5.1 COBALT

Introduction

Cobalt is a scarce and an important strategic alloying metal. It has strategic importance due to its ability to impart hardness and corrosion resistance to alloys at high temperature. It is used in super alloys for the industrial and aircraft engines. There is no production of cobalt in the country. The entire demand is met through imports only. Cobalt is found associated with copper, nickel and arsenic ore. Cobalt in association with nickeliferous limonite of Sukinda Valley, Odisha is the potential source in India.

Basis of Grade Classificatiion

Cobalt ore is not directly used in the industry, therefore the end-use grade classification is not attempted and entire estimation in the inventory as on 1.4.2015 has been placed in terms of its ore.

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), the resources are broadly classified into 'reserves and 'remaining resources'.

According to the norms of this system, estimation of cobalt ore has been made under 'remaining resources' and are placed under measured (331), indicated (332), inferred (333) and reconnaissance (334) categories.

Salient Features of the Inventory

The entire estimations of cobalt ore in the country as on 1.4.2015, at about 45 million tonnes, have been placed under 'remaining resources'' category.

All India scenario of cobalt ore reserves, remaining resources and total resources as on 1.4.2015 vis-a-vis 1.4.2010 have been given in Tables-1 and 2. The tables give an idea about the significant changes in terms of increase or decrease of resources as per lease status, grades and states. In Table-3 district wise reserves/ resources as on 1.4.2015 have been given.

There is no change in resource position of cobalt ore as compared to the previous inventory as on 1.4.2010. The resources were distributed in three states namely Jharkhand, Nagaland and Odisha. Out of the total resources, about 69% have been estimated in Jajpur district, Odisha and the balance share of 31% resources have been accounted for by Singhbhum (East) district(20%), Jharkhand and Kiphire district(11%), Nagaland . The entire resources of Jharkhand and Nagaland are in freehold areas while almost entire resources of Odisha is under leasehold .

A total of 7 deposits have been covered in National Mineral Inventory as on 1.4.2015, of which, 4 deposits are in freehold areas, 2 deposits in leasehold public and one deposit in leasehold private.

Table - 1 : Reserves/Resources of Cobalt Ore as on 1.4.2015 vis-à-vis 1.4.2010
(By Lease Status/Grade)

(In million tonnes)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India : Total	**-**	**-**	**No Change**	**44.91**	**44.91**	**No Change**	**44.91**	**44.91**	**No Change**
Freehold	-	-	No Change	14.01	14.01	No Change	14.01	14.01	No Change
Leasehold (Private)	-	-	No Change	21.06	21.06	No Change	21.06	21.06	No Change
Leasehold (Public)	-	-	No Change	9.84	9.84	No Change	9.84	9.84	No Change

figures rounded off

Table – 2 : Total Resources of Cobalt Ore as on 1.4.2015 vis-à-vis 1.4.2010 (By States)

(In million tonnes)

State	Total Resources		Net Change
	As on 1.4.2010	As on 1.4.2005	
All India : Total	**44.91**	**44.91**	**No Change**
Jharkhand	9	9	No Change
Nagaland	5	5	No Change
Odisha	30.91	30.91	No Change

figures rounded off

Table - 3 : District wise Reserves/Resources of Cobalt Ore as on 1.4.2015

(In million tonnes)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total	**-**	**44.91**	**44.91**
Jharkhand	**-**	**9**	**9**
Singhbhum (East)	-	9	9
Nagaland	**-**	**5**	**5**
Kiphire	-	5	5
Odisha	**-**	**30.91**	**30.91**
Jajpur	-	30.91	30.91

figures rounded off

5.2 MOLYBDENUM

Introduction

Molybdenum does not occur in nature in free state. Usually, it is found in chemically combined form with other elements. Molybdenite (MoS_2) is the principal mineral from which molybdenum is obtained.

Molybdenum is principally used as alloying agent in steel, cast iron and super alloys to enhance hardness, strength and wear & corrosion resistance. As a refractory metal, it is used in many electrical and electronic components, as a resistance element in electronic furnaces. There is increasing usage of molybdenum in defence industries.

Basis of Grade Classification

Molybdenum ore as mined is not used directly in the industry and therefore, end-use grade classification of this mineral is not possible.

In USA, the ore is marketed only in the form of MoS_2 concentrate which is intermediate and end-product obtained from the ore. There is no BIS classification. Therefore, the grade classification for molybdenum in the inventory has been done as 'ore' and contained MoS_2.

