TWENTY-FIRST REPORT

STANDING COMMITTEE ON PETROLEUM & CHEMICALS
(2001)

(THIRTEENTH LOK SABHA)

PRODUCTION OF OIL AND GAS

MINISTRY OF PETROLEUM AND NATURAL GAS

Presented to Speaker ***28.12.2001***

Presented to Lok Sabha on ***26.02.2002***

Laid in Rajya Sabha on ***08.03.2002***

LOK SABHA SECRETARIAT
NEW DELHI

December, 2001/Agrahayana, 1923 (Saka)

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LIST OF MEMBERS OF THE DEPARTMENTALLY RELATED STANDING COMMITTEE ON PETROLEUM & CHEMICALS
(2001)

Shri Mulayam Singh Yadav - Chairman

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Lok Sabha

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3. Shri Ramchander Bainda
4. Shri Ananda Mohan Biswas
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*17. Dr.Debendra Pradhan

18. Shri Mohan Rawale
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22. Shri Prabhunath Singh
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24. Dr. Ramesh Chandra Tomar
25. Shri Tarlochan Singh Tur
26. Shri Shankersinh Vaghela
27. Shri Ratilal Kalidas Varma
28. Shri B. Venkateshwarlu
29. Shri Rajesh Verma
30. Dr. Girija Vyas

Rajya Sabha

31. Shri Anil Kumar
32. Shri Gaya Singh
33. Shri Ram Nath Kovind

**34. Shri Daya Nand Sahay

35. Shri Moolchand Meena
36. Shri Dipankar Mukherjee
37. Shri Suresh Pachouri
38. Shri Ahmed Patel
39. Shri Mukesh R. Patel
*** 40. Vacant
41. Shri K. Kalavenkata Rao
42. Shrimati Basanti Sarma
43. Shri Rajiv Ranjan Singh 'Lalan'
44. Shri P. Soundararajan
45. Prof. Ram Gopal Yadav

SECRETARIAT

1.	Shri P.D.T. Achary	-	Additional Secretary
2.	Shri K.V. Rao	-	Joint Secretary
3.	Shri Brahm Dutt	-	Deputy Secretary
4.	Shri J.N. Oberoi	-	Under Secretary
5.	Shri Ram Raj Rai	-	Committee Officer

**** Nominated on 13.11.2001 on casual vacancy caused consequent upon appointment of Sh. Ashok Pradhan, M.P.(LS) as Minister w.e.f. 02.09.2001***

***** Nominated on 28.9.2001 as casual vacancy caused consequent upon the retirement of Dr. (Smt.) Joyashree Goswami Mahanta, MP (RS) from the membership of Rajya Sabha w.e.f. 14.06.2001.***

****** vacancy caused consequent upon appointment of Sh. Ravi Shankar Prasad, M.P.(RS) as Minister w.e.f. 01.09.2001.***

COMPOSITION OF SUB-COMMITTEE ON PETROLEUM

A SUB-COMMITTEE OF THE STANDING COMMITTEE ON PETROLEUM & CHEMICALS (2001)

Shri Mulayam Singh Yadav - Chairman

2. Dr. Girija Vyas - Convenor

3. Shri Ashok Argal
4. Smt. Sheela Gautam
5. Shri Pawan Singh Ghatowar
6. Shri B.K. Handique
7. Shri Ahmed Patel
8. Shri Mohan Rawale
9. Shri Shyama Charan Shukla
10. Smt. Kanti Singh
11. Shri Prabhunath Singh
12. Shri Tarlochan Singh Tur
13. Shri Shankersinh Vaghela
14. Shri Ratilal Kalidas Varma
15. Prof. Ram Gopal Yadav

INTRODUCTION

I, the Chairman, Standing Committee on Petroleum and Chemicals (2001) having been authorised by the Committee to submit the Report on their behalf present this Twenty-First Report on 'Production of Oil and Gas'.

2. This subject was selected for examination by the Standing Committee on Petroleum & Chemicals (1999-2000) and the preliminary material was obtained from the Ministry of Petroleum and Natural Gas. The Standing Committee on Petroleum and Chemicals (2001) decided to continue with the subject. The Sub-Committee on Petroleum, a Sub-Committee of the main Committee took evidence of the representatives of Oil India Limited (OIL), on 22nd February, 2001, Indian Oil Corporation Ltd. (IOC) on 1st March, 2001, Oil and Natural Gas Corporation (ONGC) and Directorate General of Hydrocarbons (DGH) on 11th May, 2001 and that of the Ministry of Petroleum and Natural Gas on 1st August, 2001 and 21st August, 2001.

3. The Committee wish to express their thanks to officers of the Ministry of Petroleum and Natural Gas and the representatives of ONGC, OIL, IOC and DGH for placing their views before them and for furnishing the information desired in connection with examination of the subject.

4. The Sub-Committee on Petroleum considered and adopted this Report at their sitting held on 19th December, 2001.

5. The Standing Committee on Petroleum and Chemicals (2001) considered and adopted this Report at their sitting held on 20th December, 2001. The Committee place on record their appreciation of the work done by the Sub-Committee on Petroleum.

6. The Committee also place on record their appreciation for the invaluable assistance rendered to them by the officials of the Lok Sabha Secretariat attached to the Committee.

MULAYAM SINGH YADAV

NEW DELHI
Chairman
December 20, 2001 ***Standing Committee on***
Agrahayana 29, 1923 (Saka) ***Petroleum &***
Chemicals

PART – I

BACKGROUND ANALYSIS

CHAPTER – I

Hydrocarbon Reserves and Exploration Strategy

(a) Role of Ministry, PSUs and Private Sector

The Ministry of Petroleum & Natural Gas (MOP&NG) is entrusted with the responsibility of exploration and production of oil and Natural Gas, their refining, distribution, marketing and pricing. Import and export as well as conservation of petroleum products also fall within the purview of this Ministry. The activities of the Ministry are carried through the following 9 Public Sector Undertakings, 6 subsidiaries and other companies and 7 other organisations:-

Public Sector Undertakings

1. Oil & Natural Gas Corporation Limited (ONGC)
2. Indian Oil Corporation Limited (IOCL)
3. Hindustan Petroleum Corporation Limited (HPCL)
4. Bharat Petroleum Corporation Limited (BPCL)
5. Gas Authority of India Limited (GAIL)
6. Engineers India Limited (EIL)
7. Oil India Limited (OIL)
8. IBP Co. Limited (IBP)
9. Biecco Lawrie & Co. Limited

Subsidiaries and other Companies

1. O.N.G.C. Videsh Limited
2. Indian Oil Blending Limited
3. Balmer Lawrie & Company Limited
4. Certification Engineers International Limited
5. EIL Asia Pacific Sdn Bhd
6. Numaligarh Refinery Limited (NRL)
7. Chennai Petroleum Corporation Limited (CPCL)
8. Kochi Refineries Limited (KRL)
9. Bongaigaon Refinery and Petrochemicals Limited (BRPL)

Other Organisations

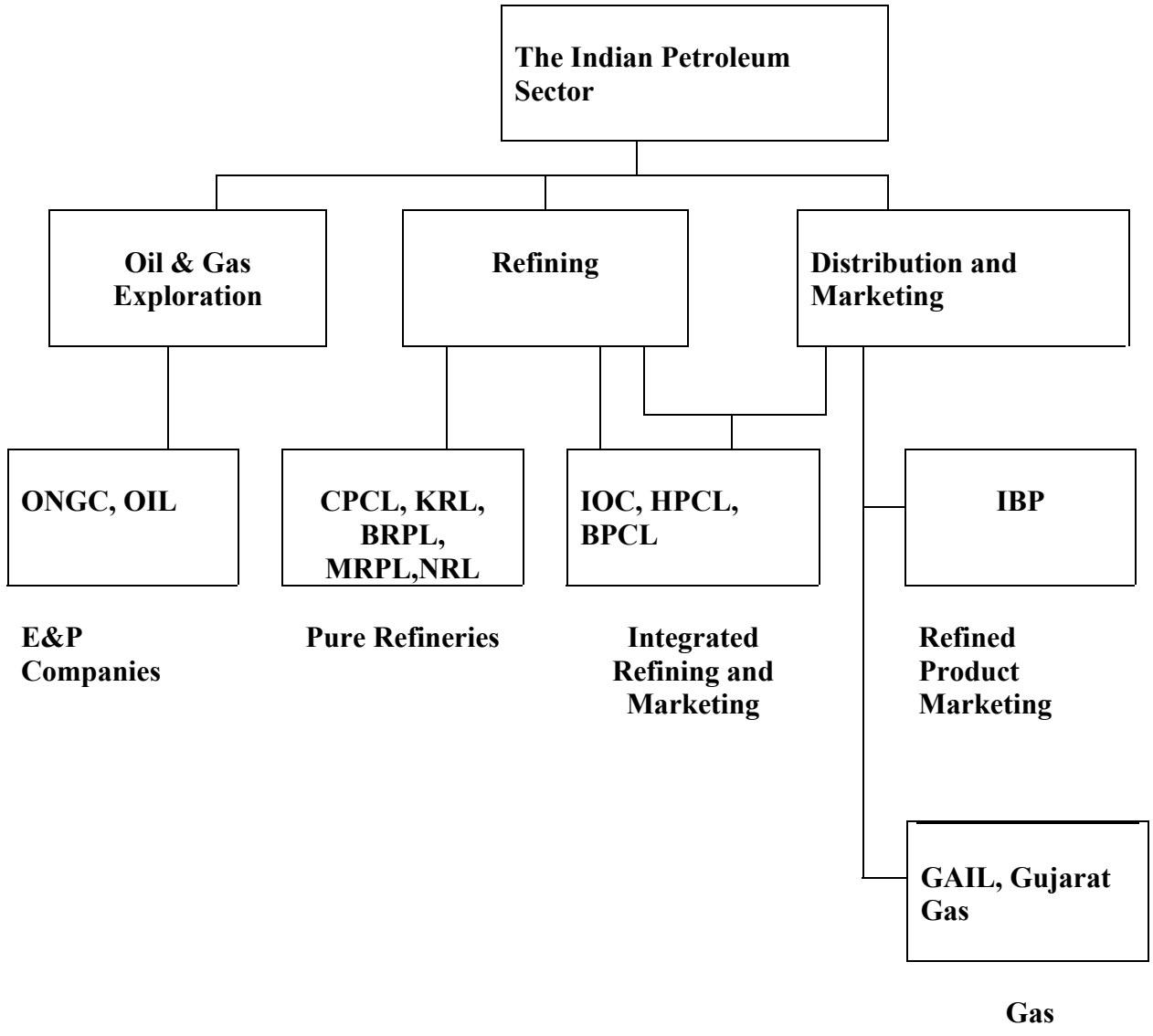
1. Oil Industry Development Board (OIDB)
2. Oil Coordination Committee (OCC)
3. Petroleum Conservation Research Association (PCRA)

4. Oil Industry Safety Directorate (OISD)
5. Centre for High Technology (CHT)
6. Petroleum India International (PII)
7. Directorate General of Hydrocarbons (DGH)

1.2 The Indian Oil Sector can be divided into three sub-sectors:-

(i) Oil and Gas Exploration & Production;
(ii) Oil Refining; and
(iii) Marketing (Gas and Refined Products).

The various players in each of these sub-sectors are listed below:-



1.3 Oil and Natural Gas Corporation (ONGC) and Oil India Limited (OIL) are the main Undertakings engaged in carrying out exploration and exploitation for crude oil and natural gas. Indian Oil Corporation have also started their participation in these activities alongwith their main area of refining and marketing. To further supplement activities of National Oil Companies, Government have been awarding oil exploration/development blocks to private companies also. The Companies like Reliance, Essar, Enron, Hindustan Oil Exploration Company (HOEC) and Enpro India have entered into these activities either as Joint partners or independently. The Directorate-General of Hydrocarbons was set up by the Government in 1993 as an agency under the control of MOP&NG to promote sound management of the Indian petroleum and natural gas resources having a balanced regard for environment safety, technological aspects of the petroleum activity.

(b) Quantum of Reserves and Reserves Accretion

1.4 The Hydrocarbons (Oil and Gas) are generated and usually accumulated in sedimentary rocks. There are rocks that have been deposited in large water bodies like lakes and seas, which form sedimentary basins. The sedimentary basins are, therefore, the target areas for exploration. The total sedimentary area is of the order of 3.14 million square kms. This includes 1.784 million sq. kms. onland and offshore upto 200 m isobath and 1.35 million sq. kms. in deep waters beyond 200 m isobath.

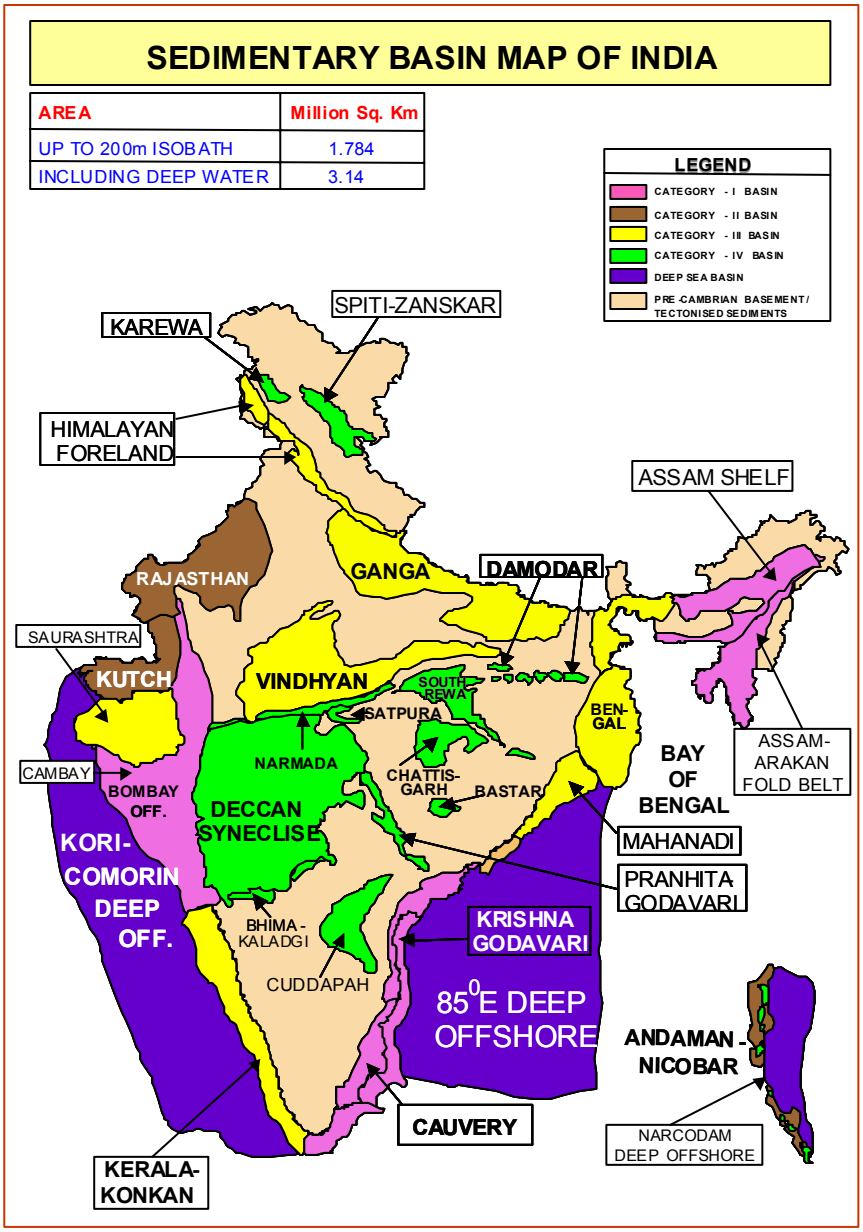
1.5 India is endowed with 26 sedimentary basins along with deep water sedimentary areas. India's prognosticated reserves are mostly distributed in 12 basins. Indian sedimentary basins have been divided into the following four categories based on the geological knowledge, status of exploration, known-hydrocarbon accumulation/seepages/shows etc:-

Category –I Basins with established commercial production	(1) Cambay (2) Assam shelf (3) Mumbai Off-shore (4) Cauvery (5) Krishna Godavari (6) Assam –Arakan Fold belt and (7) Rajasthan.
Category-II Basins with known accumulations of Hydrocarbons but no commercial production as yet.	(8) Kutch – Saurashtra (9) Andaman – Nicobar.
Category –III	

Basins with indicated hydrocarbon shows that are considered geologically prospective	(10) Himalayan Foreland (11) Ganga (12) Vindhyan (13) Saurashtra (14) Kerala-Kokan-Lakshadweep (15) Mahandi (16) Bengal
Category –IV Basins with uncertain prospects deemed prospective on analogy with similar basins worldwide.	(17) Kerewa (18) Spiti-Zanskar (19) Satpura-South Rewa-Damodar (20) Narmada (21) Decan Syneclise (22) Bhima-Kaladgi (23) Cuddapah (24) Pranhiti-Godawari (25) Bastar (26) Chhatisgarh
Deep Waters	Kori-Comorin 85^{o} East Narcodam

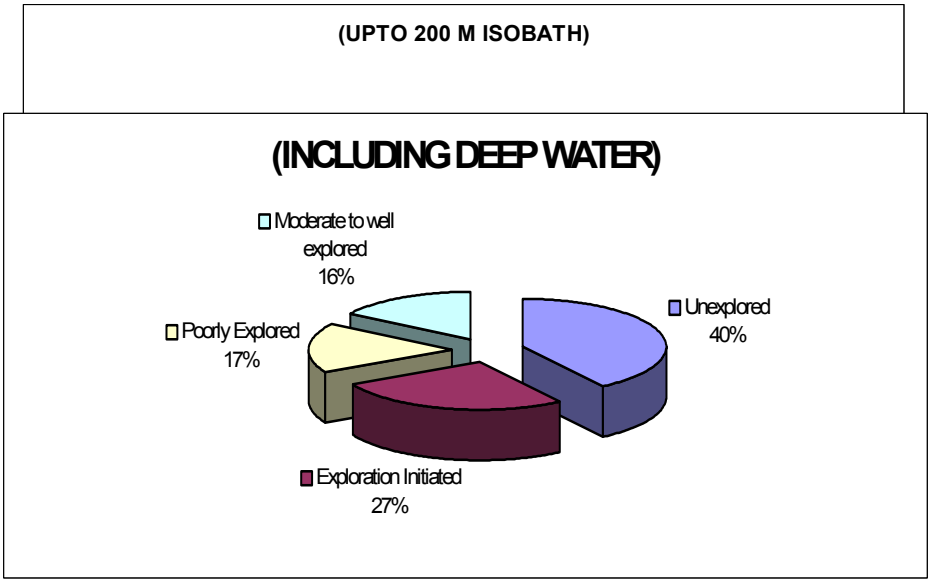
SEDIMENTARY BASIN MAP OF INDIA

AREA	Million Sq. Km
UP TO 200m ISOBATH	1.784
INCLUDING DEEP WATER	3.14



1.6 The following chart shows the status of exploration in each sedimentary basinal areas:-

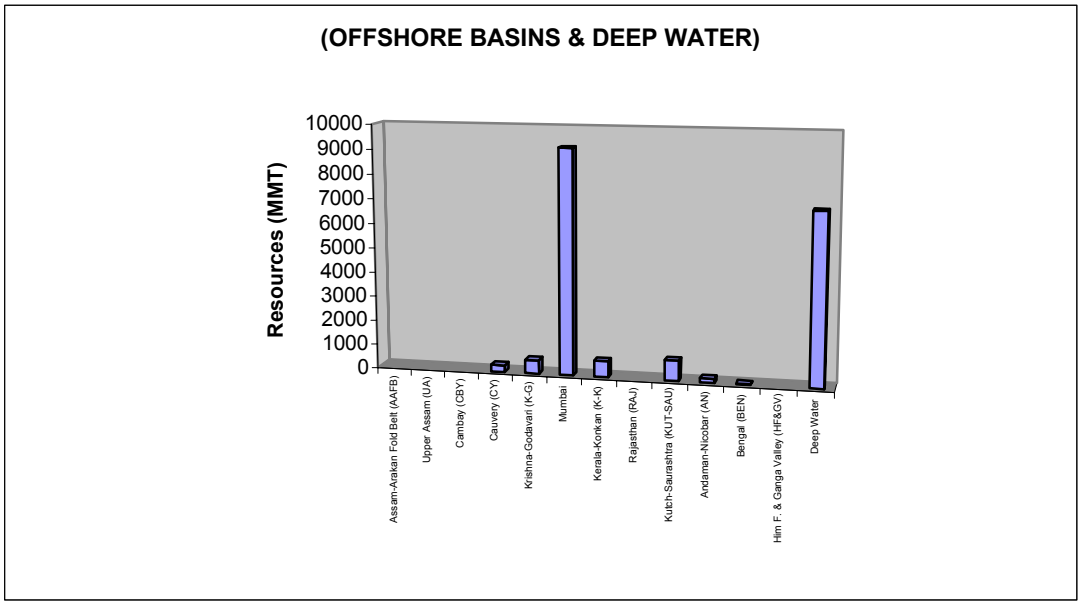
Level of Exploration	Area (Million Sq. Km.) (Upto 200 m Isobath)	%	Area (Million Sq. Km.) (Inc. Deep Water)	%
Unexplored	0.601	33%	1.276	40%
Exploration Initiated	0.156	9%	0.837	27%
Poorly Explored	0.529	30%	0.529	17%
Moderate to Well Explored	0.498	28%	0.498	16%
Total	1.784		3.140	

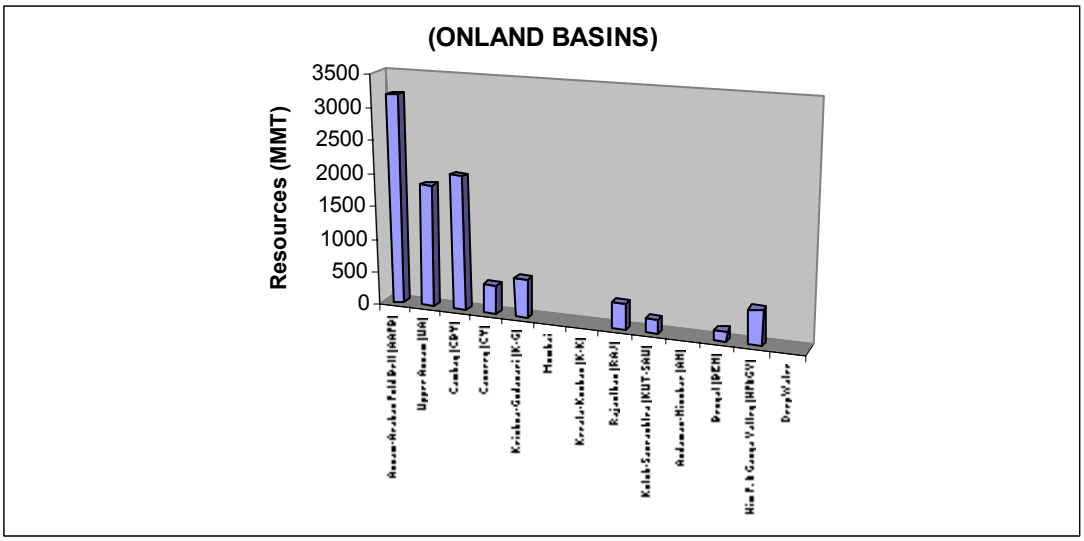


1.7 The following table shows the total hydrocarbon resources as on 1.4.2000 as informed by DGH:-

Basin	**Hydrocarbon Resources (MMT)**		
	Offshore	**Onland**	**Total**
Assam-Arakan Fold Belt (AAFB)		3180	3180
Upper Assam (UA)		1860	1860
Cambay (CBY)		2050	2050
Cauvery (CY)	270	430	700
Krishna-Godavari (K-G)	555	575	1130
Mumbai	9190		9190
Kerala-Konkan (K-K)	660		660
Rajasthan (RAJ)		380	380
Kutch-Saurashtra (KUT-SAU)	840	210	1050
Andaman-Nicobar (AN)	180		180
Bengal (BEN)	30	160	190
Him F. & Ganga Valley (HF&GV)		520	520
Deep Water	7000		7000
Grand Total	**18725**	**9365**	**28090**

1.8 The following chart shows the diagramatic presentation of the above data:-





1.9 Oil and Natural Gas Corporation Limited (ONGC) and Oil India Limited (OIL), the two National Oil Companies and a few Private and Joint Venture (JV) Companies are engaged in the exploration and production of Oil and Natural Gas in the country. The category-wise quantum of resources of the basins together with the in-place and balance recoverable hydrocarbon volumes of ONGC as on 1.4.2000 are indicated below:

Category of Basin	Prognosticated Resources (MMT) (O+OEG)	In-place volume As on 1.4.2000 (MMT)	Balance recoverable reserves (MMT)
I	16110	5482	1071
II	1180	5.72	2.15
III	1220	__	__

Similarly for Oil India Limited, the details is as under:

Category of Basin	Prognosticated Resources (MMT) (O+OEG)	In-place volume as on 1.4.2000 (MMT)		Balance recoverable reserves (MMT)	
		Oil (MMT)	Gas (BCM)	Oil (MMT)	Gas (BCM)
I	2000	589.52	205.449	68.04	93.052
II	250	14.60	9.290	2.19	2.925
III	580	-	-	-	-

The status of reserves of O + OEG for field operated by Private/Joint Venture Companies as on 1.4.200 is as under:

Category of Basin	In-place reserves (MMT)	Ultimate reserves (MMT)	Balance recoverable reserves (MMT)

I	544.17	196.49	170.07
II	0.19	--	--

1.10 Explaining the present status and future programmes in regard to area identification for exploration, Secretary in the Ministry of Petroleum and Natural Gas stated during evidence: -

> "The total sedimentary area of the country is about 3.14 million square kilometres. Only about 40 per cent of that area has been identified for exploration or is under exploration of some kind or other. The prognosticated resource base of oil and gas is 30 billion tonnes but the established reserves are only about 6.7 billion tonnes."

1.11 In response to specific query about targets set regarding reserves accretion in MOUs signed with ONGC/OIL and their actual performance, the Ministry submitted the following details for the last three years:-

Year	**ONGC**		**OIL**	
	Target (MMT)	**Actual**	**Target (MMT)**	**Actual**
1997-98	30.00	15.83	6.5	6.89
1998-99	32.52	25.07	8	8.08
1999-2000	42.00	34.46	8	7.98

1.12 In the document called Hydrocarbon Vision-2025 the Government have announced a short term, medium term and long term objectives in connection with policy regarding exploration and production sector. As a medium term objective, they have decided to finalise a programme for appraisal of the Indian Sedimentary Basins to the extent of 25% by 2005, 50% by 2010, 75% by 2015 and 100% by 2025.

1.13 During the course of evidence, the Committee pointed out that the above target was too modest and wanted to know about the shortest possible time required for preliminary appraisal of all the basins, Secretary replied as under:-

> "The total area of sedimentary basins is about 3.14 million square kilometres. So, it is a massive task to cover the entire area. The targets in the Hydrocarbon Vision were put in place by the Government looking to, of course, the primary need for acceleration of appraisal as that is the first stage of exploration and also taking into account the resources that would be available. I take your point that there is room for improving these targets. We will see what we can do to improve and crash these targets further. In any case there are the minimal targets that the Government has set itself and has announced in its policy. Then achievement requires a massive investment in exploration. So, looking to both the constraints of resources within our country and our ability to attract resources from abroad, these targets were appropriately fixed. Sir, I cannot disagree with you

when you say that we should try to cover the entire area as soon as possible. We will have a re-look at these targets once again and see what can be done to improve them."

1.14 In the context of specific survey work being done by Directorate General of Hydrocarbons, the Committee wanted to know their assessment on this, DGH clarified the status as under:-

"We have already covered from satellite gravity survey, off-shore areas and the sea up to Exclusive Zone, EEZ. This one shows the highs and lows, which are available in the subsurface below the sea. They have already been mapped now. The important part is that this is only a very indicative type of survey. It has to be further confirmed by seismic survey along with gravity and magnetic survey.

Ship bound equipment has to be used for this, and the ship will require several months to cover various parts of the offshore area. It requires a couple of years of survey offshore. Through satellite gravity, we have already covered up to EEZ. Now, from the last three or four years, we are taking small areas, like we took the East Coast of India three years ago, and we covered it with seismic and gravity magnetic, and we found 38 big structures. Based on that, the Government has carved out 12 deep-water blocks, of which seven are already awarded. In one, we already have a major discovery, and we are at the verge of having a discovery in the other two basins. So, the results are very, very promising indeed. As you desired, we are with full force getting ahead on that. It requires a few more years to finish the entire offshore area. Now, satellite gravity does not work on land. We can have photo geology; we can have satellite imageries, but that will only be scanning top surface looking for seepage of gas. We can do some gravity magnetic survey through satellite but nothing beyond that. It will ultimately have to be seismic survey. When we say were are opening up our areas and doing minimum surveys, eventually, we will require some seismic and then gravity magnetic using round vehicles which take a very considerable time. A lot of our areas are high hilly terrains. We have desert in Western India, dense forest, then we have marshy areas, and on land progress is very slow. That is why, the Secretary has mentioned that it will take several years, but no doubt we will crash the programme. We are looking into that."

1.15 When asked about the priorities fixed for exploratory work, the Ministry of Petroleum & Natural Gas submitted in a written note:-

"Government of India has planned to the 7 producing basins of viz. Cambay, Upper Assam, Assam-Arakan Fold Belt (AAFB), Krishna-Godavari, Cauvery, Rajasthan and Mumbai Offshore. It has been planned to aggressively pursue exploration in non-producing and frontier basins. These basins include Rajasthan (in part), Bengal, Kutch, Saurashtra, Mahanadi, Kerala-Konkan, Himalayan Foothills, Satpura-South Rewa-Damodar, Narmada, Ganga Valley,

Karewa, Deccan Syneclise, Pranhita-Godvari, Vindhyan; and deep water areas in East and West Coast."

