ Less than 0.05

NATURAL GAS PRODUCTION

Billion Cubic Feet Per Day	1993	2003	2012	2013	2013 share of Total
US	48.8	48.7	51.9	65.7	20.4%
Canada	7.3	12.2	18.2	15.1	4.6%
US	512.4	540.8	681.2	**687.6**	20.6%
Canada	138.6	184.7	156.0	**154.8**	4.6%
Mexico	28.5	41.7	56.9	**56.6**	1.7%
Total North America	**679.6**	**767.2**	**894.2**	**899.1**	26.9%
Argentina	21.5	41.0	37.7	**35.5**	1.1%
Bolivia	2.9	6.4	18.3	**20.8**	0.6%
Brazil	4.2	10.0	19.3	**21.3**	0.6%
Colombia	4.2	6.1	12.0	**12.6**	0.4%
Peru	0.4	0.5	11.9	**12.2**	0.4%
Trinidad & Tobago	6.2	27.0	42.7	**42.8**	1.3%
Venezuela	23.3	25.2	29.5	**28.4**	0.8%
Other S. & Cent. America	2.4	3.1	2.9	**2.5**	0.1%
Total S. & Cent. America	**65.2**	**119.4**	**174.3**	**176.4**	5.2%
Azerbaijan	6.2	4.6	15.6	**16.2**	0.5%
Denmark	4.5	8.0	5.8	**4.8**	0.1%
Germany	14.9	17.7	9.0	**8.2**	0.2%
Italy	17.4	12.7	7.9	**7.1**	0.2%
Kazakhstan	6.1	11.1	18.4	**18.5**	0.5%
Netherlands	70.8	58.1	63.9	**68.7**	2.0%
Norway	24.8	73.1	114.7	**108.7**	3.2%
Poland	3.6	4.0	4.3	**4.2**	0.1%
Romania	20.6	13.0	10.9	**11.0**	0.3%
Russian Federation	559.6	561.6	592.3	**604.8**	17.9%
Turkmenistan	59.1	53.5	62.3	**62.3**	1.8%
Ukraine	17.4	17.6	18.6	**19.3**	0.6%
United Kingdom	60.5	102.9	38.9	**36.5**	1.1%
Uzbekistan	40.8	52.0	56.9	**55.2**	1.6%
Other Europe & Eurasia	16.5	10.6	8.7	**7.5**	0.2%
Total Europe & Eurasia	**922.6**	**1000.5**	**1028.1**	**1032.9**	30.6%
Bahrain	6.9	9.6	13.7	**15.8**	0.5%
Iran	17.5	82.7	165.6	**166.6**	4.9%
Iraq	2.6	1.6	0.7	**0.6**	◆
Kuwait	5.4	11.0	15.5	**15.6**	0.5%
Oman	2.8	16.5	30.0	**30.9**	0.9%
Qatar	13.5	31.4	150.8	**158.5**	4.7%
Saudi Arabia	40.0	60.1	99.3	**103.0**	3.0%
Syria	1.8	6.2	5.3	**4.5**	0.1%
United Arab Emirates	23.0	44.8	54.3	**56.0**	1.7%
Yemen	-	-	7.6	**10.3**	0.3%
Other Middle East	0.2	0.3	2.6	**6.5**	0.2%
Total Middle East	**113.7**	**264.1**	**545.5**	**568.2**	16.8%
Algeria	56.1	82.8	81.5	**78.6**	2.3%
Egypt	11.3	30.1	60.9	**56.1**	1.7%
Libya	6.4	5.5	12.2	**12.0**	0.4%
Nigeria	4.9	22.6	43.3	**36.1**	1.1%
Other Africa	2.9	7.2	18.5	**21.6**	0.6%
Total Africa	**81.5**	**148.2**	**216.3**	**204.3**	6.0%
Australia	24.5	33.2	43.4	**42.9**	1.3%
Bangladesh	6.1	12.3	21.1	**21.9**	0.6%
Brunei	10.3	12.4	12.6	**12.2**	0.4%
China	16.8	35.0	107.2	**117.1**	3.5%
India	**15.2**	**29.5**	**40.3**	**33.7**	**1.0%**
Indonesia	53.1	73.2	71.1	**70.4**	2.1%
Malaysia	24.9	51.8	66.5	**69.1**	2.0%
Myanmar	1.1	9.6	12.7	**13.1**	0.4%
Pakistan	14.9	30.4	41.2	**38.6**	1.1%
Thailand	9.7	21.5	41.4	**41.8**	1.2%
Vietnam	0.3	2.4	9.4	**9.8**	0.3%
Other Asia Pacific	8.0	10.6	18.2	**18.7**	0.6%
Total Asia Pacific	**184.9**	**322.0**	**484.9**	**489.0**	14.5%
Total World	**2047.5**	**2621.3**	**3343.3**	**3369.9**	**100.0%**