Basis of Resource Classification

As per United Nations Framework Classification (UNFC), resources are broadly classified into 'reserves' and 'remaining resources'.

According to the norms of this system, molybdenum ore and corresponding contained MoS_2 is placed under remaining resources in pre-feasibility (221), measured (331), indicated (332), inferred (333) and reconnaissance (334) categories.

Salient Features of the Inventory

The total resources as on 1.4.2015 of molybdenum ore in the country are estimated at 19,372 thousand tonnes with about 12.7 thousand tonnes of contained MoS_2. The entire estimations fall under remaining resources category.

All India scenario of molybdenum ore and their contained MoS_2 under remaining resources and total resources as on 1.4.2015 vis-a-vis 1.4.2010 has been given in Tables 1 and 2. The tables give an idea about changes in terms of increase or decrease of resources as per lease status, grades and state. In Table - 3 district wise reserves/resources as on 1.4.2015 have been given.

Molybdenum resources are mainly distributed in Tamil Nadu with 10,051 thousand tonnes (51.9%) of ore containing 5.9 thousand tonnes of MoS_2, Madhya Pradesh with 8,000 thousand tonnes (41.3 %) of ore containing 5 thousand tonnes MoS_2 and Karnataka with 1,321 thousand tonnes (6.82%) of ore containing 1.72 thousand tonnes MoS_2.

There is thus a very small increase of 85 thousand tonnes of ore (28.8 tonnes of contained MoS_2) resources in comparison to the earlier inventory as on 1.4.2010. This is solely due to additon of a freehold deposit (in Krishnagiri dist., Tamil Nadu) since previous inventory.

Of the total resources, about 17,099 thousand tonnes (88%) ore has been estimated under inferred (333), 1500 thousand tonnes (8%) under pre-feasibility (221) and 569 thousand tonnes ores (3%) under indicated (332) categories. A sizeable quantity of resources (92%) are placed under (334), (333) & (332) categories based on preliminary nature of geological assessment. A detailed exploration in these areas may enhance the confidence level of resource endowment in the country.

Total 8 deposits of molybdenum have been covered in NMI as on 1.4.2015, of which 7 deposits are in freehold and one deposit in leasehold area.

Table - 1 : Reserves/Resources of Molybdenum as on 1.4.2015 vis-à-vis 1.4.2010
(By Lease Status/Grade)

(In tonne)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India : Total									
Ore	**-**	**-**	**-**	**19371698**	**19286732**	**(+) 84966**	**19371698**	**19286732**	**(+) 84966**
Contained MoS_2	**-**	**-**	**-**	**12668.37**	**12639.57**	**(+) 28.8**	**12668.37**	**12639.57**	**(+) 28.8**
Freehold									
Ore	-	-	-	11371698	11286732	(+) 84966	11371698	11286732	(+) 84966
Contained MoS_2	-		-	7648.37	7619.57	(+) 28.8	7648.37	7619.57	(+) 28.8
Leasehold (Public)									
Ore	-	-	-	8000000	8000000	No Change	8000000	8000000	No Change
Contained MoS_2	-	-	-	5020	5020	No Change	5020	5020	No Change

figures rounded off.

Table – 2 : Total Resources of Molybdenum as on 1.4.2015 vis-à-vis 1.4.2010 (By States)

(In tonne)

State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India : Total			
Ore	**19371698**	**19286732**	**(+) 84966**
Contained MoS_2	**12668.37**	**12639.57**	**(+)28.8**
Karnataka			
Ore	1320900	1320900	No Change
Contained MoS_2	1718.7	1718.7	No Change
Madhya Pradesh			
Ore	8000000	8000000	No Change
Contained MoS_2	5020	5020	No Change
Tamil Nadu			
Ore	10050798	9965832	(+)84966
Contained MoS_2	5929.67	5900.87	(+)28.8

figures rounded off.

