

## Chapter 1: Introduction

Oil and Natural Gas Corporation Limited (ONGC - hereinafter referred to as ‘the Company’) is an integrated Oil Exploration and Production Company (set up as Commission in 1956). The activities of the Company mainly consist of geological and geo-physical surveys, drilling of wells, production and sale of crude oil and natural gas and related research and reservoir studies in onshore and offshore areas.

The process of petroleum exploration starts with prognostication and geo-scientific surveys on the identified sedimentary basins. The information collected from these surveys is processed and interpreted to construct a logical model of the basin. The model so constructed, which is dynamic in nature and revised in different stages of exploration, is tested by drilling exploratory wells. If the area proves to be hydrocarbon bearing, delineation wells are drilled to ascertain the extent of the field and its productivity. This is followed by drilling of development wells, laying oil pipelines and installation of facilities to put the field on regular commercial production. During the producing phase of the field, the producing wells are maintained through work-over operations for maintaining the level of production or increase in production.

The Company conducts its exploration activities through Basins<sup>1</sup> and the production activities are carried out through Assets<sup>2</sup>. There were eight Basins and 11 Assets in the Company. The Basins and Assets are in onland and offshore (Shallow water and Deep water) areas. While the exploratory wells are drilled in Basins, the development wells are drilled in Assets. In addition, the Company carries out work-over operations in development areas to maintain production. Side-tracking operations are also carried out by the Company for exploration and development activities.

### 1.1 Functions of Rigs

Rigs are deployed for the following three purposes:

**Exploratory drilling** - Wells are drilled with a view to establish new hydrocarbon structure and include delineation wells drilled for delineation of the discovered structures.

**Development drilling** - It is carried out generally from a production site for which approved development schemes exist, with a view to produce hydrocarbons from them in commercial quantities.

**Work-over operations** - It includes repair/replacement of equipment in the well, for maintaining or enhancement of production.

<sup>1</sup> Basins : Western Offshore, Western Onshore, Assam and Assam-Arakan, Mahanadi, Bengal and Andaman, Krishna Godavari, Cauvery and Frontier Basin

<sup>2</sup> Ahmedabad, Mehsana, Ankleshwar, Assam, Tripura, Rajahmundry, Cauvery, Mumbai High, Neelam-Heera, Bassein-Satellite, Eastern Offshore Asset.

**Side-track operations** – To drill a secondary wellbore away from an original wellbore, which saves re-drilling the top part of the hole. A side-tracking operation may be done intentionally or may occur accidentally.

The drilling in offshore areas is carried out by different types of rigs viz. jack up rigs, (cantilever rigs, slot type rigs and mat supported rigs), semi-submersibles, modular rigs, platform rigs and drillships. In onland areas, mobile rigs and High Floor Mast / Sub structure types of rigs are used for drilling.

## 1.2 Financial Outlay

Drilling activities (both exploratory and development) in the Company are carried out by the departmental and hired rigs. As on March 2014, the Company had 112 drilling rigs. The onland rigs are largely owned by the Company (67 departmental rigs as against six hired rigs) while the more expensive offshore rigs are mostly hired rigs (31 hired rigs as against eight departmental rigs - six jack up rigs and two drillships).

The expenditure on exploratory and development drilling during 2010-11 to 2013-14 is tabulated below:

**Table 1.1: Expenditure on Exploratory and Development Drilling**

(₹ in crore)

Type of expenditure	2010-11	2011-12	2012-13	2013-14
Exploratory Drilling	8,625.27	8,463.02	10,037.56	11,452.00
Development Drilling	3,511.63	4,287.59	6,722.08	7,512.00
Total (Exp. & Dev. Drilling)	12,136.9	12,750.61	16,759.64	18,964.00
Total outlay	28,275.54	29,246.55	29,507.91	32,470.00
% of total Exp. & Dev. Drilling	<b>42.92</b>	<b>43.60</b>	<b>56.80</b>	<b>58.40</b>

Source: Annual Plan 2010-14

As can be seen from the above table, drilling activities constituted the single most significant expenditure of the Company, constituting as high as 42.92 per cent to 58.40 per cent of total expenditure of the Company during 2010-14. Besides, efficient drilling is critical for both production of hydrocarbons and reserve accretion. Hence, effective and efficient planning, deployment and utilisation of drilling resources are crucial for efficient operation of the Company.