NOTE: ◆ Less than 0.05% & ^ Less than 0.05

7.11 LIST OF SOME COMPANIES IN INDIAN E&P SECTOR

PSU COMPANIES

Andhra Pradesh Gas Infrastructure Corp. Pvt. Ltd.
Parisrama Bhawan, 5th Floor,
5-5-58/B, Fateh Maiden Road,
Basheerbagh
Hyderabad – 500 004

Bharat Petroleum Corpn. Ltd.
Bharat Bhawan
4 & 6, Currimbhoy Road,
Ballard Estate, Mumbai – 400 001

Bharat Petro Resources Ltd,
Maker Towers, E Wing, 9th Floor,
Cuffe Parade, Mumbai – 400 005

Engineers India Limited
EI Bhavan, 1, Bhikaiji Cama Place,
New Delhi 110 066

GAIL India Ltd.
1st Floor, PDIL Building,
A-14, Sector-1
Noida – 201301

Gujarat State Petroleum Corporation Ltd.
Block 15, 2nd Floor, GSPC Bhawan,
Udyog Bhawan, Sector-11,
Gandhinagar – 382010

Hindustan Petroleum Corpn. Ltd.
Petroleum House, 17, JRD Tata Road,
P.B. No. 11041, Mumbai – 400 020

Indian Oil Corporation Ltd.
3079/3, Sadiq Nagar
JB Tito Marg, New Delhi – 110 049

NTPC Ltd.
NTPC Bhawan
Scope Complex, Core-7,
5th Floor, 7, Institutional Area
Lodhi Road, New Delhi – 110 003

Oil & Natural Gas Corpn. Ltd.
Jeevan Bharti, Tower II, 6th Floor,
124 Indira Chowk, Connaught Circus,
New Delhi -110001

Oil India Limited
Plot No. 19, Film City, Sector 16A
Noida -201301

ONGC CBM-Development Project,
First Floor, HSCL Building,
Near-Naya More,
Bokaro Steel City – 827001

Prize Petroleum Co. Ltd.
C/o HPCL, 3rd Floor, UCo Bank Building
Parliament Street, New Delhi – 110001

INTERNATIONAL COMPANIES

Bengal Energy International Inc.
1140 715 – 5th Avenue SW,
Calgary, Alberta, Canada, T2P 2X6

BG Exploration and Production India Ltd.
BG House, Lake Boulevard Road
Hira Nandani Business Park, Powai,
Mumbai – 400 076

BHP Billiton – India
8th Floor, Tower -1
Jeevan Bharti Building,
Connaught Place
New Delhi – 110 001

Birkbeck Investment Ltd.
IFS Court, 28, Cyber City
Ebene, Mauritius

BP India Services Pvt. Ltd. (CBM)
3rd Floor, Tower-B, First India Place,
Sushant Lok -1, Mehrauli Gurgaon Road,
Gurgaon, Haryana

BP Exploration (Alpha) Limited
Unit No. 71 & 73, 7th Floor,
2nd North Avenue, Maker Maxity
Bandra Kurla Complex, Bandra (E),
Mumbai – 400 051, India

Cairn India Ltd.
3rd Floor, Vipul Plaza,
Suncity Sector – 54,
Gurgaon – 122 002

Coal/Gas Deep Industries Ltd. (CBM)
6th Floor, Astron Tower,
Opp. Fun-Republic Cinema,
S.G. Highway,
Ahmedabad – 380 015

Dart Energy (India) Pty. Ltd. (CBM)
DLF Cyber City,
Phase-III, Building No. 9,
Tower B, 16th Floor,
Gurgaon – 122 002