1.16 In a written note the Ministry have further informed that the Government is already in the process of formulation the plan to have an appraisal coverage of more than 35% of the Indian sedimentary basins by the end of 10th Plan i.e. 2006-2007. Thus, over one million sq. km. of India's sedimentary basins out of 3.14 million sq. km. of the total area including the deep water areas, is expected to be covered by the end of the 10th Plan.

1.17 In response to specific query of the Committee regarding feasibility of chasing the future appraisal programme of the Indian sedimentary basins the Ministry have informed that a view can be taken only after reviewing the implementation of 10th Plan. They have also expected that a few significant discoveries in lower category basins in the next few years would definitely facilitate in expediting the process of appraisal work of Indian sedimentary basins.

(c) Selection of areas for exploration and development

1.18 As regarding criteria followed for selection of areas for exploration and development, Oil and Natural Gas Corporation informed the Committee in a written note that the sedimentary basins are the target areas for exploration. Analogies with worldwide prospective basins together with their evolution and hydrocarbon habitant are freely used to deduce the characteristics of the basin under consideration before launching the exploration activities.

1.19 They have further elaborated as under:-

"Each basin has unique characteristic. Thus, the potential of hydrocarbon generation and accumulation in the sedimentary basins depends upon a number of factors such as thickness of sediments, rates of sedimentation, nature of sediments and their organic content, tectonic and thermal history of basins etc. The prospectivity (potential for Oil and Gas) of a basin is determined by analysing these factors. Further, the results of earlier exploration, if any, also provide necessary input in these analyses. A prognosis of the hydrocarbon resource potential is thus made through probabilistic models based on statistical concepts tempered with sound geological reasoning. Classification of sedimentary basin in the context of plate tectonic evolution is one such frequently used analogy-model to identify the basins of interest. The parameters that go into the identification of a sedimentary basin as a worthy candidate for initiation of exploration activities also hold good for selection of a tectonic block or sector within a basin for initiating exploration activities. The exploration cycle starts with a reconnaissance survey followed by semi detailed data acquisition and analysis. The Generation, Migration and Entrapment (GME) model is build up followed by test drilling"

1.20 When the Committee went into the further details of criteria and process of selection of areas for development and exploitation of hydrocarbon resources, the Ministry of Petroleum & Natural Gas submitted as under: -

"ONGC/OIL's policy is that of optimum development and exploitation of hydrocarbon resources discovered by exploration. The optimum exploitation rate depends on a number of factors which are analysed/reviewed/evaluated in techno-economic analysis for optimising depletion of hydrocarbon reserves. Based on the knowledge of reservoir fluid and rock characteristics, production testing and reservoir studies, technological schemes for exploitation of oil/gas fields are prepared for primary recovery and secondary and enhanced oil recovery phases using full scale reservoir simulator.

Keeping in conformity with management practices for the health of the reservoirs adopted globally, ONGC/OIL also follows a logical approach to decide on rational development/exploitation strategy of proved commercial reserves.

By a rational development of the oil field means the one with which the reservoir pool/field is developed by minimum possible number of wells ensuring the envisaged optimum rates of oil/gas production and ultimate high yield with the least possible capital investment.

The basic objectives of such a rational development plan include:

- Effective well spacing and pattern for production/injection and their sequence of drilling.
- Fixing the output of the well at different stages of the producing life.
- Determine productive life of individual wells and field.

Through delineation stage, dimension and outlines of the field, boundaries of oil and gas bearing areas are identified. The reservoir fluid and rock characteristics, which govern the movement and displacement of hydrocarbon into the well, are acquired through intensive field and laboratory studies. Hydrocarbon reserves in the pool/field are then estimated. During the delineation stage and/or thereafter work on exploitation strategy of a field/pool is initiated through feasibility studies followed by preparation of technological scheme of development. At this stage, a study of various development scenarios is undertaken which is guided by:

- Inplace hydrocarbon and Reserves (Initial geological and recoverable reserves)
- Reservoir rock and fluid properties
- Drive mechanism
- Well spacing
- Productivity indices
- Withdrawal rate

These studies are performed through numerical simulator. Most optimum economically viable variant is optimally exploited."

1.21 About the nature of monitoring of performance of the wells during production period and throughout the life, the Ministry submitted the following details: -

"During the production period, continuous observation of the performance of the wells, variations in the reservoir parameters e.g. pressure etc. is made. By making use of geological and reservoir data, pressure and water encroachment maps etc. it is possible to evaluate the state of development of the field. Through out this study and analysis, one can control the production of individual wells and of the reservoir as a whole.

Normally, during the life of the well/field, oil/gas withdrawal rates are established, monitored, changed after careful well performance analysis using indicator diagrams and on the basis of the data on water, gas and sand produced and the pressure drop. Taken in context with other geological information, the reservoir data facilitates control over production rates and ultimately on field development exploitation."

CHAPTER – II

Demand Projections and Consumption of Petroleum Products

2.1 The consumption of Petroleum Products is linked with the energy requirement of the country. Consumption of petroleum products in the country has grown by 63% over the past 10 years. The actual consumption of petroleum products was 79.16 million tonnes as against the Eighth Plan projected demand of 81.19 million tonnes in 1996-97. The compound average annual growth rate during Eighth Plan period was 6.8% as against the projection of 6.9%.

2.2 The following table shows the trends in domestic production of crude, consumption/ demand and self-reliance level of petroleum products over the last few years: -

Year	Domestic Production (MMT)	Consumption/Demand (MMT)	Self-Reliance
1989-90	34.09	54.10	63%
1990-91	33.02	55.04	56%
1991-92	30.35	56.97	50%
1992-93	26.95	58.90	43%
1993-94	27.03	61.54	41%
1994-95	32.24	67.45	45%
1995-96	35.17	74.67	44%
1996-97	32.90	79.17	39%
1997-98	33.95	85.49	37%
1998-99	32.72	90.56	34%
1999-00	31.97	97.09	32%
2000-01	31.70	100.08	31%

It can be seen from the above table that the self-sufficiency has come down from a peak of 63% in 1989-90 to 31% in 2000-01 primarily due to indigenous crude oil production stagnating in the range of 27 to 35 MMT(average 31.6 MMT).

2.3 As per the Ninth Plan projections, the oil demand of the country is expected to increase at a rate of 5.77% and is expected to be 104.80 million tonnes in the terminal year of Ninth Plan. At present the indigenous production of oil is 33 MMT and of gas is 25 MMTOI. Since the growth rate of demand for petroleum products is rising at a fast pace, our import dependence, which is 66.5% now, is likely to go up substantially.

2.4 Natural Gas production was also lower than the plan targets during Eighth Plan. Against the target of 125.42 Billion Cubic Metres (BCM), the actual gas production was

101.71 BCM. Cumulative production of gas during the Ninth Plan period is expected to be 144.53 BCM.

CHAPTER – III

Exploration and Production of Oil and Gas

(a) Physical achievement in exploration and Development

3.1 Seismic surveys play very important role in oil and natural gas exploration and exploitation, 2D seismic survey is conducted initially to understand the basic configuration. A detailed 2D and 3D survey is undertaken to identify and delineate prospect for drilling. After acquisition, data is processed in computer and interpreted/evaluated. Surveys help in reservoir management for enhanced oil recovery by means of evaluating the moving source or hydrocarbon fluids in the subsurface.

3.2 During the last five years (1995-2000) ONGC has acquired 69105 GLK/LK of 2D and 39532/GLK/LK of 3D seismic surveys and drilled 787 exploratory wells both onland and offshore areas. The following table shows category-wise details of exploratory activities of ONGC during the last five years:-

Basin	1997-98			1998-99			1999-2000			Total last 3 years		
	2D-GLK	3D-GLK	Wells	2D-GLK	3D-GLK	Wells	2D-GLK	3D-GLK	Wells	2D-GLK	3D-GLK	Wells
Cambay	1146	6638	43	1133	8386	47	1062	5885	51	3341	20909	**141**
Rajasthan	692		3	464		1	47		1	1203	--	5
Upper Assam	197	628	15	528	2195	10	452	2215	18	1177	5038	43
AAFB-Cachar	236		2	155		2	88		1	479	--	5
AAFB-Tripura	112		3	159		2	124		6	395	--	11
HF	244			123			30			397	--	--
Vindhyan	983		1	1094			485			2562	--	1
Satpura												
South Rewa												
Ganga	122									122		
Bengal-Onland#	182	867		140	776		169	419		491	2062	--
KG-Onland	635	1649	22	181	2160	22	295	1633	18	1111	5442	62
Cauvery-	18	1962	17	392	1901	19	372	1840	19	429	5703	55

Onland												
TOTAL ONLAND	**4567**	**11744**	**106**	**4369**	**15418**	**103**	**3124**	**12022**	**114**	**11707**	**39154**	**323**
Mumbai Offshore		82232	17		91207	22		88913	26	--	262352	65
Kerala-Konkan	1460		1	1581		1		18267	1	21308	--	3
Kutch-Saurashtra												
KG-Offshore	450	2012	2	959	1107	2	11	25617	3	1420	28736	7
Cauvery offshore						1	1123			1123	--	1
TOTAL OFF.	**1910**	**84244**	**20**	**2540**	**92314**	**26**	**1134**	**132797**	**30**	**23851**	**291088**	**76**
TOTAL ONGC	**6477**	**95988**	**126**	**6909**	**107732**	**129**	**4258**	**144819**	**144**	**35558**	**330242**	**399**

 # In addition, 67 sq. km. Of 3D was acquired by IIEP.

3.3 While analyzing the performance of exploratory activities of ONGC, the Committee wanted to know the details of targets and achievements. The following table shows the targets and achievements in regard to seismic surveys and exploratory wells during the last 5 years: -

a. Seismic Surveys (Onland):

Sl. No.	**Year**	**2D Seismic Surveys (GLK)**		**3D seismic Surveys (GLK)**	
		Annual Target	**Achievement**	**Annual Target**	**Achievement**
1.	1995-96	8309	7077	3849	5468
2.	1996-97	8430	6126	4162	6830
3.	1997-98	4645	4568	3914	11744
4.	1998-99	2996	4369	5204	15418
5.	1999-00	5292	3125	11975	12021

b. Seismic Surveys (Offshore)

Sl.No.	**Year**	**2D-LK**		**3D-LK**	
		Annual Target	**Achievement**	**Annual Target**	**Achievement**

1.	1995-96	25000	19007	18000	14725
2.	1996-97	20165	19251	29760	19668
3.	1997-98	3925	1910	85000	84244
4.	1998-99	925	2539	49300	92313
5.	1999-00	5750	1134	91000	132797

c. Exploratory Wells

Sl. No.	Year	Exploratory Wells	
		Annual Target	Achievement
1.	1995-96	242	199
2.	1996-97	284	189
3.	1997-98	153	126
4.	1998-99	144	129
5.	1999-00	151	145

ONGC have informed that they have expanded inputs in 19 sedimentary basins and tested for their hydrocarbons potential through seismic survey and/ or drilling. Presently exploration activities are continuing in 15 basins. As on 1.4.2000 ONGC has acquired a total of 827328 GLK/LK of 2D and 503544 GLK/LK & 6960 SSK of 3D seismic data and has drilled 4196 exploratory wells. As a result of these exploratory efforts ONGC has made 285 Hydrocarbons finds and established 5488.36 MMT of Initial Inplace volume of hydrocarbons till 1.4.2000.

3.4 The following table shows the activities carried out by Oil India Limited during the last five years: -

	1995-96	1996-97	1997-98	1998-99	1999-2000
A. SEISMIC SURVEY ASSAM & ARUNACHAL PRADESH					
2D SLK 2D GLK	2276.50	1016.60	1112	1146.17	1685.61
3D SQKM	120.92	82.96	170.32	163.34	
GVP 2D GLK	990.60	0.00	359.60	150.50	
B. EXPL DRILLING ('000 M)					
ASSAM & ARUNACHAL PRADESH	21.296	40.769	42.059	40.705	35.695
RAJASTHAN	4.872	1.520	7.498	0.501	3.064

SEP OFFSHORE	5.362	2.850			
GANGA VALLEY BASIN, U.P.				3.365	1.451
TOTAL EXPL DRILLING	**31.530**	**45.139**	**49.557**	**44.570**	**40.210**

3.5 In all out of 26 sedimentary basins OIL has tested 6 basins for their hydrocarbon potential by seismic survey and/ or drilling and has been producing oil and gas from three basins till date.

3.6 The details of exploratory drilling and seismic works carried out by PVT./ JV. companies during the last five years are given below:-

Exploratory Drilling:

(Figs. In meters)

Name of basin	**1995-96**	**1996-97**	**1997-98**	**1998-99**	**1999-2000**
K.G. Basin (off.)	3224(1)	2919(2)	14475(5)	5680(4)	-
Mumbai basin (off.)	-	3007(1)	-	2151(0)	6201(3)
Cauvery (off.)	-	-	1685(1)	-	-
Cambay (off.)	-	-	895(0)	5130(3)	-
Rajasthan (onshore)	-	-	-	2573(0)	3707(2)
Total	**3224(1)**	**5926(3)**	**17055(6)**	**15534(7)**	**9908(5)**

NOTE: Figures in bracket indicate number of wells.

Seismic Survey:

(Figures of 2D in LKM)
(Figures of 3D in sq. km)

Name of Basin	**95096**		**96-97**		**97-98**		**98-99**		**99-2000**	
	2D	**3D**	**2D**	**3D**	**2D**	**3D**	**2D**	**3D**	**2D**	3D
Mumbai basin offshore	0	1459	0	1072	527	112	0	0	0	0
Cambay onshore	-	-	150	0	16	0	0	23	-	-
Cambay Offshore	-	-	-	-	-	-	-	-	2513	-
Cauvery Offshore	-	-	-	-	-	-	-	-	-	173

Gujarat Kutch offshore	-	-	-	-	-	-	-	-	-	118
KG basin offshore	518	0	-	-	-	-	1498	-	1500	938
Rajasthan onshore	-	-	1606	14	1062	0	348	0	-	-
Pranhita Godawari (onshore)	129	-	-	-	-	-	-	-	-	-
Total	**647**	**1459**	**1756**	**1086**	**1605**	**112**	**1846**	**23**	**4013**	**1229**

3.7 In addition to the efforts of Pvt./ JV operating companies, DGH has also carried out reconnitory type of surveys to open up hitherto unexplored areas for future exploration. The details of surveys undertaken by DGH during the last 5 years are as under:-

(i) Satellite gravity studies - 1.64 million sq. kms. (under SIDA grant)
Over entire East Coast, West Coast and Andaman offshore including deeper offshore areas.

(ii) Seismic & G.M. Surveys - 11,035 LKM
(iii) Seismic onland - 1200 LKMs in Ganga Valley and Vidhyan Basin.
(iv) Aeromagnetic Surveys - 23,730 LKMs in Kutch onland areas.
(v) Magnetic Telluric Surveys – 352 sound in nagpur – Wardha and Belgaon areas.
(vi) 2D Seismic surveys – 1485 LKM in Andaman offshore

3.8 Directorate General of Hydrocarbons while summarizing their exploratory efforts made so far and the achievements made therefrom have submitted the following details: -

"During the last several years, DGH has covered the entire Indian offshore areas through Satellite Gravity Surveys. DGH has also covered large parts of eastern offshore and Andaman offshore areas including deep-water areas through Joint Venture Speculative Seismic and Gravity Magnetic Surveys.

Summary of some of the reconnitory surveys projects undertaken by DGH are as under:-

* Total area opened so far 1.756 million sq. km of which 94% is offshore and 6% onland.

* Of this total, satellite gravity surveys over the eastern and western offshore areas and Andaman account for 1.642 million sq. kms. (82%). Joint Venture Offshore speculative, geophysical surveys within the same area in eastern offshore and Andaman cover about 0.246 million sq. kms. (12%). These latter surveys have given valuable clues to structure, tectonics, sedimentary thickness and play recognition in the deep waters, and have provided inputs for modeling studies and for the preparation of a hydrocarbon prospect map of the areas.

It may be pertinent to mention here that as a result of these surveys, DGH identified 12 deep water offshore blocks which were offered under first round of NELP for the first time in the country. Out of these, 7 blocks were awarded to various private/ JV companies.

The efforts of DGH are mainly in areas where the information is required to be graded and operating companies would normally not go for exploration in such areas on commercial consideration unless the information of these areas is adequate to develop the geological perception."

3.9 Asked whether the machinery available with ONGC for seismic survey processing and interpretation matches with the latest technology internationally, ONGC replied in a note:-

"The machinery available with ONGC are at par with the latest being used in the industry worldwide in all facets of its seismic data acquisition, processing and interpretation (API) activities. The endeavor has been to continuously upgrade and/or to procure the latest technology to keep pace with the international standards. Barring patented software of oil majors, service companies world over bring about the technology growth in seismic data API. In ONGC, keeping this benchmark, the state of art data API technology is either acquired or used as per requirement. ONGC also carries out software development on its own.

As far as international practice of major E&P companies is concerned, acquisition and processing of seismic data is normally not done by E&P companies in-house and instead farmed out to geophysical service contractors. The extract details regarding the hardware/software capabilities of geophysical contractors are of proprietary nature. However, as per the verbal feedback from the international visitors, the machinery of international geophysical contractors are generally of large size (capabilities) than in ONGC , as they have to remain ever ready to undertake unforeseen requirements from any part of the world. Also, their systems

of procurement and hiring of equipment are more upgrade their systems continuously and quickly."

3.10 While going into the further details of various available methods of seismic surveys, the Committee wanted to know the achievements of ONGC in 3D surveys and status of applying 4D surveys. ONGC submitted the following details: -

"ONGC introduced 3D seismic surveys for the first time in 1985-86 in Cambay basin. ONGC is increasingly paying more attention to widespread use of 3D seismic survey as an exploration and development tool. The pre-drill 3D surveys in high cost deep-water environment as a risk reduction measure has also been started in ONGC.

Major fields of ONGC have been covered by 3D seismic surveys. In the Neelam oil field in the Mumbai offshore ONGC carried out a time-lapse 3D seismic surveys. The 3D seismic data acquired in Bombay High field will form the basis for the future time lapse 3D surveys (4D). Meanwhile, technological innovations which are in the anvil are under focus of the company for 4D surveys."

3.11 Oil India Limited have submitted the following details about their 3D and 4D survey:-

"OIL started 3D survey in 1993 in the Upper Assam Basin. 1127 SQKM 3D seismic data has been acquired since then covering four producing fields till 31st January, 2001. As 4D survey is taken after observing the field for certain time period of carrying out 3D survey, OIL is working to identify a suitable field already covered with 3D Seismic to test this technology.

OIL also conducted 3D survey covering 300 sq. km over the gas fields of Rajasthan in 1991-92.

As regards achievement, till adoption of 3D survey, OIL focused its exploration in shallower prospects restricted mainly to Tipams and Barails. Due to this superior technology, the deeper prospects at lower Paleocene/ Eocene levels could be identified. The 3D surveys and its interpretation has also brought out better reservoir delineation. Shallower prospects with smaller areal extent could also be identified."

3.12 In view of specific survey work being undertaken by DGH, the Committee specifically wanted to know about their findings. DGH submitted in a written reply: -

"2D Seismic Surveys covering an area of about 0.114 million sq. km. Were carried out in the following onland areas with very interesting geological findings as described below: -

- Vindhyan and Ganga Valley basins: About 1200 GLK of seismic work and reprocessing and reinterpretation of earlier data revealed that conditions are conducive to hydrocarbon generation and accumulation along the Narmada-Son lineament between Jhabera and Madhubani. A new lower Vindhyan, paleo-embayment comprising a number of high and low basement features has been mapped. This increases the prospectivity of blocks, which have been offered, in this new area, under NELP-II round.

- Aeromagnetic Surveys in Rann of Kutch and contiguous areas: The surveys have mapped very interesting high and low basement features with thick sediments. This area can emerge as a prospective block for oil and gas exploration.

- Magnetolelluric (MT) Surveys in Nagpur-Wardha-Belgaum area: The results have revealed hitherto unknown 3-4 kms. thick sediments below thick zone of Basalt (hard rock). These newly discovered sediments may have hydrocarbon potential.

- 3606 LKM of initial work was carried out by DGH under JV Speculative Surveys followed by 1485 LKM of infill seismic surveys in Andaman offshore. This led to the identification of several leads/ prospects with significant accumulation of Gas Hydrates and free gas beneath gas hydrates.

- Re-completion and re-interpretation of all the available geological, geophysical, geochemical and geo-technical data of Ganga and Punjab basins for a better understanding of these basins and for identifying the prospective areas. These studies have led to the demarcation of certain prospective areas and 1 block each in Vindhyan basin and Ganga basin, with new data has been offered under Second round of NELP. The remaining area needs more exploration coverage."

3.13 About their findings in east coast and Andaman Deepshore areas DGH have informed as under: -

"The interpretation of the newly acquired geophysical data in the deepwater areas of the east coast has indicated presence of a variety of new hydrocarbon plays, as well as evidence of direct hydrocarbon indicators. 35 structural features varying in size from more than 200 sq. km to 2400 sq. km have been identified.

In the Cauvery area, Eocene carbonates and sands over cretaceous highs, Paleocene wedge-out prospects, plays within gravity slump features/ Miccene turbidite fans constitute the main play types. Large structural traps within Tertiary sequence, drap-over features/ roll over anticlines within Mio-Paleocene sequences, Eocene fringe reefs and Paleogene channels within bright spots constitutes the principal play types in the Krishna-Godavari basin. In the Mahanadi area, large structural traps within Tertiary sequence, Paleocene carbonate build-ups, Paleogene wedge-outs against basement highs, turbidities, channel fills and submarine fans are some of the prominent play types. In addition to the above play types, the presence of direct hydrocarbon indicators such as flat spots, bright spots, gas chimneys, pock-marks, velocity sags etc. have been observed.

In Andaman Offshore, presence of gas hydrate deposits with substantial free gas accumulations below the hydrates have been identified, over an area of 3,000 km2 . Seven structural leads have been mapped."

3.14 During the course of examination, the Committee drew the attention of the Ministry towards the surveys conducted in Andaman Nicobar sector and Mehsana in Gujarat and Jaisalmer in Rajasthan and asked the present status of granting approval of survey data and data package which were submitted earlier to the Ministry and the reasons for delay in approval of these projects even after a lapse of several years. The Ministry of Petroleum & Natural Gas submitted the following information:-

"In Andaman offshore deepwater areas, several interesting leads have been obtained as a result of surveys carried out by the DGH. However, close grid seismic surveys were required to be carried out over these areas to confirm the leads and firm up the location for drilling. These surveys have recently been completed by DGH and are under processing and interpretation. Thereafter, drilling in the areas will be undertake keeping in view the security concern expressed for entry of foreign companies.

Under NELP-II round, 2 exploration blocks in Gujarat State (Cambay Basin) and one exploration block in Rajasthan (Jaisalmer Basin) were offered for bidding and contracts were signed in July, 2001. Data packages and basin information dockets for these blocks/basins were prepared for data viewing and sale during the NELP-II Round and there were no delays in making the data packages in this case."

3.15 When specifically asked whether DGH has prepared any hydrocarbon prospect map for various basins, DGH submitted in a written reply: -

"DGH has prepared hydrocarbon prospect map of the east coast deepwater basins and Andaman basin based on interpretation of seismic data acquired by DGH. In addition, structural and stratigraphic prospects have been mapped by

DGH in Vindhyan and Ganga valley basins based on JV speculative seismic surveys.

In addition to above, the National Oil Companies have mapped prospects in various sedimentary basins of India based on their studies."

3.16 When asked about the status of data processing facilities in DGH, the DGH submitted in a written reply: -

"Data Processing Techniques cover a wide spectrum of activities in Petroleum Industry. It may range from routine office automation to specialized techniques like seismic interpretation, reservoir monitoring, seismic data processing and E&P database.

Broadly, at present DGH is having following facilities:-

1. PCs and peripherals for office automation - PC s(about 50 nos.) are equipped with standard softwares like windows, MS-office (word excel, Powerpoint, Access), adobe, page-maker, Arc-Info, Arc-view etc. These softwares to a large extent, take care of DGH's day-to-day documentation and presentation needs.

2. Work stations for interpretation – DGH is having SUN workstations (one ultra- 60, one ultra-10, two spare-20) in client-server configuration; for seismic interpretation. These are equipped with state-of-the-art Geoquest software from M/s schlumberger. Good quality plotters-printers are attached to the work-stations. Geoquest software also includes some basic reservoir modules.

3. Databases – At present DGH is in the process of developing the E&P database. A modest database has been designed based on MS-Access Software. This is being used for storing and reporting various E&P data statistics for reporting purposes. Two more MS-Access databases have been created to maintain digital data library & Essentiality Certificates of DGH.

4. Miscellaneous Softwares - Few softwares have been specially developed for catering specific needs like, Bid evaluation Software for NELP and CBM. Money-wise for economic analysis of Pvt./ JV parties, accident analysis Software etc."

3.17 About their computing facilities they have informed as under: -

"in terms of seismic interpretation and office automation, SGH's IT set-up, can be considered satisfactory. However, periodic software and related hardware upgradation is essential to absorb technological developments.

DGH is in the process of developing the National E&P Database & Archive. Feasibility study has already been completed for E&P Database. Implementation plan is being worked out. Seismic data processing facilities are not presently available with DGH. These facilities will require substantial investment. Ministry of Petroleum is yet to take a final view whether these facilities may be established in DGH or not."

3.18 About the status of E&P Database & Archive they have submitted the following details: -

"The National E&P Database and Archive is to be created by DGH as per its charter./ DGH conducted two studies through international consultants: (1) M/s. Smedvig Technologies, Norway under the ADB grant for E&P Database & Archive and (2) M/s. Math-Tech, USA, under USTDA grant for Management Information System (E&P-MIS) to evaluate the scope of work, industry practices, and solutions available in the market. Consultants have submitted their reports.

Based on these reports a comprehensive implementation strategy is being work out."

3.19 While describing their Seismic Data Processing system they have elaborated as under: -

"Creation of seismic data processing facility in DGH would also be dependent on several factors, like availability of new data under DGH's purview, reprocessing of old data for data package preparation, availability of trained manpower, space and budget. Seismic data processing being a very specialized job, 10-16 trained personnel would be required. Modest 2000/3000sq. ft. of area (with AC & infrastructure) and US$ 4 to 5 million would be required to be invested to create a base level center."

3.20 While going into the depth of nature of work relating to survey and drilling, the Committee desired to know the details of the actual strength and expertise of scientists, geologists involved in survey, exploration and exploratory drilling activities of companies and adequate/up to mark to exploit the hydrocarbon resources of the country optimally, the Ministry of Petroleum & Natural Gas submitted the following details about ONGC: -

"ONGC is having 3825 Scientists as on 1.4.2000 in Geology, Geophysics Reservoir and Chemistry disciplines of which Geologist, Geophysicist and Chemist are 992, 1395 and 1061 respectively. These Scientists are engaged in surveys, drilling and other oil gas exploration related activities.

Presently there are 95 rigs in ONGC (76 Onland and 19 Offshore) of which 44 rigs are deployed for exploratory drilling. As per prevailing manning norms, 220 scientists each from Geology and Chemistry disciplines are required for

exploratory drilling operations. In addition to this, Geologists are required for interpretation of data, release of locations, monitoring of exploratory and development activities, preparation of development plans, JVGs, R&D backup and other synergistic approach.

ONGC is having nineteen 2D, thirteen 3D seismic parties and one Offshore seismic vessel for seismic data acquisition. As per manning practices, these activities require 230 Geophysics. In addition to this, geophysicists are required for seismic data processing and interpretation of data, VSP operations and at Regional Computer Centres.

At present, the existing manpower is adequate to cope up with the existing planned activities of ONGC.

Additional manpower in geoscientific cadre shall be required keeping in view career growth, succession planning, retirement profile and ONGC's future perspective plans."

3.21 About staff strength of Oil India Ltd. they submitted the following details: -

"So far as OIL is concerned, it has integrated facilities in terms of expertise, manpower and equipment for carrying out seismic survey and drilling. The following departments are mainly responsible for carrying out the above activities with support services from related departments:-

i) Deptt. of Geophysical Data Acquisition and Processing (GDAP) – responsible for carrying out the seismic survey operation for acquisition of data processing and interpretation.

ii) Deptt. of Geology – responsible for planning for seismic survey and exploratory drilling and also for interpretation of seismic data in conjunction with GDAP Deptt,. monitoring of drilling of wells and interpretation of drilling results and subsequent action thereon.

iii) Deptt. of Drilling – responsible for execution of the drilling operations.

As on date, OIL has 150 Geoscientists, consisting of Geologists, geophysicists, Well Logging Engineers and Petroleum Engineers working on seismic survey, operations, processing, interpretation, planning of survey, drilling, monitoring of these activities, production operation and all other related activities on various levels with varying responsibilities. OIL has adequate no. of Geoscientists to carry out the above activities in OIL's existing concessional areas."

3.22 About the staff strength of DGH, they informed as under: -

"In so far as the Office of Directorate General of Hydrocarbon is concerned, this Office has 14 Geologist, 12 Geophysicists and 3 Chemists/Geochemists. The DGH is not concerned with actual exploitation of the hydrocarbons and is concerned with monitoring of E&P activities."

3.23 When asked about the nature of coordination between ONGC and OIL and also with DGH in survey work, the ONGC replied in a note: -

"ONGC and Oil India Limited are the two national oil companies working in different sectors in the country. Both the NOCs have been acquiring acreages in different basins of the country. Data sharing by the two companies with each other for adjacent blocks/ areas of interest has been a practice as and when required. DGH being the regulatory body of the GOI undertakes speculative (knowledge building) surveys in both the land and offshore areas.

In an endeavour that requires a collective wisdom, these agencies come together. As for example, in the National Gas Hydrate Project (NGHP), all the three agencies alongwith the institutes are working together to take first step to learn to harness a possible new and clean source of energy.

In the emerging NELP regime, ONGC and OIL have common interest in some sectors where they can partner even at the bidding stage, as has been the case in NELP-I and II."