Table - 3 : District wise Reserves/Resources of Molybdenum as on 1.4.2015

(In tonne)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total			
Ore	**-**	**19371698**	**19371698**
Contained MoS_2	**-**	**12668.37**	**12668.37**
Karnataka			
Ore	**-**	**1320900**	**1320900**
Contained MoS_2	**-**	**1718.7**	**1718.7**
Kolar			
Ore	-	1320000	1320000
Contained MoS_2	-	1716	1716
Raichur			
Ore	-	900	900
Contained MoS_2	-	2.7	2.7
Madhya Pradesh			
Ore	**-**	**8000000**	**8000000**
Contained MoS_2	**-**	**5020**	**5020**
Balaghat			
Ore	-	8000000	8000000
Contained MoS_2	-	5020	5020
Tamil Nadu			
Ore	**-**	**10050798**	**10050798**
Contained MoS_2	**-**	**5929.67**	**5929.67**
Dharampuri			
Ore	-	8726620	8726620
Contained MoS_2	-	5397.87	5397.87
Dindigul			
Ore	-	519000	519000
Contained MoS_2	-	352	352
Krishnagiri			
Ore	-	84966	84966
Contained MoS_2	-	28.8	28.8
Vellore			
Ore	-	720212	720212
Contained MoS_2	-	151	151

figures rounded off.

5.3 NICKEL ORE

Introduction

Nickel is a silver white metal used as an alloy both in ferrous and non-ferrous applications, mainly in steel alloy. Besides, nickel is also used in nickel plating, coin making, ceramics, colouring glass, batteries, electronic circuits and nickel compounds. Nickel is a strategic metal and is found associated with the lateritic deposits of Sukinda valley in Odisha. Nickel is not produced from primary sources in the country and the entire demand is met through imports. However, it is recovered as a by-product in the form of nickel sulphate during refining of copper at Ghatsila copper smelter of Hindustan Copper Ltd. (HCL) in Jharkhand.

Another important source is nickeliferrous limonite in the overburden of chromite in Sukinda valley, Jajpur district, Odisha. A suitable process is being developed for its utilisation. In addition, nickel is found associated with uranium deposits at Jaduguda, Jharkhand and a process is being developed for its recovery. Resources are spread over in Singhbhum East district of Jharkhand and Jajpur, Keonjhar, Mayurbhanj districts of Odisha. Resources of nickel ore are also reported from Nagaland and Karnataka and occurrences are reported from Kerala.

Basis of Grade Classification

In the inventory as on 1.4.2015 the resources of Nickel ore have been classified into the following grades:

i) Ore with (+) 0.9% Ni
ii) Ore with 0.5 to 0.9% Ni
iii) Ore with (+) 0.5% Ni (Unclassified)
iv) Not known grade.

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), resources are broadly classified into 'reserves' and 'remaining resources'.

According to the norm of this system, the estimation of nickel ore in the country have been placed under pre-feasibility (221) & (222), measured (331), indicated (332) and inferred (333) categories of remaining resources.

Salient Features of the Inventory

The total resources of nickel ore in the country as on 1.4.2015 are estimated at 188.86 million tonnes. The entire resources fall under remaining resource category. There is minor increase in the total resources as compared to previous inventory as on 1.4.2010.

All India scenario of nickel ore reserves, remaining resources and total resources as on 1.4.2015 vis-a-vis 1.4.2010 have been given in Tables - 1 and 2. The tables give an idea about the significant changes in terms of increase and decrease of resources as per lease status, grade and states. In Table-3, district-wise reserves/ resources as on 1.4.2015 have been given.

Out of the total resources, about 90.66 million tonnes (48%) have been placed in freehold, 58.23 million tonnes (31%) in leasehold private and 39.97 million tonnes (21%) in leasehold public areas.

Of the total resources, ore containing 0.5 to 0.9% Ni are 93.53 million tonnes (50%), followed by ore containing (+)0.5% Ni (unclassified) are 52.97 million tonnes (28%) and resources of ore containing (+)0.9% Ni are 42.13 million tonnes (22%). A meager quantity of 0.23 million tonnes nickel ore has been placed under not known grade .

The state of Odisha endowed with the largest share of resources of nickel ore in the country at 174.63 million tonnes (92%). These resources have mainly been distributed in three districts, namely Jajpur (139.66 million tonnes), Mayurbhanj (27 million tonnes) and Keonjhar (7.97 million tonnes). Jharkhand has 9 million tonnes (5%) resources estimated in Singhbhum (East) district. Nagaland has 5 million tonnes (3%) resources mainly in Kiphire district. A very meager quantity about 0.23 million tonnes has been estimated in North Kanara district, Karnataka .

The entire resources of nickel ore are placed under remaining resources. Out of this 63.49 million tonnes (34%) are under inferred (333) category. These resources are based on a limited and preliminary exploration. A detailed exploration in these areas may improve the confidence level of the resources.