Deep Energy LLC,
6th Floor, Astron Tower,
Opposite: Fun Republic Cinema,
S G Highway, Ahmedabad – 380 015

East West Petroleum
1210 – 1095 West Pender Street
Vancouver, BC V6E 2M6

ENI India Ltd.
Eros Corporate Tower – 14th Floor,
Nehru Place, New Delhi – 110 019

Geo-Global Resources (Barbados) Ltd.
273/2, Sector-7A
Gandhinagar, Gujarat – 382007

Geopetrol International Inc.
The Mira Corporate Suites, Block D-1,
1 & 2 Ishwar Nagar, Mathura Road,
New Delhi – 110055

Geopetrol International Inc. (CBM)
Lane W-4D/6, Western Anenue,
Sainik Farms, New Delhi – 62

Hallworthy Shipping Ltd. SA
Foresight House 10/10a, Arthur Road
London EC4R 9AY, United Kingdom

Hardy Exploration & Production (India) Inc.
V Floor, Westminster Building,
108, Dr. Radhakrishnan Salai
Chennai – 600 004, India

Heramec Ltd.
2nd Floor, V V Mansion, # 6-3-885/7/B/4,
Somajiguda, Hyderabad – 500082

HPCL–Mittal Energy Limited
INOX Tower, Plot no. 17,
Sector-16 A, Noida- 201301, UP

Joshi Technologies International Inc,
701, 7th Floor, Parshwanath E Square,
Adjacent to Titanium Building,
Corporate Road, Prahaladnagar,
Satellite, Ahmedabad – 380015 (Gujarat)

Newbury Oil Company Ltd.
B-149, Sector-10,
Noida-201301

Niko Resources Ltd.
"Lankmark" 4th Floor, Race Course
Baroda – 390 007

Noble Energy International Ltd.
1001 Noble Energy Way,
Houston, Texas 77070

Oilex NL Ltd.
Cambay Square, 2nd Floor,
X-22-24, Electronic State,
Sector-25, Gandhinagar – 382 044

Petrogas
No. 801A, 8th Floor, Tower A, Signature Tower,
South City-1, NH-8,
Gurgaon-122 001

Ravva Oil (Singapore) Pte. Ltd.
16 Raffles Quay,
40-01A Hong Leong Building
Singapore 0104

Santos International Operations Pvt. Ltd.,
Narain Manzil 1401 & 1402, 14th Floor,
23, Barakhamba Road.
New Delhi

INDIAN PRIVATE COMPANIES

Adani Enterprises Ltd
Adani House,
Nr Mithakhali Circle
Navrangpura
Ahmedabad 380 009, Gujarat

Adani Welspun Exploration Ltd.
Sambhav Press Building,
Nr Judges Bunglow,
Bodakdev, Ahmedabad – 380 015

Assam Company India Ltd.
Oil & Gas Division
2nd Floor, 22 Community Centre
Basant Lok, Vasant Vihar,
New Delhi – 110057

Bharat Forge Infrastructure Ltd.
6th Floor, CS 8-10, Tower-A
The Corenthum, A-41,
Sector-62, Noida – 201 301

Ensearch Petroleum Pvt. Ltd.
D-179, Sector-63
Noida-201301, UP

Essar Oil Limited,
Essar Technopark, Building No. II,
Old Swan Mill Compound, CBS Marg,
Kurla (West), Mumbai – 400 070

Focus Energy Ltd.
23rd Floor, Gopala Tower, 25, Rajendra Place,
New Delhi – 110 008

Frost International Ltd.
C-69, 70, Okhla Industrial Phase-I
New Delhi – 110020

Geo Enpro Petroleum Ptd.
Express Trade Tower-I
Sector-16A, Film City
Noida – 201 301

Great Eastern Energy Corporation Ltd. (CBM)
Signature Towers. A, 14th Floor,
South City, NH-8, Gurgaon – 122 001

GVK Oil and Gas Ltd.
6-3-250/A, Road no. 1, Banjara Hills,
Hyderabad-500034

Harish Chandra (India) Ltd.
113-A, Kamala Nagar
Delhi – 110 007

Hindustan Oil Exploration Co Ltd.
Lakshmi Chambers, 192,
St. Mary's Road, ALWARPET,
Chennai – 600 018