3.24 While examining the expenditure being done by National Exploration and Production Companies on R&D, the Committee noted that it was just about 1% of the planned expenditure every year. When the Committee wanted to know about justification for this type of trend, the Ministry of Petroleum & Natural Gas submitted the following written reply:-

"Development of Technology in oil sector has a large gestation period and involve very large investment. Large number of technologies in the E&P sector are provided by the international services. These services have very strong R&D centres. Duplicating their technology through indigenous efforts does not ensure meaningful returns to national E&P companies because of limited return on R&D on such technology. The bulk of expenditure in the captive R&D centres of E&P companies is towards adaptation of these technologies to generate cost effective solutions to their operational problems.

Towards this, the expenditure incurred by the **ONGC** during VII and VIII recurring plan was of the order of 1%. However, in the first four years of the IX Plan, the expenditure on R&D is of the order of 3%. This will further increase in the coming years in view of the focus on exploration in frontier areas including deep water and EOR schemes of the ONGC fields. **Oil India** in first four years of

IX Plan have spent less than 1% of the budget on R&D activities. The low investment is mainly due to carrying out part of R&D works in other R&D institutions in India, such as IRS, KDMIPE, NGRI, BSIPB and also universities. Modest R&D setup of OIL is equipped to deal with some specific problems in OIL's operational areas/fields."

3.25 The Committee further wanted to know whether the Government propose to allocate more money on R&D, particularly to face the challenges in exploration and production in frontier/unexplored/poorly explored basins of the country, the Ministry of Petroleum & Natural Gas submitted as under: -

"ONGC and OIL has proposed to enhance the allocation for R&D particularly for taking up studies and pilots for improving recovery factors in their major producing fields, where enhanced oil recovery/improved oil recovery have been planned. The R&D allocation of ONGC in the current plan is about 3-4% and is expected to increase in the X Plan. Similarly, OIL plans to invest about 3% on R&D efforts in the X Plan.

ONGC and OIL also take up R&D/experimental studies to understand the geology of frontier areas. As brought out above, the efforts of NOCs have been to meet their technological requirements/challenges either through in house capability using its own R&D facilities or to meet by outscouting."

3.26 Dealing with the funds position for the petroleum sector the Committee wanted to know about the total collection of cess from the oil sector since enactment of OIDB Act, 1974 and the amount released so far to the OIDB and further by OIDB to oil industrial concerns or individuals for prospecting for and exploration of mineral oil within India or outside India, the Ministry of Petroleum & Natural Gas submitted the following details: -

"Total collection of cess by the Government of India (net) up to 31/03/2001 has been Rs. 38576 crore, out of which, the OIDB has been released Rs. 902.40 crore till date. Since inception and till 15/09/2001, the loan assistance to the tune of Rs. 1177.36 crore has been given to the oil industrial concern for prospecting for and exploration of mineral oil. In addition to the above, the OIDB, since inception of DGH i.e. from 1993 upto 15/09/01, has released grant-in-aid to DGH to the tune of Rs. 116.34 crore as per the requirements provided by DGH."

3.27 In the same context, the Committee referred to their earlier recommendation regarding amendment in OIDB Act so that the funds collected through cess from petroleum industries may be used for the development of petroleum industry only and wanted to know the present status and conclusive action taken in this regard and the

reasons for delay in finalisation of this matter. The Ministry of Petroleum & Natural Gas submitted the following justification:-

"In pursuance of the directions of the Standing Committee, a draft Cabinet Note was circulated to the concerned Ministries for comments. Ministry of Finance is in full agreement with this approach provided the existing budgetary support to Ministry of Chemicals and Fertilisers is also routed through the OIDB in addition to the budget of the Ministry of Petroleum & Natural Gas. Otherwise the suggested change in the Act will have severe financial implications for the finances of the Central Government. It will create a high demand of the order of Rs. 3000 core p.a. on the budget, which Government can ill-afford at this critical juncture when containing the fiscal deficit is high on economic agenda of the Government. Presently, the cess collections are far less than the Government expenditure on Petroleum, Petro-chemical and Fertiliser sectors. Hence, the rates of cess will have to be significantly increased.

Ministry of Chemicals and Fertilisers have also observed that the cess collections are far less than the Government's expenditure on petrochemicals and fertiliser sectors. If the entire proceeds are credited to the OIDB and the OIDB is also expected to carry out the responsibility of funding fertilisers and petro-chemicals sectors, the interests of the fertiliser and petrochemicals sectors would suffer. The proposed amendment, together with the rider introduced by the Ministry of Finance, will not, therefore, be in the interests of the petro-chemicals and fertiliser sectors.

These comments have been examined. Cess proceeds under the OID Act will be totally inadequate to meet the total expenditure of Petroleum, petrochemical and fertiliser sectors. For Department of Fertilisers alone, the expenditure during 1998-99 was Rs. 9604 crore while estimated cess collection per annum will be in the range of about Rs. 3000 crore. The increase in rate of cess will not be feasible as it will adversely affect oil producer and will also have upward impact of prices of Petroleum products.

Due to said reason, the proposal to amend the Act to provide for transfer of entire cess proceeds to OIDB, does not appear feasible at this stage."

(b) Physical achievements in production of Oil and Oil Recovery Schemes.

3.28 The following table shows the production of oil during the last five years: -

Production in MMT

	1995-96	**1996-97**	**1997-98**	**1998-99**	**1999-2000**
ONGC	31.635	28.685	28.250	26.305	24.648
OIL	2.882	2.870	3.094	3.295	3.283

Private/JVCs	0.650	1.346	2.514	3042	4.018
Total	**35.167**	**32.901**	**33.858**	**32.642**	**31.949**

It is visible from the above data that inspite of the addition of 3-4 MMT in production by private companies, the total crude oil production in the country is declining continuously.

3.29 The total indigenous production of the crude, the total contribution of ONGC is about 85%. The following table shows the targets set in the MOU vis-à-vis the actual performance of ONGC and OIL during the same period: -

	ONGC		OIL	
Year	**Target (MMT)**	**Actual (MMT)**	**Target (MMT)**	**Actuals (MMT)**
1995-96	33.316	31.635	2.98	2.882
1996-97	31.092	28.685	3.02	2.863
1997-98	27.733	28.251	3.05	3.094
1998-99	28.101	26.385	3.20	3.294
1999-2000	25.800	24.648	3.30	3.283

3.30 When the Committee desired to know the reasons for lowering the targets year after year particularly by ONGC the Ministry of Petroleum and Natural Gas stated the position: -

> "Annual targets are set on a yearly basis based on the past performance and potential of each field and inputs envisaged every year. This forms a part of MOU signed by NOCs. As ONGC's major fields have already crossed their plateau production phase and are in decline stage of production and also there has not been significant hydrocarbon discovery in recent years, MOU targets have been fixed accordingly. So far OIL is concerned, the production target of oil has generally shown modest increase despite no major discovery. So far gas is concerned, the targets of both NOCs have shown increasing trend. No annual targets are set for the private/ JV companies through MOUs."

3.31 The major part of ONGC's, Oil and gas production comes from the offshore fields of ONGC with Mumbai as the center. The estimated inplace value of Mumbai High Oil field with field is 1732.60 MMT and cumulative production as on 1.4.2001 is 307.29 MMT. The following table shows the production from Mumbai High during the last 4 years:-

Year	**Oil Production (MMT)**
1997-98	12.44
1998-99	11.59

1999-2000	10.15
2000-2001	10.188

3.32 The well details as on 1.4.2001 in Mumbai High field is as under: -

Total wells drilled (excluding injection wells)			564
Oil Wells		480	
(i)	Flowing of oil wells	441	
(ii)	Sick oil wells	39	
Gas wells		30	
(i)	Flowing gas wells	25	
(ii)	Sick or non-flowing gas wells	05	
Dry and abandoned wells		54	

3.33 When specifically asked about the factors responsible for stagnation in production in all major basins. The Ministry submitted as under:-

"The reasons for near stagnation oil production in the major basins contributing to the domestic production viz. Mumbai offshore, Cambay onland and upper Assam basins are as under:-

(1) Less base potential available in the beginning of the year due to ageing of the fields.
(2) Less production due to rapid decline in production rate and increase in water cut.
(3) Closure of High GOR wells in Mumbai High.
(4) Frequent power shut down affecting artificial lift operations.
(5) Land Acquisition Problems.
(6) Environmental problems like barricades/ bandhs/ thefts, etc."

3.34 When the Committee desired to know about the steps being taken to augment the indigenous oil production, the Ministry of Petroleum and Natural Gas submitted the following details in a written reply: -

"Steps taken to increase indigenous production are given below:-

- ❖ Improving the recovery factor from existing major fields by implementing Enhanced Oil Recovery (EOR)/ Improved Oil Recovery (IOR) schemes in ONGC fields.

- ❖ Increasing exploration efforts through the New Exploration Licencing Policy (NELP) . Government of India has signed 47 contracts for exploration of oil and gas in the 2 rounds of NELP.

- ❖ Attracting technology and investment through signing PSCs with consortia of Indian and foreign companies.

- ❖ Exploring in new areas such as deepwater and difficult frontier areas as also in deeper layers of producing fields. Discoveries have already been made in Krishna-Godavari deep waters.

- ❖ Speeding up the development of newly discovered fields and stepping up use of new technologies for seismic surveys, work-over and stimulation operation, drilling wells in producing areas etc."

3.35 When asked about the initiatives taken by ONGC to enhance the oil recovery, CMD, ONGC stated as under: -

"In Assam most of our fields are old and ageing fields and there has been depletion. However, we have taken up very aggressive programme of enhancing the oil recoveries and over the next three to five years we are confident that this will show results. We are using some of the cutting edge technologies. For example, in Silcher where the fields are very-very old, we are now following microbial enhancement of recovery and wells which were producing one tone a day are now producing three tonnes a day. So, it is effective on that. The second issue was the power failures were affecting our production very badly. So, we have decided to install a captive generating gensets in addition to additional feed up from State Electricity Boards so that power availability does not affect our production. Third is, as I mentioned in Jorhat, some of the structures we have gone for the exploration and we have found new oil. So, taking these three things in account – power shortage being tackled, enhance for recovery techniques being applied and aggressive explorations – we are fairly confident that we will arrest the decline and go for hopefully net increase in three to five years period."

3.36 In the same context the Committee put the same query before Oil India Limited and wanted to know about the measures being taken by them for augmentation of crude oil production particularly in the old depleting fields in Upper Assam basin. Oil India Limited submitted the following details in a written reply:-

"The old fields of Assam have yielded over 30% of its in-place reserves and is at the ultimate stage of depletion. Arresting decline/sustenance of production through various efforts both at well level and reservoir level are being tried by

inhouse efforts and outside expertise. The measures taken by OIL to increase crude oil production including for old depleting fields are as under:-

Short Term:

i) Reprioritisation and re-scheduling of developed wells alongwith gearing up of surface handling facilities and redistribution of water injection;
ii) Augmentation of workover efforts;
iii) Liquidation of sick wells on priority basis;
iv) Programmed activation of sand producers through CTU service;
v) Bringing onstream immediately exploratory wells by Quick Production System.

Mid-term/Long Term:

i) Augment Improved Oil Recovery (IOR) measures for optimum reservoir management;
ii) Gravel pack completion to retrieve locked up potential;
iii) Water shot off services to control Water Oil Ratio (WOR) of wells in key reservoirs;
iv) 3D seismic survey within producing fields to identify undrained oils within the existing reservoirs and unknown reserves within existing area of production and to identify deeper prospect below the existing producing declining reserves which were discovered in early '50s.
v) Accelerated exploration for accretion of more crude oil reserves
in addition to carrying out exploratory work in the South Bank of River Brahmaputra in Assam. OIL has also plans to carry out exploratory work in the Brahmaputra river bed, further exploration in the North Bank of river Brahmaputra, etc.
vi) Revitalisation of old depleting fields
Multi disciplinary study is being carried out to revitalise the old depleting fields which will enable OIL to devise and implement measures for further enhancement of recoverable reserves and increase oil and gas production from its ageing fields.

Geoscientific studies to identify new plays and prospects, stratigraphic traps and prospect within thrust belt have been in progress. The results of these integrated studies will provide valuable inputs for finding new oil and gas reserves."

3.37 It came to the notice of the Committee that there were specific problems being faced by the Oil Companies in the North-Eastern regions. Oil India Limited submitted the following details in this regard:-

"OIL produces crude oil from its fields in Assam and Arunachal Pradesh. OIL has been experiencing a number of constraints in oil/gas production activities. Major constraints are stated below:-

i) Infrastructural constraints leading to production curtailment caused by land acquisition problem. It is also adversely affecting our drilling performance. However, the situation is improving with the help of the State Government.

ii) Environmental problems like Bandhs, blockades, etc. occurring frequently, affecting direct loss in crude oil/gas production because of perforce shutting-in of wells.

iii) Closure of flow lines, valves, etc. by miscreant and theft of oilfield equipment and material affecting loss in oil/gas production directly.

iv) Extremely bad road conditions in and around the oilfield areas including National Highway – NH – 37 and PWD roads affecting movement of men, equipment and material, especially disruption in bowser movement directly affects the crude oil production.

The indirect effect of closure of wells is also tremendous. It takes very long time to retrieve the original production potential after closure and at times the wells die down completely. Effects ondrilling and workover operations also ultimately land up in lower oil/gas production.

OIL has taken up the above matters with the State Government. There has been improvement in the land acquisition cases recently. Security has also been intensified. Preventive measures are taken to keep the crude oil production loss to minimum during Bandh period. As regards bad road condition, OIL has also regularly offered financial assistance to the State Government for improvement of roads in and around its operational areas. In this regard it may also be noted that constant interaction with State Government both by OIL and Central Government has gradually started showing an improvement in the situation."

3.38 In response to specific query of the Committee about the Average Recovery Factor in regard to oil and gas in the country, the Ministry of Petroleum & Natural Gas informed as under: -

"Recovery factor is the empirical term by which estimated Inplace hydrocarbon is quantified as producible. This is always globally shown as a factor by percentage. This quantum of hydrocarbon (oil and/or gas) is likely to be produced from a pool/or accumulation, considering the envisaged petrophysical properties and reservoir dynamics.

Average recovery factor for Indian basins for oil is 29% and for gas is about 63%.

As regards the average recovery factor/recovery efficiency, the API Sub-Committee on recovery efficiency undertook a study in 1984 on actual field performance of producing fields, rather than on theory or laboratory data and to develop an empirical correlation for the prediction of Recovery efficiency. The significant finding of the study was that the correlation will provide very minimal use for prediction."

3.39 Explaining it further, the Ministry stated: -

"Average Recovery Factor analysis for last 10 years indicate a range of 29-30% for oil and 60-63% for gas. However, the average recovery factors for different types of reservoirs vary widely. ONGC is working to improve the Average Recovery Factor of the producing fields by applying technologies like thermal process, IOR / EOR.

Various EOR laboratory studies, full/partly are undertaken /to be undertaken during IX Plan for specific sandstone/limestone reservoirs to enhance the production and recovery efficiency.

- In Mumbai High, Air/Water alternate Gas (WAG)/Water (with additive) injection is envisaged and will be tested for its effectiveness.
- In Gandhar, Nitrogen Injection/Air Injection will be tired.
- In Kalol, Alkaline – Surfactant-Polymer (ASP) flood method.
- In Sobhasan, surfactant/ASP to be tested for its effectiveness.
- In Jhalora, ASP to be tested for its effectiveness.
- In Lakwa, Chemical flood (ASP) to be tested for its effectiveness.
- In Geleki, ASP will be tried.
- In Lakhmani, Polymer/Surfactant/ASP has been planned.
- In Sonari, Nitrogen injection (R&D) will be experimented.

These studies, depending upon the field concerned, will be laboratory tested and if successful will be applied as pilot and on successful tests, will be fine-tuned before field implementation/commercialisation. Any new technology break through will also be incorporated for advancement of efficiency factor."

3.40 About the Oil Recovery Factor of Oil India Ltd., Ministry submitted the following details: -

"Recovery factor of crude oil of OIL's fields/structure/blocks in Assam & Arunachal Pradesh varies from 20 to 45% depending on reservoir characteristics.

The average recovery factor of crude oil & natural gas in OIL's fields in Assam & Arunachal Pradesh is of the order of 30% and 68% respectively. The average recovery factor of OIL's gasfields in Rajasthan is 70%. As regards heavy oil reserves in Rajasthan, the tentative average recovery factor is of the order of 15%. However, this will depend on the identification of suitable production technology.

OIL has adopted Pressure Maintenance/EOR scheme since 60s to improve recovery factor. The steps which have been taken over the years are as under:-

I) Peripheral Water Injection;

II) Water flooding;

III) Crestal gas injection with or without water injection;

IV) Polymer flooding.

OIL is continuing its Pressure Maintenance/EOR scheme in various block. In addition OIL is also carrying out following IOR jobs for improved recovery:-

i) Water Shut Off

ii) Sand control

iii) Inhibition of Paraffin/Asphaltene deposition

In order to obtain additional requisite geo-scientific information to examine scope of further improving recovery from the depleting reservoirs, 3D seismic survey has already been taken up. Multi disciplinary study has also been planned to revitalise the old depleting fields which will enable OIL to know extent of the sand bodies, cumulative production, balance recoverable hydrocarbons and take up necessary Improved Oil Recovery (IOR) methods."

3.41 About the performance of Private/Joint Venture Companies in this field, the Ministry informed as under: -

"Average recovery factor for oil in respect of private and JV fields is currently estimated at about 26% and for gas between 60-65%.

In so far as PVT/JV fields are concerned, steps are being taken to improve the recovery factors through proper reservoir characterisation and timely water injection for pressure maintenance. Application of IOR/EOR techniques would also be planned depending upon techno-economic feasibility."

3.42 While going into the details of the Enhanced Oil Recovery (EOR) and Improved Oil Recovery (IOR) schemes of ONGC, the Committee desired to know the details of the achievements made by ONGC in this regard. The ONGC submitted the following details in a written note: -

"A review was undertaken in 1998-99 of the 15 major fields, which together contribute to over 80% of the company's reserve and production, to initiate measures for recovery improvement over the field life. This review included Mumbai High for which detailed reservoir studies were already in progress and also covered the commercial scale EOR schemes being implemented for heavy oil in Balol and Santhal fields. The review indicated opportunity for improving recovery and increasing production in progressive steps by enhancing efforts and making additional capital investments based on detailed geological and engineering investigations.

Following the review, a work programme to increase the recovery on an average by about 4 to 5% in the first stage has been drawn up for the 15 fields. This work, identified into 19 schemes, is scheduled to be completed in next 5 to 6 years at a cost of around Rs. 10,000 crores. The incremental crude oil production anticipated is about 124 MMT over the next 20 years, half of which would be from Mumbai High.

Ten schemes including Redevelopment of Mumbai High North are already under implementation and the remaining are envisaged to be put into effect in the current year.

The proposed efforts in the 15 identified fields namely Mumbai high, Heera, Neelam, Gandhar, Kalol, Sanand, North Kadi, Santhal, Balol, Sobhasan, Jotana, Lanwa, lakwa-Lakshmani, Rudrasagar and Geleki consist of installation/ upgradation of producing facilities, pipelines, drilling of approx. 650 new development wells, side tracking of existing wells, zone transfers, gas/ water shut off jobs, optimization of artificial lift systems etc.

During the implementation of the improved recover projects, particularly the Redevelopment of Mumbai high, a number of innovative drilling and well activation methods incorporating international best practices are proposed for trial testing. These new technologies like horizontal drilling, geosteering, self diverting acids, non-damaging drilling fluids, gels for gas and water shut-off, jet pumps etc. demonstrate potential for significant increase in the production rates. As confidence in the new technologies/ techniques is gained, the workscope would be

upgraded/ modified accordingly to incorporate the successes. The potential upside could be as high as 5-10% additional recovery above the considered estimates.

Further, Enhanced Oil Recovery (EOR) methods are proposed in conjunction with the conventional IOR to maximize the ultimate recovery. Because of the greater complexity in evaluation of the effectiveness and high costs involved, pilot test of the EOR is proposed to be carried out first confirm the anticipated performance before undertaking expensive field scale implementation.

About 15 EOR pilots including polymer, water alternate gas (WAG) air injection and microbial agents are at different stages of testing in various fields. It is anticipated that the studies would be completed in the next two to three years and based on the results, the feasibility of field scale application will be examined.

While EOR recoveries vary widely depending on the process, field conditions and economics, an incremental recovery of 5-6% on the average would be a reasonable estimate based on international experience.

Redevelopment of Mumbai High North has been launched in January 2001 and the project details are as under:-

Drills of new wells	:	73 (62 producers
Side track wells	:	10 Nos.
No. of new well platform	:	04 nine slot platforms
No. of new process platform	:	01 Bridge connected to existing BHN Complex
Submarine pipelines	:	83.5 kms.
Clamp on structures	:	15 nos.
Associated modifications on Different platforms	:	
Amount earmarked for the prospect	:	2929.4 crores

This will result in additional production of 24.8 MMT of oil and 5.85 BCM of gas in the next 30 years. The project will be completed in phases in next 6 years.

The redevelopment plan involving 5255.97 crores for Mumbai High South has been submitted for approval. It will give an additional oil of 35.95 MMT and 9.63 BCM of gas in next 30 years."

3.43 During the discussion held during the study tour of the Committee in October, 2001, the Committee enquired about reported objection of DGH regarding implementation of Mumbai High project and desired to know the facts in the regard. ONGC informed that ONGC had consulted DGH in formulation of Mumbai High fields redevelopment plans.

They agreed that during such consultation DGH had certain concerns focused on water and gas injection methodology, geology and geophysical study and applicability of recent enhance recovery techniques. According to them these concerns have been addressed and consensus has been reached between ONGC and DGH in implementation on Mumbai high fields redevelopment plans.

3.44 In response to the specific query of the Committee about the present deepwater drilling capability of national oil companies and their comparison with the international standards, the Ministry informed as under: -

> "Deep water exploration has been identified as thrust area in ONGC. At present, ONGC, has the capability of drilling in up to 900 metres water depth which is in line with released drilling locations available at the moment. Action has also been taken to further enhance the water depth capability to drill in up to 1000 metres water depth.
>
> World wide, the deepest water depth drilled is 2777 metres (9111 ft) in Brazil as per the data published in technical journals. However, very few number of wells have been drilled beyond 2000 metres water depth regime. World-wide deep water exploration and production companies hire suitable rigs from international drilling contractors to meet the requirement. ONGC may also look into the feasibility of hiring suitable deep water rig from the international market.
>
> Government of India has recently extended NELP fiscal terms to 6 PEL acreages of ONGC to facilitate formation of strategic alliance with foreign companies experienced in exploration and exploitation in deep water regime. ONGC has already initiated action to negotiate with such companies. This opportunity may also help ONGC in upgrading its deep water drilling capacity.
>
> OIL has not so far operated in deep water areas. Accordingly, OIL has not drilled any deep water well so far. Currently OIL does not possess any drilling capability to drill in deep water areas."

3.45 When the Committee asked ONGC about steps being taken by them to improve their deep water capability in future, ONGC submitted as under: -

> "ONGC's present drilling capability is up to 900 metre water depth which is in line with released drilling locations available at the moment. Actions has already been taken to further enhance the water depth capability to drill in up to 1000 m water depth.
>
> Worldwide, the deepest water depth drilled is 2777m (9111 ft) in Brazil. However, very few number of wells have been drilled beyond 2000m water depth regime. Worldwide deep water Exploration and Production Companies hire

suitable rigs from International drilling contractors to meet the requirement. In case locations in deeper water depths beyond 1000m are identified for drilling, ONGC would take suitable actions for hiring appropriate deepwater rig from the International market.

To develop and enhance deepwater drilling capability within ONGC, a separate deepwater drilling group has been formed in Mumbai. The group is working on strategies of developing in house capabilities as far as the drilling related activities are concerned."

3.46 The Committee further desired to know about the results of cost sensitivity analysis for deep water projects. ONGC submitted as under:-

"At the onset of deep water exploration programme of ONGC, techno-economic analysis for cost sensitivity were carried out in association with Petro consultants MAI at London where a team of ONGC executives were associated. Subsequent to this, cost sensitivity analysis is being carried out inhouse by using software like "Deepest" and "Queste".

It was felt prudent that in some of the PEL acreage's exploration may be continued through formation of strategic alliance with multinational companies experienced in deepwater exploration and exploitation to minimise risk and facilitate fast tract development through technology available with them. Accordingly, Government of India has permitted ONGC to form strategic alliance in 6 PEL acreages with NELP term in east and west coast. ONGC has already short listed 17 companies experienced in deepwater exploration and exploitation and such companies will be offered to submit their bids for forming strategic alliance after approval of Government of India on bid evaluation criteria."

3.47 While referring to the heavy oil discovery in Rajasthan, the Committee wanted to know about the present status of production. Oil India Ltd. submitted as under:-

"The heavy oil discovered in Rajasthan in 1991, has not yet been commercially produced. This heavy/ultra heavy oil needs capital intensive infrastructure to ascertain its producibility on a commercial scale. In addition, techno-economic feasibility of its transportation to suitable refineries in view of presence of sulphur or alternate use are also to be considered for commercial exploration. OIL has taken up with PDVSA, Venezuela to provide technical support to OIL to establish commercial producibility of this heavy oil through a field scale pilot. A development plan shall be worked out only after techno-economic evaluation based on the results of the pilot."

3.48 When asked about whether OIL has obtained the required technology to produce heavy oil, they submitted that they did not had the required technology to produce heavy

oil. Therefore, technical assistance has been sought from outside agencies that were having experience for production of heavy oil.

3.49 CMD, Oil India further clarified the position during the course of evidence and stated:-

> "We have made some heavy oil discovery also in the Bikaner-Nagaur basin. But the technology is a very highly specialised technology and Oil India as such does not have that technology. We tried to offer that block under the joint venture bidding but it did not materialise. This block is with Oil India Limited and we are trying to get some technological help from Venezuelan company. They are also eager to give us assistance. They are experts in producing heavy oil from the wasteland areas of that country. We are expecting the visit of their personnel very soon. After they study it jointly with the geo-scientists of Oil India Limited, we are going to set up a pilot plant. Going by the present information, the reservoir there is not very big. The modalities of utilisation after the heavy oil is produced and where it would go are to be chalked out simultaneously because the volume is so small that nobody is coming forward for power generation or downstream utilisation of bitumen at a high cost investment. We have to know the total producibility of the field and its life. For this, we will have to start the operations in a year or so."

3.50 The Committee pointed out towards the suspended exploration and production activities in Nagaland and wanted to know about the latest position in this regard. The Ministry of Petroleum & Natural Gas informed as under:-

> "ONGC has established an oil reserve of 2.69 MMT in Nagaland. Oil exploration and production activities of ONGC are under suspension in the state since April/May 1994 due to environmental reasons and also under the directive of Govt. of Nagaland. Recently, with continuous dialogue between Nagaland Government and Central Government, the issue has been resolved and operations are expected to commence shortly.
>
> The issue of territorial dispute between Nagaland and Assam is yet to be resolved."

3.51 In response to pointed query of the Committee about the constraints being faced in increasing production of crude oil and gas and other petroleum products, the Ministry of Petroleum & Natural Gas submitted in written reply: -

> "The constraints being faced by the national oil companies in increasing crude oil production are:

Unexpected reservoir behaviour of the major fields of Western offshore, specially Mumbai High, Neelam and Gandhar due to geological surprises. This occurred on account of reservoir problems like a large number of wells flowing with high gas ratio and with increasing water cut.

Major Oil fields are entering the natural declining phase. Most of the producing oil fields are old and some of the major fields including Mumbai High have entered the natural declining phase. Increase in production comes through either by additional development of existing fields or development of new fields to offset the decline from mature fields. There has not been any major oil discovery, since the discovery of Mumbai High Field to sustain the increasing trend in Crude Oil Production and arrest the decline.

Constraints in operating conditions in the North-Eastern region such as bandhs, barricades, strikes, incidence of thefts and sabotage etc. are another reasons for shortfall. Government of Nagaland has discontinued ONGC's activities in that State. These factors have not only affected the production but also affected the drilling, construction and developmental activities.

Frequent power shut-down in the Eastern Region and Western region (Gujarat) have affected the artificial lift system and consequent loss in production.

Lack of good infrastructure like bad road condition in North-East has affected movement of men, equipment and material causing delay in execution of development projects."

3.52 During the course of examination, the Committee noticed that Indian Oil Corporation (IOC) has also entered in the field of exploration and production. They wanted to know the aims and objectives of entering in the field of exploration and production of oil and gas. IOC submitted the following details in a written reply: -

"Main aims and objectives of entering into the field of exploration and production are:

- To become a major transnational integrated Energy Company playing a national role in oil security of the country.

- To create growth opportunities and maximise shareholders' value.

- Diversification of oil reserves and sourcing.

To achieve above, IOC obtained Board approval in November 1995 for entering in the field of Exploration and Production (E&P) with suitable alliance partners and to set up a core group to look after E&P activities. Accordingly, E&P group was set up in IOC, with following objectives:

i) To form 5/6 alliances [Unincorporated Joint Ventures (UJVs)] with experienced E&P Companies for joint participation in domestic/overseas opportunities to secure equity oil and gas.

ii) To develop a core group of specialists with own personnel, deputationists and consultants.

iii) To utilise the strength of Assam Oil Division (AOD) set up for taking up E&P activities in Northeast region.

3.53 About their achievements made so far, IOC submitted as under: -

IOC has made a humble beginning by securing two exploration blocks, along with ONGC, under New Exploration Licensing Policy (NELP) – 1999 round. IOC also intends to bid for 6/7 blocks with existing UJV partners – Petronas Carigali, Premier Oil and ONGC – after detailed techno-economic analysis and evaluation, under New Exploration Licensing Policy – Second Round (NELP-II), announced by the Government of India on15th December, 2000. These activities may result in securing domestic equity oil and gas in near future. This, the decision of entering in the field of exploration and production is expected to show the positive impact on the performance of refineries of IOC in the following ways:

- Securing crude oil at cost as compared to market market price. This will protect the profitability of IOC when crude oil prices shot up.

- Improving energy security by obtaining own source of oil outside the country."