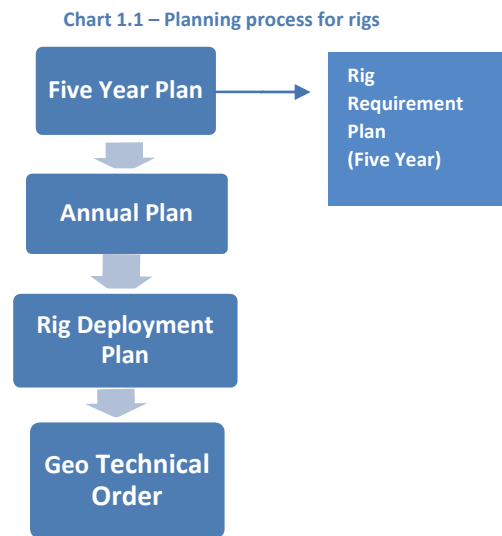
Besides exploration and development drilling plan expenditure, the Company also incurs significant revenue expenditure on work-over operations to repair sick/non-flowing wells so as to maintain /increase level of production. The work-over expenditure incurred during the period 2010-14 is tabulated below:

**Table 1.2: Expenditure incurred on work-over operations**  
(₹ in crore)

	2010-11	2011-12	2012-13	2013-14
Actual	2,768	2,341	1,904	2,094

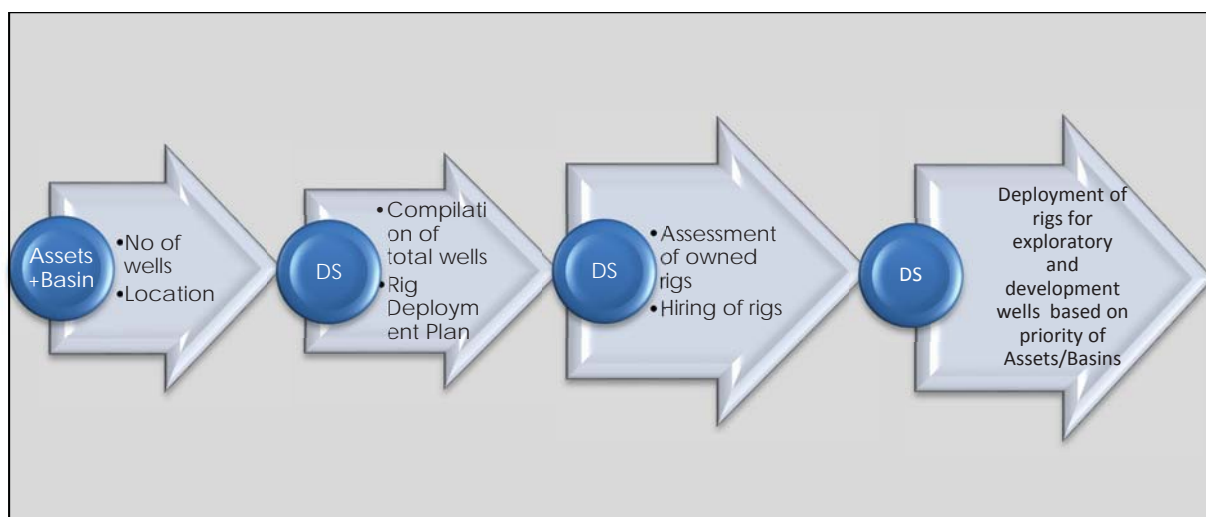
### 1.3 Management of rig operations

The management of rig operations includes planning, hiring, acquisition and deployment of rigs. The Company prepares a Five Year Plan (FYP) duly envisaging the exploration, development and production activities in the forthcoming five year period. The approved FYP includes physical targets set for exploratory and development drilling in terms of meterage to be drilled, number of locations to be drilled through mix of owned and charter hired rigs. This forms the basis for a Rig Requirement Plan (RRP), (prepared for offshore areas alone) on a five-year basis for deciding on hiring/ acquisition of rigs, based on availability of rigs with the Company. The annual operational plans of the Company are drawn in line with the FYP and considering the planned production and commitments made in respect of NELP and PEL Nomination blocks.



In line with the annual plans, the Company (Drilling Services group) also prepares a Rig Deployment Plan (RDP) for allocating rigs (both owned and hired) to specific work locations in consultation with Assets and Basins. While the wells to be drilled and their locations are decided by the respective Assets and Basins, the rig deployment plan, hiring of rigs and their actual deployment are the responsibility of Drilling Services group of the Company. The Company prepares Geo Technical Orders (GTOs) which is a micro level plan of a well to be drilled, specifying the timeline for each drilling activity.