Hydrocarbon Development Co. Pvt. Ltd. (HDCPL)
4123/D, Wing, Oberoi Garden Estate
Off Saki Vihar Road,
Chandvali, Andheri (East),
Mumbai – 400 072

Interlink Petroleum Limited
H-20, Sector-27
Noida – 201 301

Jaiprakash Associates Limited
63, J House, Basant Lok,
Vasant Vihar, New Delhi - 110057

Jay Polychem
D-143, Defence Colony
New Delhi – 110024

JSPL Oil and Natural Gas Ltd.
Jindal Center
12 Bikaji Cama Palace
New Delhi – 110065

Jubilant Oil & Gas Pvt. Ltd.
Plot No. 15, Knowledge Park II,
Greater Noida – 201306
Gautam Budh Nagar (UP)

Kanvel Finance Pvt. Ltd.
6th floor, Astron Tower
Opp. Fun republic Cinema
SG Highway, Ahmedabad
Gujarat-380015

KGN Industries Ltd.
4th Floor, 23 Vaswani Mansions,
Opp. KC College, Dinsha-Vacha Road,
Church Gate, Mumbai – 400020

Mercator Petroleum Pvt. Ltd.
3rd Floor, B Wing, Mittal Tower,
Nariman Point, Mumbai

Monnet Ispat and Energy Limited
Monnet House,11,Masjid Moth,
Greater Kailash Part – II,
New Delhi-110048

Nitin Fire Protection Inds. Ltd.
501, Delta Technology Street,
Powai, Mumbai-400076

Omkar Natural Resources Pvt. Ltd.
3-A, Omkar Esquare Off Express Highway
Opposite Sion Chunna Bhathi Signal,
Mumbai -400022

Pan India Consultants Private Limited
105, Phase-IV, Udyog Vihar,
Gurgaon-122015, Haryana

Petrocon India Limited
Videocon Tower, Jhandewalan
New Delhi

Pratibha Oil and Natural Gas Private Limited
407, Tratinex House
Solapur Street, Off P Demelo Road
Chinchbundar, Mumbai – 400001

Quest Petroleum Pvt. Ltd.
2nd Floor, Block – B
Vatika Atrium
Sector Road, DLF Phase-V
Gurgaon – 122 002

Quippo Oil and Gas Infrastructure Limited
D2, Southern Park, Saket Place,
Saket, New Delhi-110017, India

Reliance Industries Ltd.,
Reliance Corporate Park
Building No. 8, B Wing, 1st Floor,
Thane – Belapur Road, Ghansoli,
Navi Mumbai – 400 071

Reliance Natural Resources Limited (CBM)
H Block, Dhirubhai Ambani Knowledge City
Navi Mumbai – 400 071

Safal WSB Energy Pvt. Ltd .
6th floor, Astron Tower
SG Highway , Ahmedabad
Gujarat-380015

Sankalp Oil and Natural Resources Ltd.,
W – 120, Greater Kailash Part-II,
New Delhi

Savla Electronics Pvt. Ltd.
6th floor, Astron Tower
SG Highway, Ahmedabad
Gujarat-380015

Selan Exploration Technology Limited
Unit-1002, Tower-B
Millemium Plaza, Sector -27,
Sushant Lok, Phase-I
Gurgaon (Haryana)

Shiv-Vani
Tower-1, 5th Floor,
NBCC Plaza, Sector V,
Pushp Vihar, Saket,
New Delhi-110017

Sintex Oil & Gas Pvt. Ltd.
7th Floor, Abhijeet-1
Mithakali Six Rd Ellishbridge
Ahmedabad 380006

Srei Infrastructure Finance Limited
Saket District Centre, Sector 6, Pushp Vihar,
New Delhi-110017

Suntera Energy India
Plot 39, Institutional Area,
Sector 32, Gurgaon – 122 001

Tata Petrodyne Ltd,
Metropolitan, 3rd Floor
West Wing, BKC
Bandra (E)
Mumbai – 400 051

Videocon Industries Ltd.
Fort House, 2nd Floor,
221, Dr. D N Road, Fort
Mumbai – 400001

Vectra Investment Private Ltd.
Vectra House No. 15, 1st Main Road,
6th Cross, Gandhinagar
Bangalore 560009