(c) Acquisition of equity oil from abroad

3.54 In view of widening gap between demand and supply of oil and gas, acquisition of equity oil from abroad in an important part of the strategy to achieve oil security. Government is encouraging oil public sector undertakings to take up opportunities available abroad for acquiring exploration acreages, either on their own or through strategic alliances/ Joint ventures. In Hydrocarbon Vision 2025 it has been emphasised to have a focussed approach from E&P projects and build strong relations in focus countries like Russia, Iraq, Iran and North African countries. ONGC Videsh Limited, a wholly owned subsidiary of ONGC, has been actively pursuing opportunities in selected countries to acquire attractive overseas exploration acreages and producing properties. Oil India Limited has also taken some suitable action in this direction. Ministry of Petroleum and Natural Gas has submitted the following details elaborating the major activities undertaken by ONGC Videsh Limited in this direction: -

Vietnam:

"In 1988, a Production Sharing Contract was entered into with Petro Vietnam for offshore Blocks, 6, 12E and 19. The Exploration was to be undertaken in two phases of 4 and 2 years. Due to the forex constraints, ONGC-VL had farmed out 45% share to BP and Statoil, in October 1992. A total of 10 wells have been drilled under the PSC during the two phases of exploration, of which have yielded hydrocarbons. The exploration efforts resulted in the discovery of Lan Tay and Lan Do gas fields in Block 06.1 Reserves of 2.04 TCF of gas have been established.

Pursuant to the contractual provisions relating of farming of the national company, petro Vietnam prior of commencement of development, the Contractor parties ONGC-VL, BP and Statoil have concluded the assignment of 15% Participating Interest in the Project of Petro Vietnam of September 29, 1999. ONGC-VL's Participating Interest, as a consequence has reduced for 55% to 45% in the project.

The Development Plan for the development of the discovery has been approved. In the first stage of development, Essential Commercial Activities (ECAs) are being undertaken these comprise of the commercial agreements necessary for development of the gas discovery. Of these, the Assignment Agreement, the Joint Operating Agreement Amendment and Novation Agreement has been concluded. The Government Guarantees and Undertakings Agreement and the Supplementary PCS Agreement have also been initialed by all the parties. The discussion on the remaining agreements. The Gas Sales and Purchase Agreement, the Gas Transportation Agreement, the Condenstate Sales Agreement, is at an advanced stage, and it is expected that all agreements would be in place by end 2000.

Parallely, tender documents for all the major contract packages have been issued and the tenders are at various stages of technical evaluation. On the basis of present progress, the project is expected to be commissioned in 2002, for supply of gas to the end users in Vietnam.

ONGC-VL'S cumulative expenditure upto 31.3.2000 on the project is about US$ 59.545 and receipts have been US$ 45.059.

Tunisia, Egypt, Yemen

In over to reduce risks, and in line with international practice, ONGC-VL took partial stakes to the extent of 40%, 50% and 30% in exploration activities in Fejaj Permit Area of Tunisia (1995-96), Balah propect of Egypt (1996-97) and Socotra Ofshore Block –38 in Yemen (1996-97). The consortium partners holding the balance stake, as well as Operators in the above ventures were, Command Petroleum, in Tunisia, and British Gas in Egypt and Yemen.

A total of four wells were drilled in the above projects, all of which were dry, i.e. not containing any significant hydrocarbons. The total expenditure in these three exploration projects, all of which were dry, i.e. not containing any significant hydrocarbons. The total expenditure in these three exploration projects amounts to Rs. 82 crores.

Other Projects

In Iraq, contract negotiations for the exploration block being pursued solely by ONGC-VL is at the concluding stage.

For the discovered field Tuba, which was being pursued by OGNC-VL along with Reliance, M/s Sonatrach the national oil company of Algeria in now expected to join as a third partner.

ONGC-VL's bid is under consideration by the Russian oil company, Rosneft, for acquisition of 20% stake in an exploration and development project in the Russian Far East.

ONGC-VL is also evaluating some development projects in West Siberian region of Russia for participation.

A number of other projects, in Gabon, Algeria, Benin, Malaysia, Iran, Kazakhstan, Azerbijan and Russia have also been analyzed but have not been found attractive.

The total expenditure on all projects during 1999-2000 was Rs. 38.7 crores, of which Rs. 36.1 crores was towards project expenses of Vietnam project."

3.55 About the initiatives taken by the Oil India Limited in this direction, the Ministry submitted the following details:-

"Oil India Limited is currently not carrying out any exploration and development activities in other countries. However, OIL entered into a farm-in-joint venture agreement with M/s. Total Exploration Oman, a subsidiary of TOTALFINA – ELF of France and acquired 20% undivided participating interest for hydrocarbon exploration in Ghuinam (Oman) Block 4, Sultnate of Oman with maximum financial commitment of US@ 9.458 million. As per initial work programme, the first exploration well was drilled (TD-4157 M) during March/ April, 1999 but commercial discovery could not be made even though there were sufficient indications of hydrocarbon shows.

OIL has incurred (against 20% participating interest) US $ 6.65 million approx. against total project expenditure of US $ 27 million during the initial period upto 31.12.1999."

3.56 When the Committee specifically desired to know about the future strategy of the Government for picking up business opportunities in the international market, the Ministry of Petroleum and Natural Gas described as under:-

> "The strategy for picking up business opportunities in the international market has been enunciated in the Hydrocarbon Vision 2025. Some of the strategies and status of efforts made in this direction is given below:-
>
> (a) To have a focused approach for E&P projects and build strong relationships in the focus countries like Russia, Iraq, Iran and North Africa. ONGC Videsh Limited (OVL) has acquired 20% interest in Sakhalin-I project in Russia. It is scheduled to begin production from 2005. An exploration Block with proven oil discovery has also been acquired in Iraq. The exploration work has commenced. Projects in Iran and North African countries are currently under final stages of negotiations.
>
> (b) Government is encouraging companies to acquire exploration/ producing properties abroad.
>
> (c) A fast track mechanism has been put in place to allow ONGC Videsh Limited to acquire exploration/ producing properties abroad in a given time frame.
>
> (d) OIL has participating interest in an exploration block in Oman with Total Fina. OIL, IOC and OVL is pursuing opportunity in Iran.
>
> (e) OVL has signed MOUs with Pertamina of Indonesia, Sonatrach of Algeria, PDVSA of Venezuela and Rosneft of Russai to look out jointly for opportunities."

3.57 While going into the further details of the investments made by ONGC Videsh Limited in Sakhalin-I Project in Russia, the Committee referred to the issues referred to in the Press and wanted a clarification from the Ministry. About the overall economics of the project, the Ministry submitted the following clarification.

> **"ONGC** Videsh Ltd. has competed with the top oil majors to acquire participating interest in Sakhlin. The project economics have been worked out keeping in view the cost of the capital and cushion for the project risk. Sufficient legal safeguards have been built in the contract to protect OVL's interest. OVL has control in the project. It has blocking rights on investment decisions and will be a party to decisions regarding project implementation. Structure of any deal eventually relates to economics was the bottomline and has been optimized to a comfortable level.

Comparison of Sakhlin project to ONGC's investments in domestic operations are not apt. ONGC's investment decisions for domestic operations are set within the parameters of the prevailing interests rates in India. As is well known, the international interest rates are less than half of the domestic interest rates. Therefore investments for the projects in domestic operations can not be compared to international projects."

3.58 About the query whether the premium on equities was inexplicably hiked, the Ministry clarified the position as under:-

"The original indicative bid reflected a combination of two factors : (a) more conservative view on the project due to limited technical and economic information available to OVL at that time' (b) old development profile based on geological data of 1999 which provided lower levels of production and higher capital expenditure. In the subsequent meetings of due-diligence, the Operator made available their latest development plans for Sakhlin-1, as also the various technical, legal and economic information. The results of the new exploration well also unsolicited offer by an oil major which necessitated protracted negotiations on the premium to be paid. Overall, the improved profitability of the project was brought into negotiations and the premium was revised upwards. Therefore it is incorrect to say that the premium was inexplicably hiked."

(d) Physical achievements in Gas Production and Gas Flaring

3.59 The following table shows the production of Natural Gas during the last five years:-

Year	Production (Billion cubic metres)
1995-96	22.64
1996-97	23.25
1997-98	26.40
1998-99	27.43
1999-2000	28.44

The target for gas production during Ninth Five-Year Plan is 144.53 BCM. As per the Mid-term appraisal the expected production is around 140.35 BCM.

3.60 ONGC is exploring Natural Gas from four regions i.e. Mumbai Offshore (MRBc), Western Region (WRBc) including small gas production from Rajasthan Eastern Region, Southern and Central Region. The following table shows the details of gas produced, supplied, internally utilised and flared from 1991-92 to 1999-200 for ONGC:-

(Figs in MMSCMD)

Year	Production	Supply	I. Use	Flaring*	% UTL
1991-92	46.80	31.00	5.74	10.06	78.5
1992-93	45.17	35.72	5.56	3.89	91.4
1993-94	46.06	36.63	5.41	4.02	91.3
1994-95	49.16	38.27	6.27	4.62	90.6
1995-96	57.03	46.58	7.38	3.07	94.6
1996-97	58.30	47.18	7.52	3.70#	93.8
1997-98	63.15	51.01	8.35	3.78	94.0
1998-99	62.58	50.45	8.44	3.69	94.11
1999-2000	63.53	51.41	8.70	3.42	94.62

**** Includes technical flaring also.***

3.61 It can be seen from above table that gas flaring in ONGC has already come down from 10.06 MMSCMD (21.5% of production) in 1991-92 to 3.42 MMSCMD (5.3% of production) during 1999-2000.

3.62 Further, out of 3.42 MMSCMD gas flared during 1999-00, 2.42 MMSCMD (about 70%) consists of gas flared for technical requirements/operational safety and gas flared from isolated structures due to adverse techno-economics of gas transportation from such structures.

3.63 The production and flare of natural gas from OIL's fields in Assam and Arunachal Pradesh since 1991-92 till 1999-00 are as under: -

(Figs. in MM SCMD)

Year	Production	Flare	% Flare
1991-92	4.14	1.04	25.2
1992-93	4.27	1.19	27.9
1993-94	4.17	1.25	30.1
1994-95	3.93	0.91	23.3
1995-96	3.91	0.73	18.8
1996-97	4.02	0.47	11.6
1997-98	4.21	0.47	11.1
1998-99	4.28	0.51	11.9
1999-00	4.35	0.45	10.4

3.64 The details of gas produced and flared in Pvt./JV operated fields since commencement of operations is given below: -

(Figs. In MMSCM)

Year	Production	Supply	Flared*	% Flaring
1994-95	88	0	88	100
1995-96	334.1	7.5	325.4	97
1996-97	510	51.5	452.6	89
1997-98	1681	1343	304.3	18
1998-99	2874	2617	190	7
1999-00	3465	3250	144	4

**** Includes technical flaring also***

It can be seen from the above table that gas flaring has already come down to only 4% of production. During earlier years, associated gas from some of the fields was flared due to non-availability of transportation facilities. As per the contractual terms, associated gas could be flared from the field till such time transportation facilities for gas are not available. Small quantities of associated gas are also being flared from isolated small sized fields.

3.65 As per normal production practice, associated gas is produced alongwith crude oil as a by-product. The produced gas is first utilised for meeting internal requirements and the balance gas is offered/supplied to GAIL for further transportation, distribution and marketing. Low pressure associated gas/balance available gas that cannot be supplied to consumers has to be necessarily flared. This is done as gas cannot be normally stored, neither it can be allowed to escape in the atmosphere without being burnt. Flaring of such gas therefore cannot be avoided. There is, however, no flaring of non-associated(free) gas except technical flaring.

3.66 In response to the specific query of the Committee about the steps being taken by ONGC to reduce gas flaring and to maximise gas utilisation, ONGC have submitted in a written reply:-

> "Gas flaring has already been considerably reduced from a level of 10.06 MMSCMD in 1991-92 to 3.42 MMSCMD during 1999-00. Additional gas becomes available on completion of various field development schemes for augmenting production of oil and gas. In order to cater to the additional availability of gas and to ensure that there is no flaring of gas other than flaring due to technical reasons, various gas flaring reduction schemes were formulated, some of which have already been implemented while others are at various stages of implementation.
>
> In order to reduce flaring of gas from isolated/marginal fields, ONGC has been empowered by Government for direct marketing of gas upto 1.0 Lakh Cubic Metre per day (LCMD) from each of such fields. ONGC has already taken action to identify prospective consumers for early utilisation of the gas from isolated/marginal fields of WRBC and SRBC.

It may be mentioned here that even after implementation of various gas flaring reduction projects by ONGC for increasing utilisation of gas produced by ONGC, some gas flaring will, however, continue due to various technical reasons and fluctuations in gas off-take by the consumers.

It may be mentioned here that even after the implementation of various gas flaring reduction projects by ONGC and various actions being taken by GAIL for increasing utilisation of gas produced by ONGC, some gas flaring due to technical reasons (like during process upsets; flaring of purge gas to maintain pilot flares) and flaring from small isolated pools (not economical to integrate with main gas grid for utilisation) will, however, continue."

3.67 Oil India has submitted the following reasons to justify the gas flaring in their fields:-

"OIL is producing associated and non-associated gas in Assam and Arunachal Pradesh. The gas being produced by OIL is supplied to various consumers, viz. HFCL, Namrup, ASEB, Namrup, Assam Petrochemicals, Namrup, NEEPCO, Kathalguri, IOC (AOD), Digboi and various tea grids. In addition, OIL is utilising gas for its internal requirement like power generation, industrial fuel, LPG shrinkage, gas injection for pressure maintenance, etc. Inspite of this, certain amount of associated gas is still being flared by OIL at different locations in the fields in Upper Assam and Arunachal Pradesh. The amount of flare varies from time to time depending upon the extent of utilisation of gas by the consumers and the level of operational activities in the fields. The main reasons for the present flare in Assam and Arunachal Pradesh are:-

(i) Remote locations of the wells with gas availability in very low pressure and small quantities without consumers in the vicinity;
(ii) Technical flare caused by surging effect, safety realize from GCS/OCS, bleeding of gas line for repair/condensate removal, continuous flare from pilot burner, very low pressure gas;
(iii) Newly discovered fields which are yet to be fully developed but crude oil being produced;
(iv) The entire production of gas in Arunachal Pradesh is flared because of present non-availability of consumers."

3.68 About the steps being taken by them to reduce the gas flaring they have informed as under:-

" (i) Commissioning of Gas Storage Scheme; (ii) Installation of Low Pressure Booster Compressors; (iii) Connecting new fields to the Gas Pipeline Network; (iv) Installation of SCADA System for effective control of gas utilisation, etc. have already resulted in considerable decrease in gas flare. As can be seen, the flare during the start of the VIII Plan period was between 27 to 30% of production. This has been brought down to the current unavoidable level of 10%.

The additional steps including identification of consumer in Arunachal Pradesh, debottlenecking of pipelines, enhancing compression capacity, incorporation of capacity control in gas compressors and installation of Gas Holders in order to negate surging effect, etc. are in hand to further bring down the gas flare in Assam and Arunachal Pradesh to technical minimum level.

Additionally, OIL is also producing natural gas from its gasfields in Rajasthan. The gas produced in Rajasthan is supplied to RSEB for power generation at Ramgarh and hence is almost fully utilised except for very marginal amount of technical flare."

3.69 In response to the specific query of the Committee about gas flaring due to fluctuation in consumer intake or lack of consumers and steps taken to manage this situation, ONGC submitted the following details:-

"The details of gas flared by ONGC during the last five years i.e. 1996-97 through 2000-2001 due to fluctuation in consumer intake/lack of consumers and due to isolated/marginal fields is as under:-

Year	**Gas flared (MMSCMD)**	
	Lack of consumers/fluctuation in intake	**Isolated/marginal fields**
1996-97	0.470	0.111
1997-98	0.347	0.102
1998-99	0.441	0.131
1999-2000	0.208	0.149
2000-2001	0.260	0.211

Since the function of gas marketing and distribution reacts with GAIL, details of increasing gas supply and reducing gas flaring by way of identifying new consumers may be obtained from GAIL. However, in order to reduce flaring of gas from isolated/marginal fields, ONGC has been empowered by MOP&NG for direct marketing of gas upto 1.0 LCMD from each of such fields. ONGC has already taken action in this regard and 3.3 LCMD has already been allocated for 38 consumers in SRBC (9) and WRBC (29). Out of this, supply has already commenced to 13 consumers in WRBC and 2 consumers in SRBC."

3.70 While treating the 10% flaring of the total gas production as very high, when the Committee wanted to know the reaction of Oil India Limited. OIL submitted the following justification in a written reply:-

"Average flaring by OIL during April'00 to December'00 is 9.8% of the total gas produced in Assam and Arunachal Pradesh and 9.1% of the total gas produced in all its area which are all onshore. As regards technical flare which is

done in view of safety requirement, the flare level depends upon the type of installation like Oil Collecting Station, Early Production System, Quick Production System, Well head Setup, Gas Compression Stations, Gas Offtake Points etc. and a number of such installations. OIL is having around 60 nos. of such installation. The safety requirement may go as high as 3 to 4% of the total gas produced. The technical minimum flare is mainly on account of flare from pilot burners, release of safety valve, vessel draining, high pressure gas line venting, flow surge, etc. The balance flare is on account of unconnected/partially connected areas with inadequate evacuation facilities, Low pressure and low quantity gas in satellite fields and flare in Arunachal Pradesh due to non-availability of consumers of this gas. Hence, current level of flaring by OIL is unavoidable and not high. In this regard it may be noted that although the overall flare by ONGC was 3.42% including both onshore and offshore, the % flare in total onshore area was 9.8% and that in their ERBC basin was 10.7%. Hence, the flare by OIL is comparable with total onshore flare of ONGC."

3.71 About the ongoing and future action plan to reduce gas flare to bare minimum in the oil fields of Assam and Arunachal Pradesh, OIL has informed as under : -

"(i) Construction of 400 mm x 22 Km gas pipeline from Hatiali to LPG offtake at Duliajan.
(ii) Procurement and installation of Low Pressure Booster Compressors at Kathaloni, etc.
(iii) Debottlenecking of existing gas transportation lines in Dikom-Kathaloni Route by way of loop lines.
(iv) Procurement and Installation of small size Very Low Pressure compressors and Jet Ejectors for picking up very low pressure stabilizer gas (i.e. 0.7 Kg/cm^2)at different Oil Collecting Stations and pressurize them for injection into the main distribution line."

3.72 When specifically asked about the daily financial loss being suffered by OIL due to such flaring in Arunachal Pradesh, CMD, OIL informed during the evidence that it was about Rs. one lakh per day.

In the same context, when the Committee specifically wanted to know about the arrangements being made to use this gas, Oil India Limited submitted in a written reply:-

"As regards to Arunachal Pradesh, the gas production is only 0.06 MMSCMD most of which is being flared. This quantity of gas was committed to M/s. Donyi Polo for a Petrochemical Project to be set up at Kumchai, AP and an agreement of gas supply was signed to this effect in 1996. However, despite our regular follow up, the Project did not materialize. In fact M/s. Donyi Polo has abandoned the project recently. In view of this development, OIL is now exploring the possibility of utilizing this gas. Discussion was also held with Govt. of A.P. for utilization of this gas for Power Generation. However, according to them, such Projects are not economically viable. "

3.73 Explaining it further, Director (OIL) informed as under:-

"The situation is like this. In 1994 we have signed an MOU. For five years they kept us pending. They were not terminating it. Only two months back they have terminated it. Now we are looking out for other avenues because the volume of gas is very small. It is only 60,000 cubic metres. That is the volume. One way of cutting the gas is that you stop the production of oil. These are 100 per cent associated gas. Since, earlier MOU has been terminated only two months back we are looking for other consumers as Shri Sharma has said. We are looking for some power project in that area. But the area is so sparsely populated that people are not coming up. We are talking to the Assam Gas Company and some private entrepreneurs. This is going up. We will be able to find out a way out, probably, in a month or two."

(e) Self-reliance level in production of oil and gas and refining and import of petroleum products

3.74 As on 31.3.1997 the total refining capacity in the country was 62.24 MMTPA as against the domestic consumption of 79.2 MMT of petroleum products in the terminal year (1996-97) of Eighth Plan. At present the domestic refining capacity has reached the level of 112.54 MMTPA. During 1999-2000 all time high capacity addition in the year of 42.9 MMTPA was made. By the end of Ninth Plan the domestic refining capacity is expected to reach the level of 129.04 MMTPA.

3.75 The following table shows the quantum of imports of crude oil and petroleum products during the last three years:-

(Quantity in million metric tonnes; Value in Rupees Crore)

	1998-1999		**1999-2000**		**2000-2001**	
	Qty.	**Value**	**Qty.**	**Value**	**Qty.**	**Value**
Crude Import	39.808	14,917	57.805	40,028	74.097	65,932
Products Import	23.771	12,275	16,608	14,185	9.267	12,093

Total Import	63.579	27,192	74.413	54,213	83.36	78,025
Total Export	0.720	306	0.746	697	8.365	7,672
Net Import	62.859	26,886	73.66	53,515	74.999	70,353

3.76 The Committee pointed out towards stagnant crude production and continuously increasing imports and desired to know about trend of growing Import Bill and the reasons for this increase. Explaining the reasons for increase in the Import Bill, the Ministry stated in a written reply as under:-

"The main reason for the 342% increase in the Import Bill of crude oil from Rs. 14,917 crores in 1998-99 to Rs. 65,932 crores in 2000-01 are highlighted below:

(i) Increase in refining capacity: In the last three years, the refining capacity has gone up significantly. The total refining capacity in the country (including private sector) was 62.24 Million Metric Tonnes (MMT) on 1.4.1998. It went up by 11.1% to 69.14 MMT as on 1.4.1999. By 1.4.2000, the total refining capacity sharply went up by 62% to 112.04 MMT. It has yet again gone up slightly to 112.54 MMT as on 1.4.2001. Consequently, the requirement of crude oil for processing has also gone up significantly from 39.808 MMT in 1998-99 to 74.097 MMT in 2000-01, an increase of 86.1%.

(ii) Decline in products import and rise in exports: The above table indicates, import of the petroleum products has been declining sharply by 61%, coming down from 23.771 MMT in 1998-99 to 9.267 MMT in the year 2000-2001. Simultaneously, the total export of petroleum products has been going up. From a very small level of 0.720 MMT in 1998-99, it has gone up by 1062% to 8.365 MMT in 2000-01.

(iii) Crude prices: Crude prices have gone up significantly since 1999. From a level of an average of US $ 18.15 per barrel in 1999, prices went up by 67.7% to US $ 30.44 per barrel in the second quarter of 2000 and remained at a similarly high-level during the third quarter of 2000 at US $ 29.54 per barrel. After a nominal decrease to the level of US $ 27.45 per barrel in February, 2001, prices again went up by 4% and 1.4% at US $ 28.59 in May, 2001 and US $ 27.83 per barrel in June, 2001 respectively.

(iv) Rise in consumption: There has been steady increase in consumption of petroleum products from the level of 90.562 MMT in 1998-99 to 97.086 MMT in 1999-2000 to 100.075 MMT during the year 2000-01, overall increase being 10.5%.

(v) Exchange rate fluctuations: The exchange rate between Indian rupee and US $ has been increasing from Rs. 42.49 for one US $ in 1998-99 to Rs.

43.46 in 1999-2000. During the year 2000-01, the rate has been Rs. 45.78, the overall increase since 1998-99 being 7.7%."

3.77 While enumerating the steps taken to reduce the imports, the Ministry replied:-

" To reduce the Import Bill and to bring down imports of petroleum products, Government has already taken steps to increase the refining capacity in the country by taking the following actions:

- ❖ Permitting expansion of existing refineries
- ❖ Allowing setting up of new refineries in public sector and joint sector
- ❖ Encouraging private sector participation in refineries

To further give a boost to refining capacity additions, refining sector has been delicensed as a result of which domestic refining capacity has reached the present level of 114.59 Million Metric Tonne Per Annum (MMTPA) from the level of 62.24 MMTPA at the beginning of the Ninth Plan. During 1999-2000, all-time high capacity addition in a year of 42.9 MMTPA was made."

3.78 While further enumerating the strategy being adopted in regard to establishment of new refineries or capacity addition in existing refineries, the Ministry of Petroleum & Natural Gas submitted the following details:-

"Strategy being adopted in regard to establishment of new refineries or capacity expansion of existing refineries is given below:-

Low cost expansion of the existing refineries: During the Ninth Five Year Plan, till date the following refinery expansions are completed in addition to two grassroots refineries at Panipat (6 MMTPA capacity) and Numaligarh (3 MMTPA capacity).

Sl. No.	Expansion Projects	Capacity (MMTPA)
1	BPCL	0.9
2	Barauni Expansion	0.9
3	Koyali Expansion	3.0
4	HPC Vaisakh Expansion	3.0
5	MRPL Expansion (JVC)	6.0
6	Mathura Expansion	0.5
	Total Expn (PSU + JVC)	14.3

Government has already approved expansion of Chennai Petroleum Corporation Ltd. (CPCL)'s refinery at Manali by 3 MMTPA and Government approval is awaited for expansion of Kochi Refinery by 6 MMTPA. Further, four

refinery expansion projects totaling 18.4 MMTPA (at Koyali Refinery, Panipat Refinery, Barauni Refinery- all three of IOCL and BPCL refinery) are under implementation by the Navratna Oil Companies(IOCL and BPCL) after approval of their respective Boards. These projects are expected to materialise during the Tenth Plan period. Total PSU refining capacity addition by expansion of existing refineries is expected to be 27.4 MMTPA during the Tenth Plan period.

Private Sector Participation

- Setting up of Private Refineries: Setting up of new grassroots refineries was allowed by the Government by private sector either on their own or as joint ventures with downstream sector PSUs. During the Ninth Plan Period the first private refinery Reliance Petroleum Ltd. with a capacity of 27 MMTPA has been completed. Another two refineries in private sector (Essar Oil Refinery of 10.5 MMTPA and Cuddalore Refinery of 6 MMTPA) are under construction and expected to be completed by the end of Ninth Plan Period.

- Setting up of JV Refineries: The public sector companies have been allowed to set up refineries in Joint Venture. The equity participation in Joint Venture Company (JVC) by the public sector companies would be 26%, by their JV partner would be 26% and the remaining 48% by public/NRIs.

Government has already approved addition of 24 MMTPA refining capacity in Joint Venture in the country by setting up 3 grassroots refineries (Bharat Oman Refinery 6.0 MMTPA, Punjab Refinery of 9.0 MMTPA and Paradip Refinery of 9.0 MMTPA), which are expected to materialize during the Tenth Five Year Plan.

FDI in Refining Sector: Government has decided to increase the level of FDI in oil refining sector under automatic route from the existing 49% to 100%.

De-licensing of the Refining Sector: To further give a boost to refining capacity additions, refining sector has been de-lincensed."

CHAPTER – IV

WORK PROGRAMME DURING NINTH FIVE YEAR PLAN AND LONG TERM POLICY FOR E&P SECTOR

(a) Ninth Plan Projections and Performance of E&P Sector

4.1 The Government had declared the following thrust areas of specific attention during the Ninth Plan period (1997-2002):-

(i) Expeditious implementation of New Exploration Licencing Policy.
(ii) Acceleration of exploration efforts especially in deep offshore areas and also in frontier areas.
(iii) Improvement in reservoir management and enhancing oil recovery.
(iv) Exploration and exploitation of Coal Bed Methane.

4.2 The following table shows the physical performance during first two years of the Ninth Plan, anticipated for 1999-2000 and likely plan achievements:-

Programmes	9th Plan Target	1997-98	1998-99	1999-2000	Anticipated Achievement during 1997-2000	Likely achievement during 1997-2002	% of Target
Demand/ Consumption (MMT)	69.83	84.29	90.86	96.44	271.59	404.59	-
Reserve Accretion (MMT)	246.343	22.69	33.14	43.80	99.63	195.63	79.5%
Crude (MMT)	180.82	33.86	32.71	31.97	98.54	161.93	89.55%
Gas Production (BCM)	144.53	26.40	27.43	27.97	81.80	140.35	97.1%
Refining Capacity (MMT)	113.95	61.55	68.45	103.15	112.54	129.04	113%

4.3 It is evident that accretion to reserves has been below targets whereas expansion in refining capacity exceeds targets and it is expected to reach a level of 129.09 MMTPA. In

order to boost domestic production of crude oil, the Ninth Plan has emphasised a change in exploration strategy which includes:-

(i) Extensive exploration in all the basins.
(ii) Use of 3D technology for seismic survey.
(iii) Exploration in deep waters in North Brahmputra and frontier areas.
(iv) Improvement in reservoir management.

4.4 When the Committee specifically wanted to know about the initiatives taken and achievement made by ONGC in regard to drilling frontier areas, ONGC submitted the following details:-

> "ONGC has been pursuing its exploratory activities in the frontier basins of India which include those that are still in nascent stage of exploration both due to the relatively lower prospectivity perception and/or high cost/technological requirement or are in areas of hostile logistics.
>
> Efforts have been initiated to realize the potential of these basins with concomitant knowledge building leading for future intensification of exploration activities in case of encouraging results. With a view to explore in these frontier basins, ONGC has been aggressively bidding in the NELP rounds. ONGC has been successful in getting one block (GV-ONN-97/1) under NELP-99 in the Ganga Valley where it plans to undertake active exploration.
>
> Notwithstanding the NELP and despite the cost intensive nature of the exploration, ONGC at present is carrying out exploration activities and geo-scientific studies in the geologically complex sectors of Himalayan Foreland, Ganga, Vindhyan and Satpura-South Rewa basins of onland frontier areas wherever it has been allotted PELs. During the first four years of IX Plan, in these basins, ONGC had acquired a total of 3208 GLK 2D seismic data and drilled two exploratory well (Anhoni-1) in Satpura basin and (Damoh-1) in the Vindhyan basin in Madhya Pradesh. Damoh-1 is under testing.
>
> In the remaining year of IX plan (2001-02), it is envisaged to acquire 605 GLK of 2D & 160 GLK of 3D seismic data and 4 wells have been planed to be drilled. Currently one well in Himalayan Fold Belt (Sundernagar-1 in Himachal Pradesh) and one well in Vindhyan basin (Damoh-1) are under drilling and testing respectively. In the geologically complex and logistically difficult area of the Assam Arakan Fold belt ONGC has started drilling its second well in the area north of Barak Valley.
>
> In cost and technology intensive frontier areas of the Deep water sector of the east and west coast, ONGC has been pursuing its exploration plan aggressively. Pre-drill 3D seismic surveys as a risk reduction measure in these areas is being carried out. To pursue its exploration plan ONGC upgraded its own ship Sagar

Vijay to drill in deep water areas. This us a major milestone for ONGC in its pursuit for exploration in the Frontier areas ONGC has also planned to enter into strategic aliancing with reputed companies in six deep water PEL blocks to realize its plan in the cost and technology intensive area. ONGC has acquired 7531 LK of 2D and 102034 LK of 3D during the first four years of IX plan and drilled 7 wells in deep water regime/setup. ONGC has made the first deep water find in this phase of exploration activity in Krishna Godavari offshore. The well KD-1-1 in KG basin in a water depth of 844m proved to be gas bearing. Another well G-1-9 in Krishna-Godavari basin was also oil and gas bearing.