Total 10 deposits have been covered in the inventory as on 1.4.2015. Out of this 6 deposits are in freehold and 2 deposits each in leasehold public and in leasehold private areas.

Table - 1 : Reserves/Resources of Nickel as on 1.4.2015 vis-à-vis 1.4.2010
(By Lease Status/Grade)

(In million tonnes)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India : Total	**-**	**-**	**-**	**188.86**	**188.71**	**(+) 0.15**	**188.86**	**188.71**	**(+) 0.15**
(+)0.9% Ni	-	-	-	42.13	42.13	No Change	42.13	42.13	No Change
0.5 to 0.9% Ni	-	-	-	93.53	93.53	No Change	93.53	93.53	No Change
(+) 0.5 % Ni Unclassified	-	-	-	52.97	52.97	No Change	52.97	52.97	No Change
Not known	-	-	-	0.23	0.08	(+) 0.15	0.23	0.08	(+) 0.15
Freehold	**-**	**-**	**-**	**90.66**	**90.66**	**No Change**	**90.66**	**90.66**	**No Change**
(+)0.9% Ni	-	-	-	33.75	33.75	No Change	33.75	33.75	No Change
0.5 to 0.9% Ni	-	-	-	56.91	56.91	No Change	56.91	56.91	No Change
(+) 0.5 % Ni Unclassified	-	-	-	-	-	No Change	-	-	No Change
Leasehold (Private)	**-**	**-**	**-**	**58.23**	**58.08**	**(+) 0.15**	**58.23**	**58.08**	**(+) 0.15**
(+)0.9% Ni	-	-	-	-	-	No Change	-	-	No Change
0.5 to 0.9% Ni	-	-	-	21.06	21.06	No Change	21.06	21.06	No Change
(+) 0.5 % Ni Unclassified	-	-	-	36.94	36.94	No Change	36.94	36.94	No Change
Not Known	-	-	-	0.23	0.08	(+) 0.15	0.23	0.08	(+) 0.15
Leasehold (Public)	**-**	**-**	**-**	**39.97**	**39.97**	**No Change**	**39.97**	**39.97**	**No Change**
(+) 0.9% Ni	-	-	-	8.38	8.38	No Change	8.38	8.38	No Change
0.5 to 0.9% Ni	-	-	-	15.56	15.56	No Change	15.56	15.56	No Change
(+) 0.5 % Ni Unclassified	-	-	-	16.03	16.03	No Change	16.03	16.03	No Change

figures rounded off.

Table – 2 : Total Resources of Nickel as on 1.4.2015 vis-à-vis 1.4.2010 (By States)

(In million tonnes)

State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India : Total	**188.86**	**188.71**	**(+)0.15**
Jharkhand	9.0	9.0	No Change
Karnataka	0.23	0.23	No Change
Nagaland	5.00	5.00	No Change
Odisha	174.63	174.48	(+) 0.15

figures rounded off.

Table - 3 : District wise Reserves/Resources of Nickel as on 1.4.2015

(In million tonnes)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total	**-**	**188.86**	**188.86**
Jharkhand	**-**	**9**	**9**
Singhbhum (East)	-	9	9
Karnataka	**-**	**0.23**	**0.23**
North Kanara	-	0.23	0.23
Nagaland	**-**	**5**	**5**
Kiphire	-	5	5
Odisha	**-**	**174.63**	**174.63**
Jajpur	-	139.66	139.66
Keonjhar	-	7.97	7.97
Mayurbhanj	-	27	27

figures rounded off.

5.4 RARE EARTH ELEMENTS

Introduction

The rare earth group contains 17 elements as defined by International Union of Pure and Applied Chemistry(IUPAC) namely, scandium (Sc), yttrium (Y) and lanthanides (15 elements in the periodic table with atomic numbers from 57 to 71, namely, lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd), promethium (Pm), samarium (Sm), europium (Eu), gadolinium (Gd), terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (Tm), ytterbium (Yb) and lutetium (Lu). Although they tend to occur together, the 15 lanthanide Elements are divided into two groups - light & heavy elements. The light elements are those with atomic numbers from 57 to 63 (La, Ce, Pr, Nd, Pm, Sm and Eu) and the heavy elements are those with atomic numbers from 64 to 71 (Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu). Generally, the light rare earth elements are more common and more easily extracted than the heavies. In spite of its low atomic weight, yttrium has properties more similar to the heavy lanthanides and is included with this group. Scandium, besides occurring with other rare earth elements is also found in a number of minerals.