**Chart 1.2 : Process of management of drilling operations**



### 1.4 Organisation Structure

The technical control of Drilling Services group is under Director (Technical and Field Services - T&FS) who looks after planning, requirement and utilisation of drilling rigs. The administrative control of Drilling Services group for day to day operation of drilling services group is under Director (Offshore).

## 1.5 Performance of drilling operations

### 1.5.1 Exploratory and Development drilling

The performance of drilling rigs in the Company for the four years from 2010-11 to 2013-14 is tabulated below.

**Table 1.3: Plan and actual performance of drilling operations**

Drilling	2010-11		2011-12		2012-13		2013-14	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
<b>Exploratory</b>								
Meterage (KM)	514.97	384.02	505.87	375.44	502.75	343.052	480.35	320.76
Wells (Nos.)	154	125	158	135	155	108	153	106
<b>Development</b>								
Meterage (KM)	458.36	500.09	581.41	558.69	703.43	680.73	679.52	596.79
Wells (Nos.)	216	256	272	280	325	323	311	283

*Source: Annual Plans and Director (T&FS) Report*

The above table shows that while less than the planned number of exploratory wells had been drilled, development wells generally exceeded the target in 2010-11 and 2011-12.

The planned and actual utilisation of rig months for the period 2010-14 is tabulated below.

**Table 1.4: Planned and actual utilisation of rig months**

Rig Months	2010-11		2011-12		2012-13		2013-14	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
<b>Onshore</b>								
Exploratory	536.99	459.86	539.91	434.39	475.02	356.02	436.89	334.99
Development	422.29	435.69	418.48	463.74	543.82	486.95	488.88	439.72
Total	959.28	895.55	958.39	898.13	1018.84	842.97	925.77	774.71
<b>Offshore</b>								
Exploratory	218.77	196.09	172.06	147.66	223.71	162.20	215.50	200.90
Development	75.60	62.55	134.5	84.99	169.6	141.34	176.85	142.12
Total	294.37	258.64	306.56	232.65	393.31	303.54	392.35	343.02

*Source: Annual Report (T&FS) 2010-14*

The planned rig months could not be achieved in most cases. The planned targets were met only in 2010-11 and 2011-12 for development drilling in onshore areas. The reasons for non-achievement of planned rig months are discussed in Chapter 4 (paragraphs 4.2, 4.3, 4.4) and Chapter 5 (Paragraph 5.2).

### 1.5.2 Work-over operations

The planned and actual work-over operations both in onland and offshore areas during 2010-14 are tabulated below:

**Table 1.5: Planned and actual work-over operations**

Year	Location	Wells		Rig Months	
		Plan	Actual	Plan	Actual
2010-11	Offshore	142	122	159.3	127.9
	Onland	1375	1421	895	870.4
2011-12	Offshore	81	109	110.68	126
	Onland	1383	1532	936.85	916.6
2012-13	Offshore	59	72	76	83
	Onland	1392	1595	915.9	879.32
2013-14	Offshore	99	93	138	109
	Onland	1484	1581	916.7	887.55

From the above table, it can be observed that the Company had generally achieved the planned work-over operations in all the years except for two years (2010-11 and 2013-14) in Offshore areas.

### 1.6 Drilling Efficiency of Rigs

The performance of drilling rigs is evaluated mainly in terms of two Key Performance Indicators (KPIs) viz. Cycle Speed and Commercial Speed.

#### Cycle Speed

The parameter used to evaluate the operational efficiency of rigs is Cycle Speed in metre/rigs months achieved in completing a well. It is calculated on dividing the drilled depth of well by the cycle time in rig months actually used for completing the well *i.e.* the time between rig release from previous well to rig release from present well after carrying out rig building, drilling and production testing operations at present well. The total time involved in these three phases is known as 'Cycle time'.

#### Commercial Speed

The parameter used to evaluate the drilling efficiency of rigs is Commercial Speed in metre/rig month achieved in drilling a well to the target depth. It is calculated by dividing the drilled depth of well by the commercial time in rig months actually used for drilling the well *i.e.* the time from spudding of a well to hermetical testing of production casing (to check any leakages before bonding over the same for production testing), also called 'drilling time' or commercial time.

Drilling efficiency of the rigs of the Company in terms of Cycle Speed and Commercial Speed has been discussed subsequently in paragraph 5.5 of the report.