During the year 2001-2002, ONGC envisages to acquire 11500 LK of 2D and drill 3 wells in the deep water areas.

In the first round of NELP, three acreages in deep water were acquired through participation in competitive bidding. ONGC has also applied for 2 PELs for regrant (1 in Kerala Konkan & 1 in Krishna Godavari basin) and four new PEL blocks in Andaman deep-water areas. ONGC also plans to expand its deep-water portfolio through acreage acquisition in future bidding rounds under NELP and has bid for six of the eight-deepwater blocks."

4.5 Following are the exploration efforts in new (including frontier) areas being made by the Oil India Limited:-

"- Exploratory drilling in the unexplored area of North Bank of River Brahmaputra in Assam. Drilling of four wells have already been completed and fifth well is being drilled.

- Intensification of exploration for Eocene prospects in the South Bank of Rive Brahmputra in Assam. OIL discovered oil for the first time in the Eocene in its Moran oilfield. There has been discovery of 12 new oil structure in the Eocene sand.
- Development of non-associated gas resources in Assam.
- Exploratory drilling in the Ganga Valley Basin, U.P. OIL drilled one wild cat well in the Bilaspur structure in the Basin.
- Reinterpretation of the available seismic data in Rajasthan to generate exploratory location for the stratigraphic plays. Basin modelling study of the basin has been planned which will be carried out shortly.
- An integrated geoscientific study of Saurashtra Offshore area to assess the various geological plays identified by OIL and to carry out additional seismic survey/exploratory drilling based on the study.
- Examine the possibility of exploring in deep sea water. In this regard, OIL is looking into the possibility of joining hands with ONGC.

In addition, OIL has acquired an exploration block in Cauvery Offshore block under first round of NELP, OIL will look into the possibility of acquiring more blocks in future through NELP depending on the economic feasibility.

As regard drilling in other frontier areas, OIL has plans to carry out seismic survey in the logistically difficult areas in Upper Assam Basin, hitherto, unexplored shortly."

4.6 When the Committee specifically wanted to know about the initiatives being taken to improve the Reservoir Management and enhance the oil recovery during the current Five-Year Plan, the Ministry described the following details:-

"Reservoir Management is a continuous process based on two key inputs viz. the data infkiw from the field and processing of this data on computer generated reservoir models. In the recent years both these key ingredients have been fine tuned through adoption of latest international technology/practices and manpower training. In the data gathering area ONGC have introduced the latest technology in:

1) Production logging to tackle well specific problem.
2) 3D seismic API for realistic reservoir characterization and identification of bypassed oil.
3) Radioactive tracer surveys for reservoir definition.

Similarly for data processing the practice of online simulation has been adopted, thus reducing the time gap between data flow and its processing. Latest 3D reservoir simulators, 3D processing software have been installed on fast computers and help of foreign experts have also been taken for reservoir modeling. Field performance of most of the fields is now monitored on computer generated models for timely corrective measures.

Improving the reservoir management is a prime concern for optimization of recovery and enhancement of production. ONGC have recently drawn up field specific improved oil recovery schemes, which are under assessment. The feasibility studies of some of these schemes have been completed and are likely to be implemented in the next plan period. The schemes basically include implementation of field specific enhanced oil recovery processes, infill drilling revival of sick wells and installation of latest artificial lift systems, pressure maintenance and introduction of cost effective drilling and completion technology for improved scheme viability."

4.7 OIL India Limited has submitted following details about the initiatives being taken in regard to reservoir management and enhancing oil recovery:-

"The major reservoirs of the Nahorkatiya and Moran oilfields are subjected to pressure maintenance/EOR schemes from the very early phase of the production history. The major such schemes are:

(i) Peripheral Water Injection;

(ii) Water flooding;
(iii) Crestal gas injection with or without water injection;
(iv) Polymer flooding.

Gas/Water injection has been initiated in the Jorajan oilfield also from an early stage. This concept has been extended to the recent discoveries like Shalmari too. Owing to various EOR schemes being implemented in different reservoirs, significant increase in ultimate recovery has been achieved/expected in Nahorkatiya, Moran and other fields.

For declining oilfields viz. Nahorkatiya and Moran, studies are also being carried out for identifying any other sophisticated EOR pilots viz. Alkaline flooding etc. that may be applicable for the reservoirs under gas/water injection for quite sometime. An internationally reputed firm was also engaged in the recent past for studying the major reservoirs and suggesting any other EOR methods applicable. One of their recommendations viz. infill well drilling has already been implemented partially.

In addition to continuing its pressure maintenance/EOR schemes, OIL is also carrying out IOR jobs like Water Shut Off, Sand control and Inhibition of Paraffin/Asphaltene deposition for improved recovery."

4.8 In response to specific query of the Committee about planned refining capacity and performance during the current plan, the Ministry submitted the following details:-

"The present refining capacity of 112.54 MMTPA is adequate to meet the domestic requirement of most of the petroleum products in the country except LPG and Kerosene in the current year (2000-01). In fact, production of MS and HSD is more than the requirements, necessitating export of surplus quantity.

The demand of petroleum products is projected to go up to 110 MMT by the end of Ninth Plan Period i.e. 2001-02. It is expected that on over all basis, the demand of petroleum products would be met from domestic production and, thereby, requiring imports/exports only to the extent of imbalances in production/demand of specific products.

As per Ninth Five-Year Plan (1997-2002) document of Planning Commission, in order to overcome the problem of inadequate refining capacity in the country, additional 52.4 MMTPA capacity was planned to be created in Public Sector, Joint Sector and Private Sector in Ninth Plan period. Actual capacity addition achieved during the first three years of the Ninth Plan was 50.3 MMTPA. The year-wise capacity addition planned and actual achievement is indicated below:-

	Capacity Addition in MMTPA	
Year	**Planned***	**Actual**

1997-98	0.0	0.0
1998-99	6.0	6.9
1999-00	37.4	42.9
2000-01	3.0	0.5
Sub-Total	**46.4**	**50.3**
	Planned"	Anticipated
2001-02	6.0	16.5
Total	**52.4**	**66.8**

* ***As per Ninth Five Year Plan (1997-2002); Vol-2: Planning Commission dated March 1999.***

As can be seen, on over all basis, actual refining capacity addition was more than planned in the first three years of the Ninth Five Year Plan."

(b) Implementation of objectives set in Hydrocarbon-Vision-2025

4.9 Hydrocarbon Vision-2025 lays down the framework, which would guide the policies relating to the hydrocarbons sector for the next 25 years. The action required to be taken in medium term (3 to 5 years) and in the long term (beyond 5 years) to realize the Vision has also been dealt with in succeeding paragraphs. This document has set the following objectives of the Exploration Policy:-

(a) To undertake a total appraisal of Indian sedimentary basins for tapping the hydrocarbon potential and to optimise production of crude oil and natural gas in the most efficient manner so as to have Reserve Replacement Ratio of more than 1.

(b) To keep pace with technological advancement and application and be at the technological forefront in the global exploration and production industry.

(c) To achieve as near as zero impact, as possible, on environment.

To achieve the above objectives the following medium term actions are required to be taken:

(i) Continue exploration in producing basins.

(ii) Aggressively pursue extensive exploration in non-producing and frontier basins for knowledge building and new discoveries, including in deep-sea offshore areas.

(iii) Finalise a programme for appraisal of the Indian sedimentary basins to the extent of 25% by 2005, 50% by 2010, 75% by 2015 and 100% by 2025. Sufficient resources to be made available for appraising the unexplored/partly explored acreages through Oil Industry Development Board (OIDB) cess and other innovative resource mobilisation approaches including disinvestment and privatisation.

(iv) Provide internationally competitive fiscal terms, keeping in view the relative prospective perception of Indian basins, in order to attract major oil and gas companies and through expeditious evaluation of bids and award of contracts on a time bound basis.

(v) Optimise recovery from discovered/future fields.

(vi) Improve archival practices for data management.

(vii) Continue technology acquisition and absorption along with development of indigenous Research & Development (R&D).

(viii) Ensure adequacy of finances for R&D required for building knowledge infrastructure.

(ix) Make Exploration and Production (E&P) operations compatible with the environment and reduce discharges and emissions.

(x) Support R&D efforts to reduce adverse impact on environment.

(xi) Acquire acreages abroad for exploration as well as production.

The long term actions to be taken are:-

(i) 100% exploration coverage by 2025.

(ii) Leapfrog to technological superiority.

(iii) Put in place abandonment practices to restore the original base line.

(iv) Conserve resources and adopt clean technologies.

4.10 The Committee pointed towards the fact that India has total of 3.14 million sq. km. sedimentary area. Of this, only about 20% is explored and remaining area is either poorly explored or under active exploration. In Hydrocarbon Vision-2025 it has been indicated that the Government will finalise a programme for appraisal of Indian sedimentary basins to the extent of 25% by 2005, 50% by 2010, 75% by 2015 and 100% by 2025. When the

Committee asked the Government to know whether they find this as realistic approach, the Ministry of Petroleum & Natural Gas clarified the position as under:-

"In the field of petroleum geology, "appraisal" of a basin is linked to the understanding of hydrocarbon Generation, Migration and Entrapment issues, so that this knowledge base facilitates and encourages risk investment by the exploration companies operating in India. Although it is a dynamic process, currently, about 20% of the total sedimentary areas of India (onland and offshore including deep water) are explored/under active exploration and the remaining area is either poorly explored or unexplored irrespective of their status in terms of hydrocarbon discovery or production.

With the continued efforts in both producing and non-producing basins by the NOCs and Private Companies in the acreages held by them under various dispensations, and the likely acreage dispensations in future under the present system of offering new areas, the exploration coverage will improve significantly as detailed in reply to the question 2 below.

It may be mentioned that exploratory targets like 2D seismic, 3D seismic and exploratory wells during the IX Five Year Plan, which is completing this, year, are expected to be over achieved as may be seen from the following table:

Activity	IX Plan Target*	Achievement upto March, 2001	Likely achievement in IX Plan
2D seismic survey (GLK/LK)	34745	54866	111328
3D seismic (sq. Km.)	7450	21065	29675
Exp. Wells (No)	776	623	845

* ***Targets for IX Plan do not include exploration work programme of joint venture/private companies. NOCs are expected to over achieve the IX Plan targets."***

4.11 In response to the specific query of the Committee about the status of finalisation of the programme in this regard, the Ministry stated as under:-

"Govt. of India has taken following steps for fulfilling exploration programme as envisaged in India Hydrocarbon Vision-2025 document.

- The X Plan exploration programme in respect of the NOCs and the private parties are being finalised in keeping with recommendations given in Hydrocarbon Vision 2025. The X Plan programme envisages exploration in the 19 of the 26 sedimentary basins of India, which include the six frontier basins viz. Ganga valley, Himalayan Foreland,

Spiti-Zanskar, Deccan Syneclise, Vindhyan and Satpura-S.Rewa Damodar, besides the deep water areas.

- ❖ Two rounds of NELP offers announced by Govt. of India, wherein 47 contracts for exploration blocks have been signed, with various companies both NOCs and the private, will substantially enhance the extent of exploration. Similar offers are also planned in future to further improve the exploration coverage.
- ❖ Govt. of India has also identified broad medium term programme for furtherance of knowledge building pre-exploratory activities through OIDB assistance for offering blocks in poorly explored/unexplored basins/areas.

After taking into account the areas for which contracts have been signed upto the second round of NELP and the work of the NOCs in the acreages held on nomination basis, the basinal areas that would be covered by exploration, would go upto more than 25% by the year 2005.

In the medium-long term, continuation of the efforts through the NOCs and Private parties and firming up of the knowledge building activities in frontier basins will lead to further upgradation of basinal area. With the above efforts put in place, upgradation of the both poorly explored and unexplored areas of the Indian sedimentary basins will gradually improve in future and by 2025, the whole unexplored/poorly explored areas will be at least preliminarily assessed to carry out mainstream exploration activities by different players in the Indian upstream sector. A review of the status will be taken after the X Five Year Plan to formulate future plans as the assessment is a dynamic process with upgradation in technologies and other inputs on an ongoing basis."

4.12 When the Committee desired to know about the specific roles of National Oil Companies and DGH in appraisal of Indian sedimentary basins, the Ministry of Petroleum & Natural Gas informed as under:-

"As per the current policy for exploration of oil and gas, all exploration acreages are being licensed under New Exploration Licensing Policy, where NOCs are required to compete for acquiring acreages and they have been provided a level playing field in term of fiscal incentives and same contractual frame-work as the objective of Government is to accelerate exploration activities in the country following competitive route. Hence both NOCs and private players would play key roles in future exploration activities in the country.

In order to open new areas, Government through DGH or through complementary efforts of NOCs will get pre-exploratory surveys carried out to acquire knowledge base about such areas. Further DGH will prepare data packages for offering exploration areas. DGH would also monitor contracts, entered by Government of India, on behalf of Government of India."

4.13 When the Committee desired to know about the short-term/long term policy of the Government to enhance oil recovery or to revive old wells, the Ministry of Petroleum and Natural Gas submitted that Government has been emphasizing national oil companies to formulate action plan for increasing recovery factor from the fields to optimize oil production. NOCs have taken measures in this direction. About initiatives taken by ONGC, the Ministry have informed as under:-

"* Optimisation of oil production from ageing fields by infill drilling, redistribution of injection water.

* Assessment of small and marginal fields for their commercial exploitation.

* Application of state-of-art and cost-effective technology like horizontal drilling, drain hole, multilateral completion, slimholes, sub-sea completion, online simulation, water/gas shut-off by cross linked polymer etc. for lowering the front line development cost and improving the productivity.

* Identification of various causes for sickness/sub-optimally producing wells, judicious planning of workover and repair measures, expeditious implementation of their liquidation plans and effective monitoring.

* Timely implementation of development schemes particularly pressure maintenance by water injection etc.

* Putting the wells on artificial lifts.

* Application of suitable EOR processes to improve the oil recovery. For instance, thermal recovery from Balol, Santhal, Lanwa and Bechraji, Polymer flooding in Sanand.

* Seeking expert opinion from across the globe for field specific problems.

* Inviting participation of private companies and MNCs in development of small and medium sized oil/gas fields with the objectives of getting

(i) innovative technologies and
(ii) capital resources.

4.14 About initiatives of Oil India Limited, the Ministry have submitted the following information:-

"The major reservoirs of the Nahorkatiya and Moran oilfields are subjected to pressure maintenance/EOR schemes from the very early phase of the production history. The major such schemes are:

(i) Peripheral Water Injection;
(ii) Water flooding;
(iii) Crestal gas injection with or without water injection;
(iv) Polymer flooding.

Gas/Water injection has been initiated in the Jorajan oilfield also from an early stage. This concept has been extended to the recent discoveries like Shalmari too. As on date, the status of the pressure maintenance/EOR schemes is as follows:-

Field	OOIP (MMstd kls)	OOIP under EOR Schemes (MMstd kls)	EOR Scheme	Primary Recovery Factor (%)	Recovery as on 1.1.2000 (%)	Expected Ultimate Recovery Factor (%)
Nahorkatiya	200.7	141.1	Water & Gas Injection	28.8	37.5	40
Moran	72.6	52.3	Water & Gas Injection	33	35.4	40

After the reservoirs are subjected to the pressure maintenance/EOR schemes, all inputs are put together to produce the wells at optimum level. Artificial lifts are provided to the wells needing outside support, sick wells are revived by suitable workovers, produced formation water is treated safely, disposed and reinjected into underground oil reservoirs for providing outside energy etc. For the declining oilfields viz. Nahorkatiya and Moran, studies are being carried out for identifying any other sophisticated EOR pilots viz. Alkaline flooding etc.) that may be applicable for the reservoirs under gas/water injection for quite sometime. An internationally reputed firm was also engaged in the recent past for studying the major reservoirs and suggesting any other EOR methods applicable. One of their recommendations viz. infill well drilling has already been implemented partially.

OIL is continuing its Pressure Maintenance/EOR scheme in various blocks. In addition OIL is also carrying out following IOR jobs for improved recovery:-

(i) Water Shut Off
(ii) Sand control
(iii) Inhibition of Paraffin/Asphaltene deposition

Multi disciplinary study has also been planned to revitalise the old depleting fields which will enable us to know extent of the sand bodies, cumulative production, balance recoverable hydrocarbons and take up necessary Improved Oil Recovery (IOR) methods."

CHAPTER – V

Participation of Private Sector in Exploration and Production and Joint Venture Projects

5.1 The economic reforms, initiated in 1991, seek to delicense the industry and encourage private sector initiatives for supplementing and speeding up economic growth. This liberation process has also opened up the petroleum industry, both upstream and downstream sector. 30% of country's inplace reserve accretion during the last five years has been from Private/JV operations. Today 47 contracts for exploration blocks to Private/Joint Venture companies are under operation. Presently 18 discovered fields are under Private/JV operations and several others are likely to be finalised soon.

(a) New Exploration Licensing Policy and Performance of Private/Joint Venture Projects.

5.2 Continuous yearly exploration bidding rounds are being conducted and offers of small and marginal fields are being made for private participation in upstream sector. A new Exploration Licensing Policy (NELP) was formulated by the Government in 1997-98 to provide a level playing field in which all parties could compete on equal terms for the award of exploration acreage.

5.3 In response to the specific query of the Committee about the various rounds of bidding since 1980 and the results achieved so far through the involvement of private/foreign investment in exploration and production sector, the Ministry of Petroleum & Natural Gas submitted the following details:-

> "Since 1980, Government of India has invited bids for exploration blocks under 11 bidding rounds including 2 rounds under New Exploration Licensing Policy. Further Government had invited bids under 2 rounds for development of discovered of medium size and small size discovered fields. The details of these are given below:-
>
> Bidding for Exploration Blocks

Round	Blocks Offered	Contract signed
First (1980)	32	1
Second (1982)	50	0

Third (1986)	27	8
Fourth (1991)	72	5
Fifth (1993)	45	6
Sixth (1993)	46	5
Seventh (1994)	45	5
Eighth (1994)	34	4
JVEP (1995)	28	1
NELP-I * (1999)	48	24
NELP –II* (2000)	25	23

* Since NELP, ONGC and OIL are participating in bidding for acquisition of exploration acreages.

JVEP Joint Venture Exploration Programme.

NELP New Exploration Licensing Policy.

Offer of 2 rounds of discovered fields

Discovered Fields

Round	Field Offered	Contracts signed
First offer		
Medium-sized	12	5
Small-sized	31	13
Second Offer		
Medium-sized	8	-
Small-sized	33	9”

5.4 Asked about the achievements of JVs/Private parties in the field, the Ministry stated:-

“The participation of private players in the E&P sector of India has resulted in exploration efforts, collection of data and discoveries of oil and gas.

Summary Results (Upto March, 2001):

- 2D Seismic Survey - 20775 LKM
- 3D Seismic Survey - 6663 Sq. Km.
- 2D Reprocessing - 33518 LKM
- Drilled Wells exploratory - 36
- Oil Production - 15.91 MMT
- Gas Production - 12547 MMm3
- Investment made - US $ 1.56 Billion

(Provisional)

❖ New Oil and Gas Discoveries (till June, 2001):

Sl. No.	Block/Discovery Name	Oil/Gas
1.	RJ-ON-90/1 (Rajasthan)	Oil
2.	Ravva Satellite Gas Discoveries	Gas
3.	CB-OS-2	
	CB-OS-2 Lakshmi	Gas
	CB-OS-2 Ambe	Oil/gas
	CB-OS-2 Gauri	Oil/gas
	CB-OS-2 Parvati	Oil
4.	K.G. DWN-98/2 Annapurna	Gas"

5.5 When the Committee desired to know about the present policy of the Government to permit/encourage private/foreign participation/Joint Ventures Collaboration in Hydrocarbon Sector, the Ministry of Petroleum & Natural Gas stated:-

"Government of India has announced New Exploration Licensing Policy (NELP). Under this, ONGC and OIL have provided level playing field by providing same fiscal and contract terms as available to private companies. Attractive fiscal incentives like abolition of cess, non payment of signature and production bonus, 7 year tax holiday on commercial production, reduced rates of royalty payment for offshore and deep water areas have been provided for in NELP to attract private companies to bid for maximum number of blocks under NELP. Government has awarded 47 blocks including 7 deepwater blocks.

Government has also announced the policy for exploration and exploitation of Coal Bed Methane (CBM). Under this policy blocks would be offered to private companies for exploration and exploitation of CBM. Exploration of CBM will help in reducing the gap of demands and supply of natural gas.

Government, in March, 1999, decided to continue the policy of offering discovered fields with the change that in future bids are to be invited by ONGC/OIL, instead of Government."

5.6 The salient features of New Exploration Licensing Policy are:-

A. GENERAL

- Fiscal stability provision in the contract

- Finalisation of contract on the basis of Model Production Sharing Contract (MPSC)
- Petroleum tax guide is in place to facilitate investors
- Possibility of seismic option in the first phase of the exploration period
- NOC's to compete for acreages

B. FISCAL AND CONTRACTUAL TERMS

- No payment of signature, discovery or production bonus
- No customs duty on imports required for petroleum operations
- No minimum expenditure commitment during the exploration period
- No mandatory state participation/carried interest by NOCs.
- Freedom to sell crude oil and natural gas in domestic market at market related prices
- Biddable cost recovery limit up to 100%
- Sharing of profit petroleum based on pre-tax investment multiple achieved and is biddable
- No cess on crude oil production
- Royalty payment for crude oil on ad-valorem basis
    - 12.5% for onland areas
    - 10% for offshore areas
- Royalty on deep water areas (beyond 400m bathymetry)
    - 5% for first seven years after commencement of commercial production
- Option to amortise exploration and drilling expenditures over a period of 10 years from first commercial production
- Contribution to site restoration fund fully deductible in same year for income tax
- Liberal depreciation provisions making companies eligible for further tax adjustments
- Infrastructure status
- 7 years tax holiday from commencement of production
- Conciliation and Arbitration Act, 1996, which is based on UNCITRAL model shall be applicable.

C. BID TERMS

Companies would be required to bid for:

- Work programme commitment
- Profit petroleum share expected by the contractor at various levels of pre-tax multiple of investments
- Percentage of annual production sought to be allocated towards cost recovery

D. BID EVALUATION CRITERIA

Evaluation of bids will be carried out based on weigtages assigned under the following four main criteria:

Criteria	Weightages on a scale of 100 points
a) Technical capability	6
b) Financial Capability	4
c) Work Programme	60
d) Fiscal package	30

For work programme, the maximum weightage would be given to the work programme commitment for exploration phase – I.

5.7 In regard to the actual procedure being followed for awarding oil fields for exploration and production activities, the Ministry submitted the following details:-

"Prior to the formulation of New Exploration Licensing Policy (NELP), the exploration blocks were identified for offering in consultation with ONGC and OIL, who were the licensees. The identified blocks were put on the offer through publication of Notice Inviting Offers in national and international dailies/journals. Companies were given about 5-6 months time to submit bids. The bids were invited following open international competitive bidding system. Information docket/data packages were prepared by ONGC/OIL for each of the blocks on offer. Interested companies could inspect and/or buy the Information docket/data packages to facilitate preparation of their offers. All the bids received by the bid closing date were considered for evaluation. The main criteria for evaluation of bids were: the technical and financial capability of bidding company/consortium, work programme and commercial terms offered to the Government. The bids were evaluated by ONGC/OIL/DGH. The evaluation were considered by the Empowered Negotiating Committee of Secretaries (ECS) comprising Secretary (P&NG), Finance Secretary and Law Secretary and CMD, ONGC/OIL also assisted the Committee as technical members.

The recommendations of the ECS on award of blocks were put up for the consideration and approval of Cabinet Committee on Economic Affairs (CCEA). The blocks were awarded to the successful bidders after obtaining CCEA approvals.

The above bidding procedure were also followed for awarding medium and small-sized fields under two offers of the discovered fields.

After awards, the contracts were negotiated with the awardee based on the Model Production Sharing Contract and these were signed with the legal vetting from Ministry of Law with the approval of Minister of Petroleum and Natural Gas.

With a view to increase exploration efforts in the country, Government approved New Exploration Licensing Policy (NELP) in 1997. The blocks under NELP are identified by DGH with the assistance from ONGC/OIL. As most of the data in the country are with ONGC/OIL, they assist DGH in preparing data packages/information docket. Blocks/areas, under NELP are offered through an international competitive bidding system. ONGC/OIL are also requested to compete for acreages and they get same fiscal and contract terms at par with private companies. The bids are evaluated by DGH and evaluation are considered by the Empowered Committee of Secretaries (ECS) comprising of Secretary (PNG), Finance Secretary and Law Secretary. The bid evaluation criteria takes into account technical and financial capability of bidders, work programme and fiscal packages offered by the bidders. The recommendations of ECS is decided by CCEA. Blocks are awarded with the approval of CCEA. Contracts are finalised based on the Model Production Sharing Contract for NELP. Contracts are signed with the legal vetting by Ministry of Law and with the approval of Minister of P&NG."

5.8 When the Committee desired to know about the details of investments under NELP-I and NELP-II:-

"Government of India had formulated New Exploration Licensing Policy (NELP) and 2 rounds of bids have been invited under this policy for exploration of oil and gas in the country. A total of 47 contracts (24 contracts under NELP-I and 23 contracts under NELP-II) have been signed.

The details of minimum committed investment estimates (exploration phase-I) under NELP-I and NELP-II.

Companies	**Estimated exploration investment in million US$**	
	NELP-I	**NELP-II**
Foreign Companies	68.41	22.66
Indian PSUs	23.03	239.60
Indian Private Companies	156.86	48.25
Total	248.30	287.85

The estimated expenditure in all the 3 exploration phases is about US $ 1166 million under NELP-I and about US$775 million under NELP-II.

In view of the large unexplored/poorly explored area available in the country, the objective of Government has been to accelerate exploration efforts in the country either through National Oil Companies or through Private Sector both Indian and foreign. Under the 2 rounds of NELP, about 16%-17% of the total sedimentary area have been covered and for this 47 contracts have been signed."

5.9 About the initiatives being taken to attract more foreign companies, the Ministry of Petroleum and Natural Gas submitted:-

> "Foreign companies specially major oil companies have their own strategies and preferences for investment decisions. In last few years, several countries including some of the countries like CIS, Brazil and West African countries perceived to have very high potential for hydrocarbons have opened up their frontier for exploration by foreign companies. This has increased competition for limited exploration resources available world-wide. Within given international scenario, Government is making best effort to attract maximum investment in the exploration of oil and gas and the 2 rounds of NELP, have been successful from the point of view of exploration area taken up by the companies for exploration.
>
> It may be mentioned that at exploration stage, private companies mostly use service providers for surveys and exploratory drilling and hence they may use the services of reputed seismic and drilling companies.
>
> Foreign companies have also option to enter in exploration by taking interest from existing operating companies and some of the companies in past have used this route to enter in the exploration and production of gas in India.
>
> Substantial portion of investment in any E&P project is required after establishing commercial discovery through exploration and thereafter companies may farm out their interest to other companies including foreign companies to bring in technical and financial resources.
>
> As regards, the issue of attracting more foreign companies, it may be clarified that against an international competitive bidding system with quantitative system for bid evaluation being followed by Government of India, the participation by foreign companies in the bidding process does not ensure that they would get the area/blocks as they have to compete with PSUs and Indian Private Sector. Government would continue to encourage all companies whether domestic or foreign to participate in bidding process by providing attractive fiscal and contractual terms.
>
> To sum-up the above, efforts of Government have been to accelerate exploration in the country by attracting investment either from PSUs, Indian Private Sector or foreign companies. The objective is also to explore in a time bound manner through the mechanism of Production Sharing Contracts. Viewed from this angle, the first 2 rounds of NELP have been able to meet the objective."

5.10 During the course of examination, the Committee were informed that under New Exploration Licensing Policy-II bids for 23 blocks were received. Only 6 foreign/multinational companies had participated in the bidding process and most of the blocks have been awarded to Indian companies. The Committee enquired about poor

response of foreign companies even after offering attractive contractual terms and other measures. The Ministry of Petroleum and Natural Gas replied:-

> "Any investment decision by a company is generally influenced by geological prospectivity, regional preference, competing opportunities available World-wide, perceived ecnomics of the acreages on the offer, infrastructure, operating environmental etc.
>
> It may be mentioned that ten and six foreign companies had participated in NELP-I and NELP-II respectively. However, the foreign companies have to compete with the domestic national and private oil companies under a transparent and quantitative Bid Evaluation Criteria (BEC) and this does not guarantee that participation by foreign companies would ensure exploration acreages for them.
>
> Foreign companies have also option to enter in exploration by taking interest from existing operating companies and some of the companies in past have used this route to enter in the exploration and production of gas in India. Further most of the investment is involved only at the development state after the discovery and at that time a company has option to farm out its interest to a technically and financially capable foreign company.
>
> Efforts of Government have been to accelerate exploration in the country by attracting investment either from PSUs, Indian Private Sector of foreign companies. The objective is also to explore in a time bound manner through the mechanism of Production Sharing Contracts. Viewed from this angle, the first 2 rounds of NELP have been able to meet the objective."

5.11 The Committee further also wanted to know whether the Government propose to upgrade the large tracts of sedimentary areas of the country to improve the marketability of blocks and to attract more technologically superior foreign oil companies in the countries before offering the bids for NELP-III, the Ministry submitted the following details:-

> "Government propose to cover all the unexplored/poorly explored sedimentary areas of the country through reconnitory surveys progressively in order to build the geological knowledge base for improving the marketability of blocks and attracting foreign multinationals. Since this activity involves planning acquisition, processing and interpretation of data which will take time, it may be possible to cover only limited areas within the time frame set for announcement of NELP-III which is expected in the last quarter of the current fiscal year 2001-02. DGH through a seismic company initiated 2-D seismic surveys in Deep offshore areas of East Coast and Southern Tip of India and have completed acquisition about 11450 LKMS. Interpretation of this data is under progress. This is expected to result in identification of 10-15 blocks in East Coast and Southern Tip for offer under NELP-III.

In addition some value addition is being carried out in the old areas by way of reprocessing of old data."

5.12 The following private/joint venture operators have commenced production of oil and gas from:-

(1) Cairn Energy (India) PVT. Ltd. in 'Ravva' offshore field.

(2) Enron Oil & Gas (India) Ltd. in 'Panna Mukta' offshore Field

(3) Enron Oil & Gas (India) Ltd. in 'Mid and South Tapti' offshore field.

(4) GeoEnpro Petroleum Ltd. in 'Kharsang' oilfield.

(5) Hardy Exploration & Production (India) Inc. In 'PY-3' (CY-OS-90/1) offshore field.

(6) M/s. Niko Resources from Bhandut, Indrora and Lohar Small sized fields

(7) M/s. Selan Exploration from Bakrol, Indora and Lohar small sized fields

(8) M/s. Joshi Technologies Inc. & M/s. L&T from Dholka field

(9) M/s. HOEC from Asjol field.

5.13 As regards Exploration blocks, work has commenced in the following blocks:-

- In KG-OS-90/1 by Hardy Exploration & Production Ltd.
- In GN-ON-3 by HOEC
- In BB-OS-5 by MD Petrom Oil & Gas Pvt. Ltd.
- In CY-OS-90/2 by M/s. Hardy Exploration & Production Ltd.
- In RJ-ON-90/4 & RJ-ON-90/5 by Essar Oil Ltd. India
- In KG-OS/6, CB-OS-2, RJ-ON-90/1 & KG-DWN-98/2 by Cairn Energy
- In CB-OS-1 by Enron Oil and Gas
- In GK-OS-5 by Tullow Oil plc

5.14 Oil production from Pvt./JV fields during the first three years of the IX plan period was 9.57 MMT. Oil Production during the terminal year 2001-02 of the IX Plan is expected to be about 3.5 MMT.

5.15 In response to the specific query of the Committee that how far the Joint Ventures have been proved beneficial for ONGC, ONGC submitted the following written reply:-

> "Out of Joint Ventures in Panna-Mukta, Mid-South Tapti and Ravva medium sized fields. Profit petroleum has started coming in Ravva and Mid & South Tapti. In the case of Ravva, ONGC is being carried by the consortium for a sum of US$55 MM as a compensation for the past cost. However, for Panna-Mukta & Mid-South Tapti no compensation for work done earlier by ONGC has been provided. The Signature bonus received by ONGC in respect of Ravva. Panna-Mukta and Mid-South Tapti fields are US$18 MM, US$21 MM respectively. Production bonus received in respect of Ravva and Mid-South Tapti fields are respectively US$18 MM and US$6 MM. No production bonus has been received in respect of Panna-Mukta field till date.
>
> In the exploration blocks commercial discoveries have been made only in two blocks: CY-OS-90/1 and CB-OS/2. One of these two blocks CY-OS-90/1(PY-3) is under production but has not yet reached the profit regime. There is no provision in the condition for exploration blocks for past cost compensation. It may be mentioned here that ONGC's profitability is adversely affected because PSC condition that ONGC, being the licensee in exploration blocks, would bear the statutory levies (Royalty & Cess) on total production from the block.
>
> In the case of small size fields of 1992 (excluding Modhera field) for which the contracts have been signed, where ONGC does not hold any PI, US$545,000+Rs. 143 lakhs in the form of signature bonus/production bonus have been received by ONGC so far. However, under the terms and conditions of Notice Inviting Offers for these fields, there is no provision for past cost compensation."

5.16 When the Committee specifically desired to know whether ONGC has formed any Joint Venture with foreign companies experienced in exploration and exploitation in deep water areas, ONGC submitted the following details:-

> "ONGC has not yet formed any Joint Venture with foreign companies experienced in exploration and exploitation in deepwater regime. However, Government of India has extended NELP terms for 6 of ONGC's deepwater PEL blocks for Joint Venture with foreign companies. ONGC has already short listed 17 companies experienced in deepwater exploration and exploitation and such companies will be offered to submit their bids for forming strategic alliance after

approval of Government of India on bid evaluation criteria already submitted to MOPNG."

5.17 When the Committee wanted to know about the status of various Joint Ventures of Oil India Limited, OIL submitted the following details:-

"The details of various joint ventures signed by OIL and their present status are as under:

(i) Overseas-Oman Project: OIL entered into a farm-in joint venture agreement with M/s. TOTAL Exploration Oman, a subsidiary of TOTALFINA-ELF of France and acquired 20% undivided participating interest for hydrocarbon exploration in Ghuinam (OMAN) Block-4, Sultanate of Oman with maximum financial commitment of US$9.458 million. As per initial work programme, the first exploration well was drilled (TD-4157 M) during March/April, 1999 but commercial discovery could not be made even though thee were sufficient indications of hydrocarbon shows.

At present, the work programme for geo-chemical modelling, seismic reprocessing and field work review of the block is in progress. Decision about further activity will be taken after completion of the present work programme.

(ii) Assam-Arunachal Block AAP-ON-94/1 JV: OIL has entered into JV agreement for this block awarded in the VIIIth Round of Exploration Bidding. The JV partners in this block are M/s. Hindustan Oil Exploration Co. Ltd. (HOEC), M/s. General Fibre Dealers Pvt. Ltd. (GFDL) and OIL. PEL of the area has been granted recently and exploratory work is expected to start shortly.

(iii) Rajasthan Blocks Rj-on-90/4 & RJ-ON-90/5 JV: OIL entered into JV agreement for these two exploration blocks awarded in the Vth Round of Bidding with M/s. Essar Oil Limited (EOL). The PSC was signed on 30.10.1996. OIL will have 30% carried interest after commercial discovery. EOL initially held 100% undivided interest, subsequently assigned 25% to Polish Oil & Gas Co. Ltd.

Phase I of work programme comprising data review and seismic survey completed. The operator has since surrendered one block (RJ-ON-90/4) and presently drilling an exploratory well in the other block.

(i) Saurashtra Offshore Block No. SR-OS-94/I JV: OIL entered into joint venture agreement with M/s. Reliance Industries (RIL) for this block awarded in the VIIth Round of Exploration Bidding. PSC was signed on 12.4.2000. RIL is in the process of acquiring geo-scientific data.

(ii) Kharsang Oilfield (Arunachal) Joint Venture Project: OIL entered into joint venture agreement for development of Kharsang field in Arunachal Pradesh with M/s. Geopetrol International Inc. of France, Geo-Enpro Petroleum Ltd. & Enpro India Ltd.

The PSC for development of the Kharsang field was awarded in the 1st Round of JV participation for medium size fields. The PSC was signed on 16.6.1995 which is valid upto 25 years.

The field is producing at the rate of around 130-140 KLPD of crude oil per day at present. The operator has planned to take up development drilling shortly.

In addition OIL has initiated action for participation in the joint venture in one of the exploration block in the Islamic Republic of Iran (FARSI Block) alongwith ONGC Videsh Limited and Indian Oil Corporation Limited for which bid has been submitted, for a deep water exploration block with ONGC awarded under NELP, Equity participation Petronet Mangalore-Hassan-Bangalore Limited."

(b) Regulatory Mechanism for Upstream Sector

5.18 Till recently the upstream petroleum sector was largely a monopoly of public sector companies. This is now being increasingly thrown open for private investment. Currently, National Oil Companies viz. ONGC and OIL are holding about 70 per cent of total PEL areas and multi-national and private companies are holding the remaining 30 per cent. Similarly, the National Oil Companies retain 74% of mining lease areas and the remaining 26% is held by Multinational and Private Companies. At present, the production from joint operated fields accounts for nearly 10% of the total country's production. Directorate General of Hydrocarbons which was set up in 1993 to supervise the upstream petroleum activities, monitors the Petroleum Exploration Licences (PEL's) which national and private oil companies are operating. The function and responsibilities of DGH are advisory except regulation of the preservation, upkeep and storage of data and samples pertaining to petroleum exploration etc. However, DGH under the administrative control of Ministry of Petroleum and Natural Gas does exercise certain responsibilities and functions which are regulatory in nature.

5.19 About the role and functions of DGH, the Ministry have stated:-

"To provide technical support and advice to the Ministry of Petroleum & Natural Gas on issues relevant to the exploration and optimal exploitation of hydrocarbons in the country and on the strategy of taking up exploration and exploitation of oil and gas reserves abroad by the national oil companies:

- ❖ To advise the Government on the offering of acreage for exploration to companies as well as matters relating to relinquishment of acreage by companies.

- ❖ To advise Government for laying down safety norms (technical aspects) and framing regulations on safety (technical aspects) in oil fields operations;

- ❖ To advise Government on pollution control measures and review of environmental performance as per existing laws, rules and regulations;

- ❖ To advise Government and suggest ways to minimise conflict between exploitation of hydrocarbons and other resources;

- ❖ To review the exploration programmes of companies operating under Petroleum Exploration Licenses granted under the Oil-Fields (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 review the development plans for commercial discoveries of hydrocarbons 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 reassess the hydrocarbon reserves discovered and estimated by the operating companies in discussion with them;

- ❖ To review, regulate and enforce safety (technical aspects) of offshore operations;

- ❖ 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;

- ❖ To conduct research, studies, surveys, information drilling and related activities hitherto unexplored or poorly explored areas;"

5.20 When specifically asked about the type of monitoring the Government do in case of project being implemented by the National and Private Joint Venture Companies, the Ministry submitted:-

"The Ministry monitors ONGC and OIL projects through quarterly and periodical exploration and production meetings against the MOUs entered by them with Government. The issues raised by ONGC and OIL, requiring attention/help from Government are addressed promptly. As regards operations by private companies, they are governed by the provisions of the respective contracts and Management Committee/DGH, who is also in the Management Committees monitor the progress and implementation of PSCs."

5.21 During the course of evidence, the Committee pointed out that there was a long gestation period between submission of exploration report and advice of DGH and clearance from the Ministry and asked about the Coal Bed Methane project of Mehsana in Gujarat, Director General-DGH informed that their work is over and data package is ready. Only the permission of Central and State Governments is required for clearance of the blocks for exploration. In the same context he also informed that they did not receive the required data from National Companies in time and if they receive the data timely, the work would be expedited.

5.22 While going into the details of monitoring process and survey work being done by DGH, the Committee desired to know whether the present staff strength is sufficient to handle the work. DGH replied in note:-

"A total of about 235 PELs are held by various National and Private/J.V. Companies. PELs of NOCs are being monitored by DGH with regard to work programmes whereas PELs of Private/JVs are being monitored in terms of PSCs. Due to acute shortage of staff, DGH is finding it difficult to handle the present volume of work. However, Ministry has recently very kindly sanctioned the additional manpower of 27 executives to be posted immediately on deputation from various PSUs. DGH has already formulated the Phase-II and Phase-III expansion programmes and submitted to Ministry for kind consideration. DGH has envisaged an ultimate manpower requirement of 210 executives under Phase-II and 385 executives under Phase-III to be implemented by end 2001-02 and 2002-03 respectively.

DGH has presently an executive strength of only 57, out of which 52 executives are from technical, contract finance and legal disciplines engaged in the activities like, contract monitoring, survey, NELP, CBM and gas hydrate related work and other technical jobs. The entire technical staff is handling multi-disciplinary functions. In addition to the technical work relating to his own area like geology, geophysics, logging, production, safety, environment and financial evaluation, legal aspects, etc. almost every executive is additionally carrying out contract monitoring, surveys, NELP, CBM and gas hydrates related work and other jobs like issuance of Essentiality Certificates (ECs), handling legal matters and also work relating to Parliament Questions and various Parliamentary Committees in so

far as these relate to DGH. DGH staff is also required to maintain close liaison with various Ministries/Departments for facilitating the activities and clearances relating to all the PSCs signed till date with Private/JV operations."

5.23 When asked about the actual procedure followed by DGH in case of financial and technical monitoring and action taken in case of time and cost overruns of the projects, DGH submitted as under:-

"The Budgets and Development plans submitted by operators of various fields/exploration blocks are examined in DGH for its reasonability of cost, time planned for each activity and other technical parameters. The comparisons are made with similar activities/cost data prevailing in the market, like that of NOCs, international rig rates, and the rates of seismic and drilling services. Sometimes, Consultancy from other organisation like EIL, IOGPT, IRS etc. is also taken to analyze these costs, technical parameters/aspects in detail.

Once the project and development plans are implemented, the Variance Analysis Reports are scrutinized by DGH on the basis of Technical and Financial reports submitted by operators periodically. Wherever, there are Cost over runs variations are specifically analyzed with reference to the existence of time over run if any. Few instances can be quoted like the Well cost exceeding the budgeted cost, delay in putting up the facilities. These delays are examined and in case of non-acceptability of reasonability of variations in the cost, the cost recoveries are restricted. Moreover, while approving any budget/plan, DGH sometimes puts certain stipulations which help to lower the overall cost of project, for instance/restriction on employment of number of expatriate positions, the charging of Home office support cost (foreign office of operator), reducing the G&G (Geological and geophysical) and General & Administration Cost etc. While monitoring the projects, DGH ensures that these stipulations are adhered to by the operator and no cost petroleum recovery is allowed to the operator for such amounts.

In addition, DGH also ensures that the development Plan of the fields is optimized. It neither involves excessive expenditure or unwarranted production of oil and gas from a reservoir affecting its health. Development plans are critically examined in DGH, so that, optimal production is obtained from a field. This involves cutting down the drilling of number of wells, and their locations, if required. By following these measures, we ensure that the value of Government assets and profit, oil and gas is maximized."

5.24 When asked about the nature of coordination /cooperation between ONGC, OIL and DGH, DGH submitted as under;-

"Although DGH gets cooperation from ONGC and OIL with regard to E&P issues, still there is scope for further improvement especially on the issue of data and information flow to DGH. DGH being the depository of all the national E&P data, needs the automatic data flow system to cater to the needs of E&P activities with regard to planning its own survey work programmes, identification of blocks and advising Ministry on offering of acreages, preparation of data packages and other information and statistics on E&P activities in order to develop the National E&P data archive. To this extent, the coordination level, particularly data flow systems needs to be improved further. There should be automatic flow of data from ONGC/OIL and a copy of all the activity reports need to be made available to DGH in a timely fashion."

5.25 When the Committee asked the Ministry about the reasons for not undertaking any detailed study of manpower to DGH in view of their widened nature, scope and volume of work during the last few years and their future responsibilities, the Ministry submitted as under:-

"Based on its work-load, DGH had proposed to the Ministry of its manpower requirement of 95 in phase-I, 219 at phase-II and 414 at phase-III. The phase-I requirement has already been approved. The second phase is planned to be implemented during the year 2002-03 and DGH has been asked to submit the proposal for phase-II.

ONGC and OIL have already relieved their personnel to join DGH on deputation. It has been the effort of the Government to assist DGH in getting the necessary manpower from Oil PSUs."

5.26 In response to specific query of the Committee whether the regulatory functions of DGH are running freely, Director, DGH informed that Regulatory Authority was not functioning fully because there was a small number of staff and guidelines have not been incorporated in Regulatory Act. They also informed the DGH has submitted certain suggestions in the Ministry. If these are accepted that can make change in their status. He also informed that the H.R.D.A. Act was approved *in principle* in 1997 and draft was also prepared but due to change in the Government no further follow up could take place and now a new report has been prepared in this regard.

5.27 While referring to the recent move of the Committee to create a separate Regulatory Authority for upstream sector, the Committee wanted to know about the details of the recommendations of Narad Committee in this regard. The Ministry of Petroleum & Natural Gas submitted as under:-

"The main recommendations of the Narad Committee are as under:-

i) A separate regulatory authority for the upstream hydrocarbon sector.

ii) The domain of the Upstream Hydrocarbon Regulatory Authority (UHRA) to encompass activities such as surveys, exploratory drilling, development drilling, EOR,IOR and it should not extend beyond processing and purification facilities of oil and gas.

iii) Empowering of UHRA to monitor enforcement of environmental regulations, initially for the offshore to supplement the efforts of MOEF.

iv) Regulatory functions and administration of PSCs should be carried out by two different agencies and prior to any empowerment of the UHRA to exercise any regulatory powers, separate arrangements would need to be made for representing the Government of India in the Management Committee. This function would be discharged by DGH under the overall control of the Ministry with the revised charter of responsibilities and functions and DGH could be funded by OIDB as at present.

The creation of UHRA involves complex process of consultations on issues such as Health, Safety and Environment, Division of roles between various authorities, consultations in the Government. No firm time-table has been framed in view of complex nature of the job."

5.28 When asked about the present status of proposed Regulatory Authority for upstream sector and the proposals to give more powers and independence to DGH and also that why DGH has not been vested with adequate power and staff which commensurate with its added responsibility and function, the Ministry informed that the recommendations of the Narad Committee are under examination in the Government. As regards the powers to DGH, it has been delegated majority of decision-making powers including administrative and financial powers.

5.29 When the Committee wanted to know the views of DGH in this regard Director, DGH, referred to the model of Norwegian Petroleum Direcotrate, which is semi independent in the sense that they come under the Ministry but for technical decisions they are independent. He suggested that it will be better if this model is followed in our country also on the same pattern as being followed in USA, Malaysia, Indonesia and UK.

CHAPTER - VI

Exploration and Exploitation of alternate resources of Hydrocarbons

6.1 With the ever-increasing dependence on petroleum imports due to relatively stagnant domestic production and spiraling growth in demand, the Government is encouraging development of alternative source of hydrocarbons. With this view, Coal Bed Methane (CBM) and Gas Hydrates have been identified for vigorous exploration and development. There are also unconventional hydrocarbon bearing reservoirs like fractured basement, fractured shale/traps etc. which also deserve extensive exploration.

(a) Exploration of Coal Bed Methane

6.2 India is endowed with rich deposits of coal and lignite. These coal and lignite seams contain varying amounts of methane depending on the rank of the carbonaceous matter, the depth of burial and the geotectonic setting of the basins. The commercial production of such methane, better known as coal bed methane is a proven technology has added to the natural gas production of some countries. Government has formulated a CBM policy providing attractive fiscal and contract terms for exploration and production of CBM in the country. Government has already invited bids for 7 blocks located in Jharkhand, Madhya Pradesh, Rajasthan and West Bengal. The bid closing date is 31.8.2001. This is expected to give boost to the exploration efforts for this new source of energy.

6.3 In addition to this, ONGC is engaged in exploration of CBM in Raniganj coalfield in West Bengal and Jharia coalfield in Jharkhand. They have formulated further work programme to assess CBM potential with a view to exploit it commercially.

6.4 Government has also signed a contract with Great Eastern Energy Corporation Ltd. (GEECL) for CBM operations in Raniganj coalfield in West Bengal.

6.5 In response to the specific query of the Committee about probable potentiality and state-wise availability of Coal Bed Methane, the Ministry of Petroleum & Natural Gas submitted the following details:-

> "State-wise estimated resource base of CBM for Gujarat, Jharkhand, Madhya Pradesh, Rajasthan and West Bengal are 137, 107, 104, 9 and 101 billion cubic metre respectively.
>
> DGH has also initiated/planned to initiate study to assess CBM resources in Maharashtra, Tamilnadu and Chhattisgarh.
>
> To encourage the exploration and exploitation of alternate hydrocarbon resources like Coal Bed Methane (CBM), Government of India formulated a CBM

policy after giving the consideration to technical aspects and terms offered by other countries. Accordingly, Cabinet approved CBM policy in July, 1997. It was decided to explore and exploit the CBM resources of the country through global competitive bidding route. Accordingly, a Model Contract, Notice Inviting Offer, Bid Format and Bid Evaluation Criteria were also finalized. Government of India has offered 7 blocks under the first round CBM for exploration and production of CBM. These 7 blocks are located in Jharkhand (2 blocks), Madhya Pradesh (3 blocks), Rajasthan (1block) and West Bengal (1 Block). The bid closing date is 31.8.2001.

While exploring and producing, CBM, the mineability of coal is also taken into account so that coal mineability in future including any damage to coal formation is not affected. Normally the depth from which CBM is to be produced depends on the CBM content and its techno-economic feasibility."

6.6 When the Committee specifically asked the ONGC about the progress made so far by them in the process of coal and Bed Methane Coal exploration, ONGC submitted the status in a written reply:-

"ONGC entered into coal bed methane exploration in 1994. So far ONGC has drilled six R&D wells for CBM exploration. First two wells were drilled in Durgapur Depression of West Bengal while the other four wells were drilled in Parbatpur block of Jharia coal field in Bihar. The first well in Jharia tested successful, confirming the coal bed methane potential of the Gondwana Coals for the first time. As a follow up to the leads obtained in Jharia-I, three more wells viz. Jharia 2,3 and 4 were drilled, with an objective to carry out production evaluation and study the potential of the other coal seams.

PEL for a block in North Raniganj has been granted by Government of India to ONGC. Preliminary geological field studies have been undertaken in the area.

Based on the encouraging results of CBM exploration, the 9th Plan target of 2 CBM wells has been revised upward to 20 wells in the Mid Term Review. A total of 11 wells are planned for 2000-01(RE) and 2001-02 (BE) in addition to the three wells Jharia – 2, 3 and 4 presently under testing.

Recently, a MOU has been signed between ONGC and Coal India Limited for joint participation in CBM exploration. A Steering Committee, a joint CBM Exploration Team and a Operational Team has been formed for planning and identifying potential CBM Projects in Raniganj and Jharia basins.

ONGC is also considering to participate in the bidding round CBM-1(7 blocks) announced by Government of India recently in Jharkhand (2 blocks), Madhya Pradesh (3 blocks) and one each in Rajasthan and West Bengal. ONGC is in the process of evaluating these blocks for further action."

6.7 While going into the details of the procedure being followed in the bidding process, the Committee wanted to know the fiscal and operational terms on which the Coal Bed Methane blocks have been offered for global bidding and its comparison with international standards, the Ministry of Petroleum & Natural Gas submitted the following details in written note:-

"The broad fiscal and contract terms for exploration an production of CBM under CBM policy are as under:-

Fiscal regime

i) The contractors would be required to pay license/lease fee and charges including surface rentals, land acquisition charges etc. as per the P&NG rules or as required under any other provisions.

ii) The contractor shall pay royalty at the rate of 10% and Production Level Payment (PLP) on sliding scale based on the monthly average of daily production rate of CBM with increased rate PLP being payable only on incremental production.

iii) The contractor and any sub-contractors will be exempted from payment of customs duty on import of goods and materials required for exploration and exploitation of CBM.

iv) Income tax payable as per the provisions of Income-Tax Act, 1961.

v) Contractor will be provided fiscal stability during the entire period of contract.

Broad contract terms:

i) The blocks will be awarded through open global competitive bidding.

ii) The duration of the contract will be for 38 years for blocks located in a normal area and 40 years for blocks in a frontier area and will be divided into four phases with companies having walk-out option at the end of phase-I and phase-II.

iii) Government will not have any participating interest. Foreign/Indian companies could have 100% participating interest.

iv) The contractor will have the freedom to market the gas in India.

v) Assignments will be permitted with the prior approval of Government.

vi) Contract in general and arbitration proceedings in particular will be governed by Indian Law.

The fiscal terms for CBM operations in India were framed after studying fiscal regimes of main countries such as USA, China and Poland and it compares competitively."

6.8 Since the CBM exploration involves the State Governments, the Committee wanted to know that on what terms and conditions the concerned State Governments have agreed to permit the exploration of Coal Bed Methane and also the expected earning of Central Government from the blocks already offered for exploration, the Ministry submitted the following facts in this regard:-

"State Governments viz. Gujarat, Jharkhand, Madhya Pradesh, Rajasthan and West Bengal have given their consent to the CBM policy, terms of which have been given above. However, most of the State Governments have requested Central Government to consider sharing of Production Level Payments with State Governments, which is being examined.

As regards, the expected earning from the CBM blocks already offered, it is too early to make any estimates as reserves are yet to be realistically assessed and it would also depend on the costs of development and production, infrastructure, gas price etc."

6.9 With a view to know the future of the implementation of CBM policy, the Committee enquired about the number of blocks that have been identified by DGH for offering under the next phase of global bidding round, the Ministry submitted the following details:-

"For NELP-III round for exploration of conventional oil and gas, exercise is in progress to identify exploration blocks in various onland and offshore areas both shallow and deepwater. It is expected that about 25-30 blocks may be available for offer under NELP-III round.

For the next round of CBM exercise will be undertaken, after knowing the response for the blocks on offer by 31.8.2001, to identify the blocks in consultation with Ministry of Coal and based on technical information and other parameters such as economic viability, coal mining schedule etc.

ONGC and Great Eastern Energy Corporation Ltd. (GEECL) are already engaged in CBM operations in the country. It is proposed to acquire more data in

the 10th Five Year Plan in the coal bearing States of Andhra Pradesh, Maharashtra, Madhya Pradesh, Orissa and Tamilnadu."

(b) Exploitation/Exploration of Gas Hydrates

6.10 Gas hydrates is being considered an important source of Hydrocarbon energy for the future. There are numerous potential offshore areas of gas hydrate accumulation within India's exclusive economic zone. When asked about the assessment of the Government about availability of gas hydrates and present status of National Gas Hydrate Programme, the Ministry submitted the following details:-

"National Gas Hydrate Programme (NGHP) for exploration of Gas Hydrates is in the initial stages of R&D/knowledge building. Various studies have been initiated for assessment of the resource base. Based on review of large quantum of seismic data both in East and West Coast of India, at present two areas of interests have been identified from gas hydrate point of view. One area of interest lies in the Krishna-Godavari area of East Coast and another Goa offshore area of West Coast. Review of data of Mahanadi area in East Coast and Saurashtra area in the West Coast is also undergoing. To study the resource base of gas hydrate in the two areas where gas hydrate has been identified based on seismic data acquired, more geoscientific investigations have been planned to be carried out in near future under NGHP.

It may be mentioned that the technologies for gas hydrates are still at R&D stage Worldwide."

6.11 When the Committee wanted to know about the steps DGH propose to take for exploring the potential of gas hydrates available in India's Exclusive Economic Zone, DGH submitted the following details in a written reply:-

"A National Gas Hydrate Programme (NGHP) was initiated by MOP&NG in the year 1997. Based on draft concept paper prepared by DGH, the MOP&NG re-constituted the Steering Committee on 19.9.2000. Simultaneously, to initiate R&D activities in the field of gas hydrate, a Technical Committee was constituted on the advice of DGH.

In the 3 Technical Committee Meetings held in the last six months, five projects related to Gas Hydrates (GH) have been cleared for approval by the Sterring Committee after discussion with the representatives from DGH, ONGC, OIL, NGRI, GAIL and NIO (all members of NGHP). DGH functions as the coordinator of the Technical Committee. These projects will help in exploring the potential and Resource Estimation of GH available in India's EEZ. After

extensively reviewing the seismic data acquired by ONGC and OIL over the 10-15 years, in both east and west coasts of India by NGHP member organisations, a few areas have been shortlisted for further geoscientific investigations. It has been planned to carry out Geoscientific Investigations (including side scan Sonar, High Resolution Seismic (sparker) survey, swath bathmetry data and Gravity crore and water samples for sedimentological, chemical, microbial, dissolved gas concentration etc. of shallow sediments in the Krishna-Godavari basin in East coast and Goa offshore area in the Westcoast. In addition to these, special seismic processing is planned to be carried out in collaboration with University of Victoria, Canada. Two more proposals for Gas Hydrate studies have also been taken up and these are : (i) technical collaboration with JNOC, Japan. This is the only active and successful International Programme where efforts are made to conduct R&D studies for exploring and producing gas from hydrates and (ii) consortium membership of Center for Research on Hydrates, Colorado School of Mines, USA.

The above five proposals were presented through a working paper to the Second Steering Committee Meeting held on 24.4.2001 at MOP & NG. All the project proposals were agreed/approved in principle by the Steering Committee. The projects are planned to be completed by year 2002 when drilling activity is expected to commence for assessment of ground realities."

6.12 When the Committed wanted to know from DGH about the preparation of National Gas Hydrate programme and the time frame fixed for the development of gas hydrates particularly in the Western and Eastern off-shore Andaman areas, DGH submitted as under;-

"A road map for National Gas Hydrate Programme (NGHP) prepared by the Technical Committee was presented to the Steering Committee on 24.4.2001. The road map includes initially the resource base estimation of gas hydrates in Indian offshore followed by ground truthing, which include deep water drill ship for operation in 900-2500 m water depth. The drilling activity is planned to start by the year 2002. In the meantime, study and R&D work will continue about production methodologies, laboratory studies to understand thermodynamics/kinetics of gas hydrates. Ultimately, pilot studies for production of gas from gas hydrates are expected to start from year 2005."

6.13 About the availability of Gas is Andaman, DG, DGH informed the Committee during evidence as under:-

"In Andaman, we have established the largest reservoir of gas hydrate at the bottom of the sea. As a result of that, the Government has now formed a National Gas Hydrate Programme. DGH is the coordinator of the Technical Committee of the National Gas Hydrate Programme. Now Andaman can emerge as a very important source of gas. Right now our ship is working in Andaman because we have found bit interesting locations out of which we may like to drill, at least one or two, and rest produce that gas."

6.14 When asked about the quantity of gas likely to be found there, DG, DGH clarified the position as under:-

> "We cannot say at this stage. We know there is gas. We have only done seismic survey. This is a survey using sound waves. It only tells you if there is gas. If you kindly permit me, there is a map in the book at page 48. It will show you. We are showing a section. The last diagram shows that we have 160 metres of gas column there but this is based on sound waves only. This is all the new technique we are using now. This is a very specialised kind of processing. It is called 'GA Inversion Technique', which we have used using the help of an American expert. He helped us in these surveys through the special processing. That shows gas is present 160 metres thick. Now, this has to be test-produced. Unless you drill a well, I cannot commit the gas is there. Only surveys indicate very strong possibilities of gas there."

PART – II

Recommendations/ Conclusions of the Committee

The Committee note that hydrocarbons (oil and gas) are generated and usually accumulated in sedimentary rocks. There are rocks that have been deposited in large water bodies like lakes and seas, which form sedimentary basins. India is endowed with 26 basins alongwith deep water sedimentary areas. These sedimentary basins are, therefore, the target areas for exploration. These basins have been divided into four categories based on their degree of prospectivity 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.

2. The Committee regret to note that out of 26 sedimentary basins only seven basins falling under the first category have been extensively explored. Only one basin i.e. basin of Rajasthan has been upgraded to category I from category II. Kutch and Andaman areas have also shown the accumulation of hydrocarbons but no commercial production has started as yet. Out of the total sedimentary area of 3.14 million sq. kms. only 15% i.e. 0.498 million sq. kms. is moderate to well explored. In 27% of the area the exploration has been initiated and 17% of the total area is poorly explored and 40% totally unexplored as yet. In short, the Committee has taken note that almost 2/3 of the country's sedimentary area remains either poorly explored or unexplored. The Committee also observe that exploratory thrust has been lent only to a few selected basins where the maximum possibility of availability of oil had been found and very little effort has been put in to explore the new areas. The Committee regret to note that even after the strong recommendations of the Standing Committee on Petroleum and Chemicals made in their 4th Report (10th Lok Sabha) in 1994, the Government have not changed their exploration strategy for accelerated exploration of all the basins with a view to locate and develop new oil and gas reserves in a time bound programme. The Committee find that due to this approach, no major recovery of oil and gas has been done during the past several years. The Committee express their strong desire that the extensive exploration efforts should be spread over all the basins including unexplored/ less explored having favourable geological formations/ and pursued vigorously in continuation to the exploration in producing basins.

3. The Committee find that in the policy document Hydrocarbon Vision – 2025 it has been emphasized that the Government would finalise a programme for appraisal of the Indian sedimentary basins to the extent of 25% by 2005, 50% 2010, 75% by 2015 and 100% by 2025. During the course of evidence, Petroleum Secretary had assured the Committee to take all possible steps to advance this target. The Committee regret to note that even after a lapse of more than one year of the

preparation of the document, the Government have not been able to finalise the programme for appraisal of Indian sedimentary basins. The Committee therefore, direct the Government to prepare the final programme without any further delay so that the work relating to appraisal of the Indian sedimentary basins may proceed under a set time frame and as per the proposed target of 35% by the end of 10th Plan. The Committee also desire that the Government should sincerely explore the possibilities to advance the targets so that the survey work of entire area be completed within the shortest possible time.

4. The Ninth Plan targets for recoverable reserves accretion is between 243-343 million tonnes of oil and oil equivalent of gas MMTOE for ONGC and OIL but the target is not likely to be achieved. The Committee regret to note that the largest oil producing company ONGC has not been able to achieve the targets set for the accretion of reserves during 1997-98, 1998-99 and 1999-2000 continuously. Oil India Ltd. has achieved their targets of production. The Committee strongly recommend that ONGC should analyse the reasons for continuous failure in achieving the targets in such an important area and rectify the shortcomings so that they may be able to achieve the targets set by the Ministry and Planning Commission in future.

5. The Committee have analysed the trend of domestic production vis-à-vis consumption/demand of petroleum products over the last few years. It is significant to note that the indigenous crude production has become almost stagnant in the range of 27 to 35 MMT (average 31.6 MMT). The crude production was 34.09 MMT in 1989-90 and during 2000-01 it was 31.70 MMT only. On the other side, the consumption has almost doubled during the same period. It was 54.10 MMT during 1989-90 and it has reached the level of 100.08 MMT in 2000-01 and it is expected to be of the range of 104.80 MMT in the terminal year of 9th Plan. Due to this trend of production and consumption, the country's self-sufficiency level in petroleum sector has come down from a peak of 63% in 1989-90 to 31% in 2000-01. Since the growth rate of demand of petroleum products is rising at a fast Pace, our import dependence, which is 66.5% now, is likely to go up substantially. This situation is alarming and it needs to be seen from the perspective of energy, security of the country and requires sustained and concerted efforts. In the Committee's view this can be achieved through well-directed policy. The Committee welcome the initiatives taken by the Government in preparing a document known as Hydrocarbon Vision-2025 and desire that the objectives set for the exploration and production sector should be followed properly and the oil companies should take all possible initiatives to enhance the oil production either through new discoveries or through better recovery from the present oil fields. The Committee, therefore, recommend that the National Oil Companies should enhance their exploration efforts by formulating aggressive strategies, sustained institutional changes and mobilization of external technology appropriate for the current level risks and stage of maturity of the oil and gas fields. It is suggested initially that they should intensify their exploration efforts in selected acreages and focussed areas.

6. The Committee observe that seismic surveys play very important role in oil and gas exploration and exploitation. 2D seismic survey is conducted initially to understand the basic configuration. A detailed 2D and 3D survey is undertaken to identify and delineate prospect for drilling. 4D surveys help in reservoir management for oil recovery by means of evaluating the moving source or hydrocarbon fluids. The Committee find that during the last five years, ONGC, OIL , Private/Joint Ventures and even DGH have acquired a good quantity of seismic data through 2D and 3D seismic surveys. They are now shifting much of their attention towards 3D surveys to identify more resources. On the other side, no one has started the work on 4D surveys, which is more important for oil recovery from the existing fields. The Committee, therefore, recommend that National Oil Companies, particularly ONGC in Mumbai High Region should now quickly proceed for intensive 3D and 4D seismic surveys for a better success of their oil recovery schemes and for new finds. The Committee also desire that Oil India Limited should also identify the suitable fields which have already covered with 3D seismic to test this technology in view of their on-going schemes of oil recovery in depleting Assam oil fields. The Committee also recommend that they should procure the desired latest technology to upgrade their present system without any delay.

7. The Committee note that optimizing recovery from currently/future producing fields through technology support and Enhanced Oil Recovery (EOR)/Improved Oil Recovery (IOR) assumes great importance. Currently the National Oil Companies have already implemented EOR schemes particularly in Gujarat and fields of upper Assam but with no viable impact as yet. Major oil producing fields have also been identified for implementation of EOR/IOR schemes by both the NOCs. The work on redevelopment of Mumbai High has also started. The Committee are not satisfied with the pace of work and progress being made so far in this direction. The Committee, therefore, desire that the NOCs should undertake EOR/IOR schemes more aggressively in a time bound manner and with specific targets to obtain additional oil and gas in future.

8. The Committee observe that the EOR/IOR schemes being undertaken by NOCs have the only objective to extract maximum quantity of crude from their currently producing fields. For this purpose, the application of traditional/ordinary techniques or technology cannot provide the desired results. The Committee, therefore, suggest that for this purpose, the NOCs should obtain the latest available technology/techniques from the other oil producing countries otherwise the rate of failure and loss will be more in terms of exploration, production and finance also. The Committee would like to caution ONGC particularly, who are undertaking very expensive project of Mumbai High. Air/water Alternate Gas (WAG), water (with additive) injection is being tested for its effectiveness. But the other better supposed methods being used by other countries in similar conditions like surfactant, chemical flood or polymer in Mumbai High Region. No doubt, there is very high temperature inside the seabed, but under similar situations similar techniques have been proved beneficial in other countries of the world. The Committee desire that ONGC should obtain and test this type of technology and utilise those if found suitable, in their EOR/IOR schemes.

9 The Committee are happy to note that during the last several years, Directorate General of Hydrocarbons has completed a huge task by covering the entire offshore areas through Satellite Gravity Surveys. They have also covered the large part of Eastern offshore and Andaman offshore including deep water areas through Joint Venture speculative seismic and Gravity Magnetic surveys. These surveys have given valuable clues to structure, tectonics, sedimentary thickness and clay recognition in deep waters and have provided inputs for modelling studies and for the preparation of a hydrocarbon prospect of these areas. These efforts of DGH are more valuable in the sense that these have been done in the areas where the information is required to be upgraded and operating companies normally do not go for exploration in such areas on commercial considerations. DGH has prepared hydrocarbon prospect map for the east coast deep water basins and Andaman basin. They have also mapped the structural and stratigraphic prospects in Vindhyan and Ganga valley. The Committee, however, note that 94% of the survey projects undertaken by DGH belong offshore areas and they have done a little for onland surveys. In view of this fact, the Committee desire that the Government should utilise the services/expertise of DGH and assign them the work of extensive survey of onland areas also. For this purpose, the Government should provide/equip them with desired number of staff and technology and provide financial strength also so that they may be able to provide inputs for preparation of a hydrocarbon prospect map of all the basins in a fixed time frame on the pattern of map prepared for offshore and deep-water areas.

10. The Committee observe that several interesting leads have been obtained during the surveys carried out by DGH in Andaman offshore deep water areas but the confirmation has not been done as yet to firm up the location of drilling. For this purpose grid seismic surveys have also been completed by DGH. The Committee desire that DGH should process and interpret the data in the shortest possible time so that drilling work may start in that region at the earliest.

11. The Committee note that DGH is in the process of developing the National E&P Database and Archive. Feasibility Study has already been completed for E&P Database and consultants have submitted their reports. The Committee, therefore, desire that DGH should work out an implementation plan in the shortest possible time. Simultaneously, the Committee also observe the excellent work being done by them in the field of seismic survey expertise in preparation of basin dockets and data packages and desire that the Government should permit DGH to establish seismic data interpretation facilities and provide all required investments for both the purposes.

12. While going into the details of staff strength and expertise of scientists and geologists involved in survey, exploration and exploratory drilling activities of the National Oil Companies and DGH, the Committee observe that for this purpose as on 1.4.2000 ONGC has 3825 scientists, OIL has 150 geoscientists and DGH has 29 geoscientists, ONGC has informed that additional manpower shall be required

keeping in view the ONGC's perspective plan. The Committee recommend that the Government/ONGC should arrange/provide the required number of staff at proper time so that ONGC's perspective plan may not suffer in any way due to lack of manpower. The Committee also find the number of geoscientists working in DGH is inadequate in view of their expanded field of activity. The Committee, therefore, recommend that the Government should undertake a study to provide the required number of geoscientists to DGH so that they may be able to perform their assigned roles efficiently.

13. The Committee note that the petroleum industry is passing through a tough phase. On the one hand the production of crude has become stagnant and on the other side the consumption has gone up several folds. There is no major discovery after the discovery of Mumbai High in 1970's. The National Oil Companies and other agencies have to perform aggressively in the exploration and production sector. For this purpose, they require huge funds. Although, there has been some flow of funds through Joint Ventures or participation of private sector but the domestic companies have to arrange the funds from various other sources. The Committee also note that the huge funds collected through cess from petroleum industries are not being used for the development of petroleum industry, rather it is being used to maintain the fiscal balance of the Government. Out of the total collection of Rs. 38576 crores by way of cess collected under the provisions of Oil Industry Development Board, 1974 only an amount of Rs. 902.70 crores has been released to OIDB so far. The Committee (1995-96) had strongly recommended to amend the OIDB Act so that the funds collected through cess may be used for the development of petroleum sector only. The Ministry had agreed to their suggestion and draft Cabinet Note was also circulated to the concerned Ministries for comments. After consideration of the views of Ministry of Finance and the Ministry of Chemicals & Fertilisers, the Government have not found it feasible to amend the Act at this stage. The Committee do not find this approach of the Government as justified , since it endangers the energy security of the country. The Committee once again reiterate their earlier

recommendation that the Government should come out with the required amendment in OID Act without any further delay.

14. The Committee are surprised to note that the National Oil Companies have been spending just 1% of their planned expenditure on Research and Development for exploration and production activities. The Government viewed that a large number of technologies in the E&P sector are provided by the international services and there is no need of duplicating their technology through indigenous efforts without any meaningful return to the companies. Therefore, they have not found it appropriate to make more investment for R&D that too for limited meaningful return to National E&P companies. ONGC expect an expenditure of 3-4% in the 9th Plan whereas OIL expects only 1% during the same period. The Committee are not convinced by the views expressed by the Government. In the Committee's view the researches being done in other parts of the world may not be appropriately useful

under Indian conditions particularly in deep water and frontier areas. It cannot be advisable to depend totally upon the adopted results of researches by others. Ground level researches under Indian situations can produce better and economic results. The Committee, therefore, recommend that ONGC and OIL should strengthen their R&D centres by enhancing their expenditure on R&D and developing in-house capability to meet their technological requirements/challenges particularly in the field of improving productivity and recovery from the oil fields at the minimum cost and exploration in deep water and frontier areas.

15. The Committee note that the average recovery factor for Indian basins for oil is 28% and for gas is 63% of initial oil-in place reserve. This is low by international standard. ONGC and Oil India Limited have taken various initiatives to improve the average recovery factor of producing fields by applying technologies like thermal process, improved oil recovery IOR/EOR schemes. ONGC hope an improvement of 4%-5% after 4-5 years of implementation of all the schemes including the development of Mumbai High schemes. The Committee recommend that the Government should prepare a time bound programme to ensure an improvement in reservoir management and increase recovery rates for all major fields by at least 5% in a shortest possible time in consultation with both the National Oil Companies.

16. The Committee observe that ONGC has taken various initiatives to enhance the production and recovery efficiency in Mumbai High. It is understood that there were some objections from DGH side on technical grounds. Ultimately the issue has been settled and redevelopment plan has been finalised for implementation. The Committee would like to emphasise that ONGC should try to follow all the suggestions made by DGH particularly in regard to water and gas injection methodology, geology and geophysical study and applicability of recent enhance recovery techniques which were the main concerns in the process of reaching at consensus between ONGC and DGH in implementation of Mumbai High fields redevelopment plans.

17. The Committee note that DGH has completed the survey work along the entire east and west coast of India including deep waters and Andaman offshore areas. These surveys have given valuable clues to structure, tectonics, sedimentary thickness and play recognition in the deep waters. Through these surveys, an area of 1.35 million sq. Km. has been recognised measuring a water depth between 400 and 3000 metres. DGH should complete the extensive survey work particularly in Andaman region to detect new prospects so that the drilling work may start soon. The Committee also observe that ONGC has the capability of drilling in upto 900 metres water depth only. ONGC has put in little effort during the last several years to enhance this capability, moreover, they have informed in case of any need in future they propose to hire deep water rig from international market. The Committee do not support this approach of ONGC and desire that being the prime National Oil Company, they should either obtain more higher deep water drilling capability independently or develop in-house capabilities with the deep water drilling group with a view to compete with the international majors and demand of time.

18. The Committee regret to observe that the heavy oil was discovered by Oil India Limited in Rajasthan in 1991 but no commercial production has started as yet. The main factor responsible for this situation has been explained as the non-availability of technology with OIL for production of this oil. The Committee desire that OIL should take all possible initiatives including pursuing the technology negotiations with Venezuelan Company or with other companies with such technology to start the production from this field in the shortest possible time.

19. The Committee also observe that ONGC has established an oil reserve of 2.69 MMT in Nagaland but the exploration and production activities are under suspension since April/May 1994 due to environmental reasons and also under the directive of Govt. of Nagaland. The Committee desire that the Central Government should continue the efforts so that the disputes are resolved and the operations start without any further delay.

20. The Committee welcome the initiatives taken by the Government to encourage the oil sector PSUs to obtain available opportunities abroad for acquiring exploration acreages either on their own or through strategic alliances/Joint Ventures with a view to supplement adequate, stable, assured and cost effective hydrocarbon energy to the country. ONGC Videsh Limited had grabbed some opportunities by participating in overseas E&P acreages for obtaining equity oil and gas which include projects in Vietnam, Russia, Iraq, Algeria, Tunisia, Egypt and Yemen and they are in progress in some other projects in North African countries as partners. They have acquired 20% interest in Sakhalin-I Project in Russia, which is scheduled to begin production from 2005. Oil India Limited has participating interest in exploration block in Oman. The Committee desire that the Government should provide all facilities to the companies participating in such projects. In this regard, the Government should put in place a comprehensive policy to include total deregulation of overseas E&P business and empowering the companies to compete with international oil companies with provision of fiscal and tax benefits. Moreover, the Government should also ensure that such participation is justified, transparent and comparatively beneficial than the domestic investments.

21. The Committee feel that there is a huge involvement of funds in E&P projects abroad. No doubt, few oil companies have sound financial health but if they proceed to participate in quality E&P projects abroad they must go as a strong 'Buyer Power'. The Committee, therefore, desire that the Government should evolve a mechanism to leverage India's 'Buyer Power' to obtain good projects abroad as also declared in the document Hydrocarbon Vision-2025. In Committee's view, without such mechanism our companies will not be able to participate in quality exploration and production Projects.

22. The Committee observe that there is a continuous increase in natural gas production. However, the Committee find that there is a large unsatisfied demand of natural gas in the country. As per the available data, against the demand of 110

MMSCMD in 1999-2000, the domestic supply was 64 MMSCMD. The Committee find that there are shortfalls in the availability of natural gas *vis-à-vis* the commitments already made in the different regions of the country. In addition, the demand for natural gas in core sectors like power generation and fertiliser production has been on increase. There is a continuously growing demand of CNG in metro cities. This demand is likely to grow by 7% per annum or even more. There is no significant increase in gas production during the last five years and no new discovery gives any hope of good increase in gas production. The Committee, therefore, desire that the national oil companies should continue their efforts to enhance the gas production. Simultaneously, the Government should take policy decision and act promptly on the issues of large-scale import of gas. Similarly, the Government should also take all initiatives to finalise the proposals regarding Iran-India pipeline and continue the efforts to import the gas from Bangladesh to fulfil the unsatisfied demand of natural gas.

23. The Committee are happy to note that percentage of gas flaring in ONGC, OIL and Private/Joint Venture operated fields has significantly come down during the last ten years. Particularly in the case of ONGC and Pvt/JV sector fields, it has come near the international level. The Committee also observe that some technical flaring is essential for operational safety. However, the Committee note that a good quantity of gas is still being flared from the isolated structures in the oil fields of Assam and Arunachal Pradesh due to adverse techno-economics of gas transportation and through such flaring there is substantial financial loss. The Committee also notice that the onshore flaring in the fields of ONGC and OIL is still at the higher range of 10% of the total gas production. The Committee, therefore, desire that ONGC and OIL should take all possible steps to reduce the gas flaring on onshore area and bring it to the level of international standard of 5%. The Committee also observe the slow pace of gas flaring reduction on schemes of ONGC and OIL and desire that they must compete these schemes within a fixed time frame.

24. The Committee observe a peculiar situation of gas flaring in ONGC and OIL operated fields where a huge quantity of gas from isolated/marginal fields is being flared due to fluctuation in consumer intake or lack of consumers. The Committee welcome the step taken by the Ministry empowering these oil companies for direct marketing of gas upto 1.0 LCMD from each of such fields. The Committee note that OIL is still flaring total quantity of gas produced in Arunachal Pradesh and in good quantity in upper Assam fields. The Committee, therefore, desire that OIL must take all possible initiatives to find the consumers for such gas so that this is gainfully utilised and not left for flaring. The Committee hope that OIL will come up with some solution in three month's time.

25. The Committee observe that during the last three years the refining capacity has gone up significantly. The total refining capacity in the country (including private sector) was 62.24 MMT on 1.4.1998. It went up by 11% to 69.14 MMT as on 1.4.1999. By 1.4.2001, the total refining capacity sharply went up by 6.2% to 112.04 MMT. It has again gone up slightly to 112.54 MMT as on 1.4.2001. On the other side

the consumption of petroleum products has went up from the level of 90.562 MMT in 1998-99 to 97.086 MMT in 1999-2000 and to 100.075 MMT during the year 2000-01. Therefore, the present refining capacity is more than enough to fulfill the demand of petroleum products. Consequently, the requirement of crude oil for processing has also gone up significantly from 39.808 MMT in 1998-99 to 74.097 MMT in 2000-01, an increase of 86%. Due to this reason the import Bill of crude oil showed an increase of 342% and it went from Rs. 14,917 crores in 1998-99 to Rs. 65,932 crores in 2000-01. The Committee find this situation of dependence on import as very alarming one and this has adversely affected country's finances. The Committee, therefore, desire that the Government should take measures to contain the import Bill and manage the oil pool deficit so that they may not be able to show the adverse impacts on the economy of the country and financial health of the public sector oil companies particularly in the post APM period.

26. The Committee observe that the consumption of oil and gas has increased significantly during the last few years and the present refining capacity available in the country is adequate to fulfil the present demand. However, in coming years, total PSU refining capacity addition by expansion of existing refineries is expected to be 27.9 MMTPA during the Tenth Plan period. Government have already approved an addition of 24 MMTPA refining capacity in Joint Venture in the country by setting up 3 grassroot refineries i.e. Bharat Oman Refinery, Punjab Refinery and Paradip refinery which are expected to materialise during the Tenth Plan. The Committee observe that several expansion projects which were to be completed during the Ninth Plan could not see the light of the day due to long decision making process of the Government and pending environmental issues. The Committee, therefore, desire that the Government should ensure an early completion of all the pending new refinery projects and expansion projects of existing refineries. They should be more cautious about the Joint Venture refineries.

27. The Committee observe that in the Ninth Plan document the Government have decided several thrust areas for exploration and production. This included the expeditious implementation of New Exploration Licencing Policy. The Committee are happy to note that the Government have got success in bringing two rounds of NELP during this period and expect the third one by the end of this plan. During first two rounds of NELP, 47 contracts have been signed. The Committee appreciate the excellent efforts done by Directorate General of Hydrocarbons in the field of exploration particularly the survey work. Their superior quality of data and availability of entire information in data packages, CD-ROMs and also on international website has attracted the National as well as International Companies to participate in E&P activities in new prospects of Indian basins. The Committee desire that such efforts should also continue in future since a good quality of data for deep waters is also available with them. The Committee also desire that the Government should not devote more time in administrative formalities for approval of the data and proposals received from DGH for various prospects.

28. In the Ninth Five Year an emphasis was laid to change the exploration strategy. In order to boost domestic production of crude more attention was desired on extensive exploration in all the basins and also in deep waters and frontier areas, improvement in reservoir management and use of 3D technology for seismic survey. The Committee regret to note that there is a little progress in spreading the exploration activities in all the basins from the side of National Oil Companies. DGH has done very good job in exploration in deep water in Andaman area and in some frontier areas. Area for 3D surveys have been increased but not to the desired extent. Similarly, no significant achievement has been made in case of reservoir management also. The Committee, therefore, desire that the Government should not ignore the priorities fixed to be achieved during a particular Five Year Plan rather those should be reflected in the policies of the Government and followed under the prescribed time frame. In view of present failure, the Government should analyse the reasons for such performance in each field and prepare a time bound programme to be completed during the next Five Year Plan to prevent such failures in future.

29. The Committee observe that to further supplement the exploration efforts of National Oil Companies the entire upstream petroleum sector has been opened up to the private sector or investment through Joint Venture/strategic alliances. The New Exploration Licencing Policy offers competitive terms and a level playing field for both NOCs and Pvt./JV oil companies. 47 contracts have already been signed under two rounds of NELP. The Committee observe a remarkable achievement in inviting attention and participation of companies in bidding rounds for exploration and production of oil and gas. This all became possible mainly due to recently undertaken geo-scientific work by DGH in less explored and virgin areas of the county to upgrade the information authenticity of data and attractive fiscal terms. As per the available information DGH has carried out several more exploratory blocks to be offered in subsequent exploration bidding rounds. The Committee, therefore, recommend that the expertise of DGH should be utilised to find more and more blocks of interest through similar surveys particularly in deep water, frontier areas and unexplored/poorly explored onland areas.

30. The Committee note that under two rounds of NELP, a total of 47 contracts have been signed and about 16% to 17% of unexplored/poorly explored area has been covered. While analysing the participation of private sector, the Committee find that only ten foreign companies participated in NELP-I and six in NELP-II. The Committee do not find this response as satisfactory one. The Committee, therefore, recommend that the Government should analyse the reasons for such poor response of foreign companies despite taking several specific measures like declaration of best contract and financial terms, organizing road shows etc. The Committee also desire that the shortcomings, if any, may be rectified before the announcement of NELP-III round so that technologically superior foreign companies may come forward particularly for bids relating to deep water blocks.

31. The Committee observe that Private/Joint Venture participation has been on a phenomenal rise in oil and gas production during the last five years and now accounts

for about 13% of domestic production. This trend is likely to improve further. DGH currently monitors all Petroleum Exploration Licences which national and private oil companies are operating. After close of NELP-II, more than 100 exploration blocks and discovered fields are being monitored by DGH. DGH is also monitoring the execution and management of all the production sharing contracts on behalf of Government of India. DGH is continuously monitoring the performance of petroleum reservoirs including Mumbai High and also advises on any mid course correction required to ensure that optimal and sound reservoir management practices are followed. The Committee observe that the work of DGH has become of great importance. The Committee find that DGH has not been given full organisational strength to fulfil its responsibilities and functions. The Committee, therefore, recommend that DGH is organisationally strengthened and paucity of funds is not allowed to come in their way so that the Directorate may be able to perform their work efficiently. The Committee also desire that the National Oil Companies should work in tandem with the advices of DGH particularly in respect of reservoir management schemes.

32. The Committee note that DGH is the depository of all the national E&P data, they need automatic data flow system from the National Oil Companies and other companies for better monitoring of the projects. The Committee, therefore, desire that as required, all concerned organisations including national oil companies may be impressed upon to submit their data and information to DGH timely and properly so that they may be able to cater the needs of E&P activities with regard to planning its own survey work programmes, identification of blocks and advising the Ministry on offering acreages, preparation of data packages and other

information and statistics on E&P activities in order to develop the National E&P Data Archive.

33. The Committee appreciate the objectives set in Hydrocarbon Vision-2025 which lays down the framework which would guide the policies relating to hydrocarbons sector for the next 25 years. The main objectives of the exploration policy as declared in this document include the total appraisal of Indian sedimentary basins, optimise crude oil and natural gas in most efficient manner to have Reserve Replacement Ratio of more than 1, be at the technological forefront in the global exploration and production industry and to achieve a near zero impact on environment. The Committee, therefore, desire that for achieving these objectives, the Government should finalise a time bound programme for every medium term and long term action declared in the document specifically for appraisal of Indian sedimentary basins by 2025, exploration in deep water and frontier areas, improvement in archival practices for data management and acquiring acreage abroad for exploration as well as production.

34. The Committee observe that R&D has played a key role in the development of petroleum industry. This is more so in the upstream sector where the discovery rate

and production technology have shown a marked improvement with each innovation. But all these are mainly through adopted technology. National Oil Companies are investing 1% of their expenditure on R&D. The R&D efforts in petroleum sector are highly capital-intensive. The main thrust of R&D in upstream sector would be directed towards improving the quality of prospect, enhancement of recovery from existing fields, technological aspects of marginal field development, deep water technology and cost control in petroleum operations. R&D attention is also required for finding and developing unconventional resources like Coal Bed Methane and Gas Hydrates. The Committee, therefore, desire that the Government should ensure that R&D agenda is decided with a market drive approach and demand articulation. The Committee recommend that as desired in the Hydrocarbon Vision-2025, the Government should take all possible steps to ensure adequacy of finances for R&D.

35. The Committee observe that one of the medium term proposed actions in Hydrocarbon Vision-2025, include to improve archival practices for data management, on this front a lot has to be done. At present the data is being collected by DGH but they don't have even seismic data analysis facility with them. In this age of computers, data management plays a very important role. The Committee, therefore, recommend that the Government should develop archival practices for data management independently or with DGH within a shortest possible time.

36. The Committee note that the country is endowed with rich deposits of coal and lignite and these coal and lignite seams contain varying amounts of methane of popularly known as Coal Bed Methane. State-wise estimated resource base of CBM for Gujarat, Jharkhand, Madhya Pradesh, Rajasthan and West Bengal are 137, 107, 104, 9 and 101 billion cubic metres respectively. DGH has planed to initiate study to assess CBM resources in Maharashtra, Tamil Nadu and Chhattisgarh also. CBM policy was declared in 1997 but after a long time, recently the Government of India has offered 7 blocks for exploration and production of CBM. Bids have been obtained and are in the process of evaluation. The Committee welcome this step and desire that the Government should expedite the process of identifying more CBM blocks so that the extensive exploration and production of CBM may start from all the States possessing such gas. Simultaneously, the study to assess more CBM resources should also be taken aggressively. The Committee also desire that the Government should negotiate with the State Governments to resolve the issue of production level payments amicably within a time of three months.

37. The Committee observe that gas hydrates is treated as an important source of Hydrocarbon energy in future. The Ministry of Petroleum and Natural Gas initiated a national Gas Hydrate Programme in the year 1997. In the same direction, a technical committee has been constituted for exploiting the potential of gas hydrates available in India's Exclusive Economic Zone. A road map for Natural Gas Hydrate Programme as prepared by the Technical Committee was submitted to the Steering Committee in April, 2001. As per the future programme drilling activity is planned to start by the year 2002 and pilot studies for production of gas from gas hydrates are

expected to start from the year 2005. DGH has established the largest reservoir of gas hydrate at the bottom of the sea in Andaman and test production is being done by them. The Committee desire that now the Government should come out with National Gas Hydrate Programme and work aggressively on this project under presently decided time frame. The Committee also desire that the Government should give every type of financial support to DGH and other agencies involved in this programme since this is at R&D stage and require huge capital investment.

MULAYAM SINGH YADAV

NEW DELHI
Chairman
December 20, 2001 ***Standing Committee on***
Agrahayana 29, 1923 (Saka) ***Petroleum &***
Chemicals

APPENDIX –I

GLOSSARY OF COMMONLY USED TERMS IN EXPLORATION & PRODUDTION SECTOR

Anomalies : In geophysical parlance these are measurable variations or changes in the physical properties of subsurface rocks. In gravity surveys, changes in rock density are determined while in magnetic surveys changes in the magnetic character of the rock are determined. These observed changes can, after correction for non-geologic effects, be presented as two-dimensional maps of "anomalies" over the earth's surface and then interpreted in terms of three-dimensional subsurface variations of rock properties. These in turn must relate to what is termed as the "geology" of the subsurface.

Associated gas : The gas that occurs with oil, either overlying it as free gas or in solution.

Barrel ` A common unit of measurement of liquids in the petroleum industry. It equals 42 US standard gallons or 35 imperial gallons.

Basin : A depression in the earth's crust where sedimentary materials have accumulated.

Blow-out : A condition resulting from high pressure fluids blowing all the drilling mud out of the hole and flowing out of control.

Cable-tool drilling : In this now-obsolete system the rock was penetrated by hammering or percussion of a bit on bottom. The bit was suspended on a wire-line and the necessary motion imparted by a beam pivoted at the centre, the walking beam.

Circulation : The journey cycle of the mud from surface tanks through the kelly and drill-pipe and bit to the subsurface and then back again to the surface through the annular space between the drill-pipe and wall of the drilled hole.

Condensate : Liquid hydrocarbons separated from natural gas, usually by cooling.

Development Well : A well drilled in an already discovered oil or gas field.

Dip : The angle which a rock-layer (stratum) makes with a horizontal plane.

Dipping : The procedure employed to measure the depth of oil, with a graduated stick or rod, in an oilfield or refinery tank.

Drilling mud : A carefully concocted mixture of clays and other minerals, usually in water, pumped down the drill-pipe to lubricate and cool the bit, flush out cuttings, provide a wall to the open-hole and balance formation pressures.

Drill-pipe : The steel pipe used for carrying and rotating the drilling tools and for permitting the circulation of the drilling mud.

Enhanced Oil Recovery (EOR) : A means of recovering a tertiary or third "crop" of oil after primary and secondary methods have been used. These latter methods still leave about 70% of the original oil-in place in the reservoirs. EOR processes such as miscible and thermal flooding are designed to help recover as much as possible of this left-over oil. These processes are desirably implemented even during the primary and secondary stages of oil recovery.

Erosion : The aggregate of all processes by which rock material is dissolved, loosened and removed from any part of the earth's surface.

Exploration : In the oil business, all the processes leading to the discovery of previously undiscovered accumulations of oil or gas.

Fault : A fracture within the earth's crust along which rocks have been displaced.

Field : A geographic area containing one or more hydrocarbon reservoirs all related to the same geological structure.

Flaring ; The burning of gas vented through a pipe.

Gas-Oil Ratio (GOR) : The quantity of gas produced with the oil, usually expressed as cubic feet per barrel or as volumes of gas per volume of oil.

Geology : The study of the earth, the rocks of which it is composed and the changes that it has undergone.

Geophysics : The study of variations in physical properties of the earth such as the pull of gravity, intensity of the magnetic field, susceptibility of rocks to electrical currents and the speed of acoustic waves within the crust.

Geothermal Gradient : A measure of the rise of rock temperature with depth below the surface.

Hydrocarbons : Organic chemical compounds made up predominantly of carbon and hydrogen, but sometimes with sulphur, oxygen or nitrogen, typically forming chain-like molecules. Those with upto 4 carbon atoms are gaseous; those with 20 or more are solid; and those in between are liquid.

Igneous Rock	:	Rock crystallized or solidified from molten material at the surface or within the crust.
Infill	:	Well drilled between established producing wells to increase production.
Maturity	:	The condition reached by a source bed through prolonged existence at high temperature whereby organic matter is converted into petroleum.
Metamorphic rock	:	Rock altered from pre-existing rocks by heat, pressure or chemical reactions within the earth's crust.
Methane	:	Chief constituent of natural gas; a light, odourless, flammable gas, CH4. Also produced by partial decay of plants in swamps.
Migration of Oil	:	The journeys which oil (or gas) makes from the source to the reservoir rock in response to the action of multiple forces. The exact mechanisms and pathways are still uncertain.
Natural Gas	:	Gas issuing from the earth under pressure and often produced in association with crude oil, when it acts as an important factor in the recovery of the latter. Referred to as casing-head gas if it is from an oil-well.
Oil-Shale	:	An immature, highly organic, fine-grained sedimentary rock from which hydrocarbons can be artificially liberated.
Perforation	:	A method of making holes through the casing opposite the producing formation to allow the oil or gas to flow into the well and eventually to the surface.
Petroleum	:	Naturally occurring mixtures of organic chemical compounds, including oil and natural gas.
Photogeology	:	The interpretation of the surface geology of an area from aerial photographs.
Primary Recovery	:	Oil recovered from the subsurface through the recovery action of natural energies and forces operating in the reservoir rock. When these energies weaken, the pressures are maintained by injecting gas or water or both near the oil reservoir.
Reflection	:	A sophisticated electronic system that seismograph detects and records the intensity and character waves generated at the surface and reflected back from rock interfaces within the earth's crust.

Reserves : A somewhat hazy concept but generally accepted as the quantity of oil and gas yet unproduced but commercially recoverable with present-day techniques. Sub-classifications recommended by a study group of the Eleventh World Petroleum Conference include Proved Reserves (subdivided into Proved Developed and Proved undeveloped) and unproved reserves (subdivided into Probable and Possible)

Reservoir Rock : A rock unit, usually sedimentary, which is sufficient extensive, porous and permeable to contain and to yield significant volumes of petroleum.

Sandstone : A sedimentary rock composed predominantly of more-or-less compacted or cemented sand-grains.

Saturation : The saturation rock composed predominantly of more-or-less compacted or cemented sand-grains.

Secondary Recovery : Any of several procedures used to revitalize depleted oilfields through injecting water, gas etc. into the reservoir to flush out oil remaining in the pore space.

Sedimentary Rock : Rock made up of mineral grains or rock fragments usually deposited from some transporting medium such as running water, ice or wind.

Seepage : Oil or gas trickle flow from an underground accumulation, now observable at the surface; this leakage may have been going on for centuries and could be attributed to prolonged erosion, fault-lines or lack of permeability barriers, Near-surface paraffination could create a cap-rock effect thus converting the seepage into a potential accumulation.

Separator : A pressure vessel used to separate well fluids into gases and liquids.

Silt : Rock fragments finer than sand, but still gritty and not so fine as clay.

Structure : Manner of rock disposition in space; any deformation bending, warping, dislocation of rocks which in oil exploration could provide a habitat for oil.

Torsion Balance : In gravity surveys, an instrument that measures the distortion or warping of the gravitational field rather than the intensity of the field. Now outdated.

Ultimate Recovery : The sum of reserves and cumulative production of oil and gas.

Unconformity : A surface or interface between rock layers of different ages representing a gap in the rock record because of an interval of erosion or non-deposition.

Weathering : The physical disintegration and chemical decomposition of rocks due to natural causes through the passage of time.

Wire Line : Any of several sophisticated electronic device tools lowered into a well-bore on a cable to record the physical properties of the rocks penetrated (e.g. electrical logs).

Workover : A term applied to any operation performed on a well subsequent to completing it e.g. cleaning casing, reperforation, plugging back etc.

At the outset, Hon'ble Convenor welcomed the Members of the Sub-Committee and the representatives of Indian Oil Corporation Limited. The Sub-Committee took oral evidence of representatives of IOC in connection with examination of 'Production of Oil and Gas'.

2. The main issues which formed the basis of discussions included the aims and objectives behind entry of IOC in the field of exploration and production of oil and gas, their participation in bidding process under New Exploration Licencing Policy, their future plans, alliance with domestic and overseas companies in the activities relating to Exploration and Production, exploration activities in the North-Eastern region and in the State of Rajasthan. The other issues which came up for discussion included the new marketing plans by IOC, future plan for addition in refining capacity and their role in oil conservation. The Committee expressed their hope that IOC would achieve the heights in the field of exploration and production also as they have achieved in refinery and marketing sector.

3. The verbatim record of the proceedings of the sitting has been kept.

The Sub-Committee then adjourned.

APPENDIX – II

MINUTES

SUB-COMMITTEE ON PETROLEUM

A SUB-COMMITTEE OF STANDING COMMITTEE ON PETROLEUM & CHEMICALS (2001)

FIRST SITTING

22.02.2001

The Sub-Committee sat from 1500 hrs. to 1645 hrs.

PRESENT

Dr. Girija Vyas - Convenor

MEMBERS

LOK SABHA

2. Shri Ashok Argal
3. Smt. Sheela Gautam
4. Shri B.K. Handique
5. Smt. Kanti Singh
6. Shri Prabhunath Singh
7. Shri Ratilal Kalidas Varma

SECRETARIAT

1. Shri Ram Autar Ram - Joint Secretary
2. Shri J.N. Oberoi - Under Secretary

Representatives of Oil India Limited (OIL)

1. Shri B.B. Sharma - Chairman and Managing Director
2. Shri N.C. Baishya - Director (Operation)
3. Shri S.K. Patra - Director (Expl. and Dev.)
4. Shri M.R. Pasrija - Director (Finance)

At the outset, Hon'ble Convenor welcomed the Members of the Sub-Committee and representatives of OIL. The Sub-committee took oral evidence of the representatives of Oil India Limited (OIL) in connection with examination of 'Production of Oil & Gas'.

2. In the beginning, OIL made an audio-video presentation to describe the activities of Oil India Limited relating to exploration, development and production of oil and gas. The main issues which formed the focal point of the discussion included the role being played by Oil India Limited in exploration and production of oil and gas in Assam, Arunachal Pradesh and Rajasthan, seismic survey and drilling operations in North Bank of Brahmputra and success ratio of oil wells. This also included the high rate of flaring of gas particularly in Arunachal Pradesh, steps being taken to reduce the flaring and search of consumers for the gas being flared there.

3. The Committee observed that there was a stagnation in production of oil and gas by OIL and felt an urgent need of extensive survey work and an improvement in exploration process with a view to increase the production of oil and gas to fulfil the continuously growing demand of these products. They also felt that OIL should take more initiatives to reduce the gas flaring which was resulting in monetary loss of Rs. one lakh per day besides wasting of the important natural resource of the country. The Committee wanted OIL to search for the consumers who could utilise this gas being produced from the wells in Arunachal Pradesh.

4. The verbatim record of the proceedings of the sitting has been kept.

The Sub-Committee then adjourned.

Appendix-III
MINUTES

SUB-COMMITTEE ON PETROLEUM

(A SUB-COMMITTEE OF THE STANDING COMMITTEE ON PETROLEUM & CHEMICALS)

(2001)

SECOND SITTING
01.03.2001

The Sub-Committee sat from 1500 hrs.to 1630 hrs.

Present

Dr. Girija Vyas - Convenor

Members

Lok Sabha

1. Shri Ashok Argal
2. Shri Pawan Singh Ghatowar
3. Shri B.K. Handique

Secretariat

1.	Shri Ram Autar Ram	-	Joint Secretary
2.	Shri Brahm Dutt	-	Deputy Secretary
3.	Shri J.N. Oberoi	-	Under Secretary

Representatives of Indian Oil Corporation Limited

1.	Shri M.A. Pathan	-	Chairman
2.	Shri A.K. Arora	-	Director (Refineries)
3.	Shri O.N. Marwaha	-	Director (Marketing)
4.	Shri S.N. Jha	-	Director (Pipelines)
5.	Shri Subir Raha	-	Director (HK)
6.	Dr. A.K. Bhatnagar	-	Director (R&D0
7.	Shri M.S. Ramachandran	-	Director (Planning & Business Development)
8.	Shri A.H. Aggarwal	-	ED (Finance)
9.	Shri S. Bose	-	GM (Exploration)

At the outset, Hon'ble Convenor welcomed the Members of the Sub-Committee and the representatives of Indian Oil Corporation Limited. The Sub-Committee took oral evidence of representatives of IOC in connection with examination of 'Production of Oil and Gas'.

2. The main issues which formed the basis of discussions included the aims and objectives behind entry of IOC in the field of exploration and production of oil and gas, their participation in bidding process under New Exploration Licencing Policy, their future plans, alliance with domestic and overseas companies in the activities relating to Exploration and Production, exploration activities in the North-Eastern region and in the State of Rajasthan. The other issues which came up for discussion included the new marketing plans by IOC, future plan for addition in refining capacity and their role in oil conservation. The Committee expressed their hope that IOC would achieve the heights in the field of exploration and production also as they have achieved in refinery and marketing sector.

3. The verbatim record of the proceedings of the sitting has been kept.

The Sub-Committee then adjourned.

APPENDIX – IV

MINUTES

SUB-COMMITTEE ON PETROLEUM
SUB-COMMITTEE OF STANDING COMMITTEE ON PETROLEUM & CHEMICALS
(2001)

FOURTH SITTING
(11.5.2001)

The Committee sat from 1100 hrs. to 1200 hrs.

PRESENT

Dr. Girija Vyas - Convenor

MEMBERS
LOK SABHA

2. Shri Ashok Argal
3. Smt. Sheela Gautam
4. Shri Mohan Rawale
5. Shri Shyama Charan Shukla
6. Shri Tarlochan SinghTur
7. Shri Shankersinh Vaghela

SECRETARIAT

1.	Shri Ram Autar Ram	-	Joint Secretary
2.	Shri Brahm Dutt	-	Deputy Secretary
3.	Shri J.N. Oberoi	-	Under Secretary

REPRESENTATIVES OF OIL & NATURAL GAS COMMISSION

1.	Shri Naresh Narad	-	CMD
2.	Shri Jauhari Lal	-	Director (P)
3.	Shri I.N. Chatterjee	-	Director (F)
4.	Shri Y.B. Sinha	-	Director (E)
5.	Shri V.K. Sharma	-	Director (O)

At the outset, Hon'ble Convenor of the Sub-Committee on Petroleum welcomed the Members of the Sub-Committee and the representatives of ONGC to the sitting.

2. The Committee took oral evidence of the representatives of ONGC in connection with the examination of the subject Production of Oil and Gas'. The major issues which came up for discussion included depletion in production of oil and gas, steps taken to enhance production, hydrocarbon exploration activities undertaken by ONGC, seismic surveys, processing and interpretation methods, procedure of setting targets set in MOUs vis-a-vis actual performance, targets reviewing by Planning Commission, R&D activities, expenditure incurred on these activities, action plan for increasing recovery factor from the existing fields, performance of ONGC vis-à-vis private companies handing over of proven fields to private companies for production, foreign exchange earnings and outgo, progress with regard to production of Coal Bed Methane (CBM) gas etc. etc.

3. A verbatim record of the proceedings has been kept.

The Committee then adjourned.

APPENDIX – V

MINUTES

SUB-COMMITTEE ON PETROLEUM
SUB-COMMITTEE OF STANDING COMMITTEE ON PETROLEUM & CHEMICALS
(2001)

FIFTH SITTING
(11.5.2001)

The Committee sat from 1215 hrs. to 1315 hrs.

PRESENT

Dr. Girija Vyas - Convenor

MEMBERS
LOK SABHA

2. Shri Ashok Argal
3. Smt. Sheela Gautam
4. Shri Mohan Rawale
5. Shri Shayama Charan Shukla
6. Shri Tarlochan Singh Tur
7. Shri Shankersinh Vaghela

RAJYA SABHA

8. Prof. Ram Gopal Yadav

SECRETARIAT

1.	Shri Ram Autar Ram	-	Joint Secretary
2.	Shri Brahm Dutt	-	Deputy Secretary
3.	Shri J.N. Oberoi	-	Under Secretary

REPRESENTATIVES OF DIRECTORATE GENERAL OF HYDROCARBONS (DGH)

1.	Dr. Avinash Chandra	-	Director General
2.	Shri G.C. Saxena	-	GM
3.	Shri R.C. Khurana	-	DGM
4.	Shri S.K. Das	-	DGM

At the outset, Hon'ble Convenor of the Sub-Committee on Petroleum welcomed the Members of the Sub-Committee and representatives of Directorate General of Hydrocarbons (DGH).

2. The Committee took oral evidence of the representatives of DGH and the main issues which came up for discussion included the role of the Directorate in surveying oil and gas fields, opening of new/ unexpected areas for production, reviewing of exploration and exploitation activities of operating companies, R&D activities undertaken by the Directorate availability and adequacy of funds for these activities, present manpower strength of the Directorate, need to increase manpower, adoption of modern technology for discovery and assessment of deposits of hydrocarbons, time taken by the Government in implementation of proposals submitted by DGH, availability of oil/ gas in Andaman and Nicobar islands .

A verbatim record of the proceedings has been kept.

The Sub-Committee then adjourned.

APPENDIX – VI

MINUTES

SUB-COMMITTEE ON PETROLEUM

A SUB-COMMITTEE OF THE
STANDING COMMITTEE ON PETROLEUM & CHEMICALS (2001)

SEVENTH SITTING
(01.08.2001)

The Sub-Committee sat from 1500 hrs. to 1600 hrs.

Dr. Girija Vyas - Convenor

Members

Lok Sabha

2 Shri Pawan Singh Ghatowar
3 Shri B.K.Handique
4 Shri Shyama Charan Shukla
5 Shri Prabhunath Singh

Secretariat

1.	Shri Brahm Dutt	-	*Deputy Secretary*
2.	Shri J.N. Oberoi	-	*Under Secretary*

Representatives of Ministry of Petroleum & Natural Gas

1.	Shri V.N. Kaul	-	*Secretary*
2.	Shri Naresh Narad	-	*Additional Secretary*
3.	Shri Ravi Saxena	-	Joint Secretary & FA
4.	Shri C. Vijayaraghavan	-	*Joint Secretary*
5.	Shri J.M. Mauskar	-	*Joint Secretary*
6.	Shri B. Bharali	-	*Adviser (Exploration)*

At the outset, Hon'ble Convenor welcomed the Members of Sub-Committee on Petroleum and the representatives of the Ministry of Petroleum and Natural Gas.

2. The Committee took oral evidence of the representatives of the Ministry of Petroleum & Natural Gas in connection with the examination of the subject 'production of oil and gas'. The major issues which came up for discussion included the demand and indigenous production scenario, initiatives being taken to enhance the oil and gas production, the performance of private sector in the field of oil production, factors responsible for continuous increase in import bill and steps taken to contain it, seismic surveys and targets for exploration in all the basins, commercial soundness of investment made by ONGC Videsh Limited in Sakhlain-I Project in Russia, foreign investment in oil sector under NELP-I and NELP-II and considerations in awarding the contracts of Assam Oil Fields. Other topics which were discussed in detail included production of oil and gas in Nagaland Oil Fields, reasons for decline in production of oil and gas in North-East, oil recovery from Mumbai High and steps taken for enhancement in production of oil and gas from this region, exploration and production in Brahmaputra Valley, exploration of alternate resources of hydrocarbons, etc. etc. The Ministry was asked to submit detailed notes particularly on the following points:-

(i) Factors responsible for continuous increase in import bill;
(ii) Justification for overseas investment of ONGC in Russian Oil Fields;
(iii) Process followed in awarding the contracts in Assam Oil Fields; and
(iv) Declining trend of oil and gas production in North-East.

3. The verbatim record of the proceedings has been kept.

The Sub-Committee then adjourned.

APPENDIX – VII

MINUTES

SUB-COMMITTEE ON PETROLEUM

A SUB-COMMITTEE OF THE
STANDING COMMITTEE ON PETROLEUM & CHEMICALS (2001)

EIGHTH SITTING
(21.08.2001)

The Sub-Committee sat from 1500 hrs. to 1630 hrs.

Dr. Girija Vyas - Convenor

Members

Lok Sabha

2 Shri Pawan Singh Ghatowar
3 Shri B.K.Handique
4 Shri Shyama Charan Shukla
5 Shri Prabhunath Singh
6 Shri Tarlochan Singh Tur

Secretariat

1. Shri Brahm Dutt - *Deputy Secretary*
2. Shri J.N. Oberoi - *Under Secretary*

Representatives of Ministry of Petroleum & Natural Gas

1. Shri V.N. Kaul - Secretary
2. Shri Naresh Narad - Additional Secretary
3. Shri Ravi Saxena - Joint Secretary & FA
4. Shri C. Vijayaraghavan- Joint Secretary
5. Shri J.M. Mauskar - Joint Secretary
6. Shri Shivraj Singh - Joint Secretary
7. Shri B. Bharali - Adviser (Exploration)

At the outset, an Hon'ble Member sought the permission of the Chair to raise an important matter and discussion thereon before the witnesses were called in for evidence. He stated that the Sub-Committee on Petroleum, a Sub-Committee of the Standing Committee on Petroleum & Chemicals was engaged in examining the subject titled as *'Marketing of Petroleum Products including Natural Gas with special reference to Rural & Hilly Areas'.* In the process of the examination of this subject , the Sub-Committee had

sought some information from the Ministry of Petroleum & Natural Gas on specific points relating to the distribution of natural gas. However, Hon'ble Minister in his letter dated 16th August, 2001 addressed to Hon'ble Speaker has stated that Mahanagar Gas Limited and Indraprastha Gas Limited have been set up by joint venture gas companies and are not PSUs. Therefore, this examination does not come under the ambit of Sub-Committee in terms of Para 331-E(2) of the Rules and Conduct of Business in Lok Sabha. Photocopies of the Ministry of Petroleum & Natural Gas communication on the subject forwarding the Minister's letter were circulated amongst the Members who went through its contents. The Sub-Committee discussed this issue for some time and observed that it was an attempt to infringe upon the jurisdiction of a parliamentary committee and as such the contentions put forward in Minister's letter were not acceptable. The Sub-Committee decided to refer the matter to Hon'ble Chairman for his intervention, with the request that an audience be sought with Hon'ble Speaker on this issue. The Sub-Committee then decided to proceed with the day's business and call the witnesses for formal evidence.

2. The Committee took oral evidence of the representatives of the Ministry of Petroleum & Natural Gas in connection with the examination of the subject 'Production of Oil & Gas'. The major issues which came up for discussion included the present oil and gas production scenario, the steps taken to augment the production and improve the Average Recovery Factor, performance during 9th Five Year Plan and projections for the 10th Plan, success ratio of the exploration efforts, feasibility of crashing the future appraisal programme, exploration techniques, special schemes of exploration and production being undertaken in Mumbai High and deep sea areas, foreign investment in exploration and production business and the performance of production-sharing contracts particularly the Panna-Mukta oil fields and Ratna R-series. The other topics which were discussed in detail included the capability of ONGC in deep sea drilling and availability of rigs for this purpose, activities of Directorate General of Hydrocarbons, nature and justification for setting up a separate Upstream Regulatory Authority and finalisation of agreement for supply of gas for Assam Gas Cracker Project.

3. The verbatim record of the proceedings has been kept.

The Sub-Committee then adjourned.

APPENDIX – VIII

MINUTES

SUB-COMMITTEE ON PETROLEUM

A SUB-COMMITTEE OF THE
STANDING COMMITTEE ON PETROLEUM & CHEMICALS (2001)

FOURTEENTH SITTING
(19.12.2001)

The Sub-Committee sat from 1530 hrs. to 1600 hrs.

Dr. Girija Vyas - Convenor

Members

Lok Sabha

2 Shri Ashok Argal
3 Smt. Sheela Gautam
4 Shri Shyama Charan Shukla
5 Smt. Kanti Singh
6 Shri Tarlochan Singh Tur
7 Shri Ratilal Kalidas Varma

Secretariat

1. Shri Brahm Dutt - *Deputy Secretary*
2. Shri J.N. Oberoi - *Under Secretary*

At the outset, Convenor, Sub-Committee on Petroleum welcomed the Members to the sitting of the Sub-Committee and explained the purpose of the day's meeting.

2. Thereafter, the Sub-Committee considered and adopted the following two Draft Reports:

(i) Production of Oil and Gas.

(ii) ** ** ** ** ** ** ** ** **

** ** ** ** ** ** ** ** **

3. The Sub-Committee authorised the Convenor to finalise the Reports and submit these to the Chairman for consideration by the Standing Committee on Petroleum & Chemicals.

The Sub-Committee then adjourned.

***** Matters not related to this Report***

APPENDIX – IX

MINUTES

STANDING COMMITTEE ON PETROLEUM & CHEMICALS (2001)

Twelfth Sitting

(20.12.2001)

The Committee sat from 0930 hrs. to 1000 hrs.

PRESENT

Shri Mulayam Singh Yadav - Chairman

MEMBERS

Lok Sabha

2. Shri Ashok Argal
3. Shri Padam Sen Choudhary
4. Shri Dilipkumar Mansukhlal Gandhi
5. Smt. Sheela Gautam
6. Shri Shriprakash Jaiswal
7. Smt. Nivedita Mane
8. Shri Punnulal Mohale
9. Dr. Debendra Pradhan
10. Dr. Bikram Sarkar
11. Shri Shyama Charan Shukla
12. Smt. Kanti Singh
13. Shri D.C. Srikantappa
14. Shri Tarlochan Singh Tur
15. Shri Ratilal Kalidas Varma
16. Shri B. Venkateshwarlu
17. Shri Rajesh Verma
18. Dr. Girija Vyas

Rajya Sabha

19. Shri Anil Kumar
20. Shri Ram Nath Kovind
21. Shri Daya Nand Sahay
22. Shri Dipankar Mukherjee
23. Shri K. Kalavenkata Rao
24. Shri Rajiv Ranjan Singh 'Lalan'
25. Shri P. Soundararajan

Secretariat

1. Shri Brahm Dutt - Deputy Secretary
2. Shri J.N. Oberoi - Under Secretary

At the outset, Hon'ble Chairman welcomed the Members to the sitting and explained the purpose of the day's meeting. He conveyed his thanks to the Members of the Committee for the cooperation extended by them in conducting the business of the Committee smoothly during the tenure of two years. He specifically mentioned the achievements of the Committee in presenting the 24 Reports during his tenure and gave the full credit of this achievement to three Sub-Committees of the Committee .

2. Thereafter, he invited the Members to give their suggestions, if any, on the draft Reports being considered for adoption. On the suggestion of a Member, the Committee decided to modify Paras 30 and 31 of Twenty-First Report on `Production of Oil and Gas so as to make DGH to remain advisory body. The Committee then considered the following draft Reports:-

(i) Twenty-First Report on 'Production of Oil and Gas'.

(ii) ** ** ** ** ** ** ** ** ** ** **
** ** ** ** ** ** ** ** ** ** **

(iii) ** ** ** ** ** ** ** ** ** ** **
** ** ** ** ** ** ** ** ** ** **

(iv) ** ** ** ** ** ** ** ** ** ** **
** ** ** ** ** ** ** ** ** ** **

3. After some consideration, the Committee adopted the Reports subject to modification as above.

4. The Committee, thereafter, authorised the Chairman to finalise the Reports after factual verification from the concerned Ministries/Departments and present them to Hon'ble Speaker before completion of the term of the Committee i.e. on 31st December, 2001 under the Direction 71-A of Directions by the Speaker, Lok Sabha.

5. The Committee placed on record their appreciation of the work done by the Sub-Committees on Petroleum and Fertilisers.

6. The Committee also placed on record their appreciation for the valuable assistance rendered to them by the officials of the Lok Sabha Secretariat attached to the Committee.

The Committee then adjourned.

***** Matters not related to this Report***

Appendix-X

COMPOSITION OF THE STANDING COMMITTEE ON PETROLEUM & CHEMICALS (1999-2000)

Shri Mulayam Singh Yadav - Chairman

Members

Lok Sabha

2. Shri Ashok Argal
3. Shri Ramchander Bainda
4. Shri Ananda Mohan Biswas
5. Shri Ajay Singh Chautala
6. Dr. (Smt.) C. Suguna Kumari
7. Shri Padam Sen Choudhary
8. Shri T.T.V. Dhinakaran
9. Shri Dilipkumar Mansukhlal Gandhi
10. Shrimati Sheela Gautam
11. Shri Pawan Singh Ghatowar
*12. Shri Bijoy Krishna Handique
13. Shri Shriprakash Jaiswal
14. Shrimati Nivedita Mane
15. Shri Punnulal Mohale
16. Shri P. Mohan
17. Shri Ashok Pradhan
18. Shri Mohan Rawale
**19. Dr. Bikram Sarkar
20. Shri Shyama Charan Shukla
21. Shrimati Kanti Singh
22. Shri Prabhunath Singh
23. Shri D.C. Srikantappa
24. Dr. Ramesh Chandra Tomar
25. Shri Tarlochan Singh Tur
26. Shri Shankersinh Vaghela
27. Shri Ratilal Kalidas Varma
28. Shri B. Venkateshwarlu
29. Shri Rajesh Verma
30. Dr. Girija Vyas

Rajya Sabha

*31 Shri Ram Nath Kovind
32. Shri Anil Kumar
**33 Shri Moolchand Meena
34. Dr. (Smt.) Joyasree Goswami Mahanta
***35. Shri Dipankar Mukherjee
36. Shri Ahmed Patel
37. Shri Mukesh R. Patel
****38. Shri Suresh Pachouri
**39. Shri Ravi Shankar Prasad
40. Shri K. Kalavenkata Rao
41. Shrimati Basanti Sarma
**42. Shri Rajiv Ranjan Singh
43. Shri Gaya Singh
44. Shri P. Soundarajan
45. Prof. Ram Gopal Yadav

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* ***Nominated to serve as Member of the Committee w.e.f. 16th May, 2000.***

** ***Nominated to serve as Member of the Committee w.e.f. 5th May, 2000.***

*** ***Nominated to serve as Member of the Committee w.e.f. 24th April, 2000.***

**** ***Nominated to serve as Member of the Committee from Committee on Defence w.e.f. 5th May, 2000.***

Appendix-XI

COMPOSITION OF SUB-COMMITTEE ON PETROLEUM

A SUB-COMMITTEE OF THE STANDING COMMITTEE ON PETROLEUM & CHEMICALS (1999-2000)

	Shri Mulayam Singh Yadav	**-**	**Chairman**
2.	**Dr. Girija Vyas**	**-**	**Convenor**
3.	Shri Ashok Argal		
4.	Smt. Sheela Gautam		
5.	Shri Pawan Singh Ghatowar		
6.	Shri B.K. Handique		
7.	Shri Ahmed Patel		
8.	Shri Mohan Rawale		
9.	Shri Shyama Charan Shukla		
10.	Smt. Kanti Singh		
11.	Shri Prabhunath Singh		
12.	Shri Tarlochan Singh Tur		
13.	Shri Shankersinh Vaghela		
14.	Shri Ratilal Kalidas Varma		
15.	Prof. Ram Gopal Yadav		