Rare Earth Elements (REE) are characterised by high density, high melting point, high conductivity and high thermal conductance. A number of rare earth minerals contain thorium and uranium in variable amounts but thorium and uranium do not constitute essential components in the composition of the minerals.

The principal sources of rare earth elements are bastnaesite (a fluorocarbonate which occurs in carbonatites and related igneous rocks), xenotime (yttrium phosphate) commonly found in mineral sand deposits, loparite which occurs in alkaline igneous rocks and monazite (a phosphate). The rare earths occur in many other minerals and are recoverable as by-products from phosphate rock and from spent uranium leaching. In India, monazite is the principal source of rare earths and thorium.

Basis of Grade Classification

The following grade classification has been adopted in the mineral inventory as on 1.4.2015.

Unclassified : Estimation for which supporting data is not available to classify under any grade.

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), resources are broadly classified into' reserves' and 'remaining resources'.

According to norms of this system reserves / resources of Rare Earth Element has been placed under indicated (332) and inferred (333) categories.

Salient Features of the Inventory

All India scenario of REE reserves, remaining resources and total resources as on 1.4.2015 have been appended in Table - 1 and 2. In Table 3, district-wise reserves/resources as on 1.4.2015 have been given.

The total resources of Rare earth elements in the country as on 1.4.2015 are estimated at 25493 tonnes . The present inventory on REE is prepared for the first time.

Of the total resources entire 25,493 tonnes are placed in freehold category.

Odisha is the only state where estimation of REE with 25,493 tonnes has been done. The resources of REE also reported from Uttar Pradesh in Jhansi district where resource estimation has not been made.

A total of 5 deposits have been reported in the present inventory.

Table - 1 : Reserves/Resources of Rare Earth Elements (REE) as on 1.4.2015 vis-à-vis 1.4.2010
(By Lease Status/Grade)

(In tonne)

	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India : Total	-	-	-	**25,493**	-	**(+) 25,493**	**25,493**	-	**(+) 25,493**
Unclassified	-	-	-	25,493	-	(+) 25,493	25,493	-	(+)25,493
Free Hold	-	-	-	**25,493**	-	**(+) 25,493**	**25,493**	-	**(+) 25,493**
Unclassified	-	-	-	**25,493**	-	**(+) 25,493**	**25,493**	-	**(+) 25,493**

figures rounded off.

Table – 2 : Total Resources of Rare Earth Elements as on 1.4.2015 vis-à-vis 1.4.2010

(By States)

(In tonne)

State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India	**25493**	**-**	**(+)25493**
Odisha	25493	-	(+)25493

Figures rounded off

Table – 3 : Districtwise Reserve / Resources of Rare Earth Elements as on 1.4.2015 (By States)

(In tonne)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total	**-**	**25493**	**25493**
Odisha	**-**	**25493**	**25493**
Ganjam	-	19140	19140
Puri	-	6353	6353

Figures rounded off.

5.5 TIN

Introduction

Tin is a silver white metal with bluish tint, malleable and ductile in nature. Tin is one of the earliest known metal in use for making bronze. The largest single use of tin is in tin plating of iron, steel, copper, etc. Other major use of tin is in alloys such as solder and bronze. In India tin ore is found associated with granite, pegmatites and quartz veins and also in placer deposits. Resources are spread over in Bastar and Dantewada districts of Chhattisgarh, Tosham deposit in Bhiwani district of Haryana and Malkangiri district of Odisha. The production of tin in the country is not substantial. Chhattisgah was the only state producing tin concentrates.

Basis of Grade Classification

Before putting to any end-use, tin ore is converted into concentrate and then smelted for extraction of metal. Therefore the grades of tin have been classified under ore and metal.

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), resources are broadly classified into 'reserves' and 'remaining resources'.

According to the norm of this system, the reserves of tin ore and corresponding metal in the country have been placed under proved (111) and probable (121) & (122) categories. The remaining resources have been placed under feasibility (211), pre-feasibility (221) & (222), measured (331), indicated (332) and inferred (333) categories.

Salient Features of the Inventory

The total resources of tin ore in the country as on 1.4.2015 are estimated at 83,725 thousand tonnes containing 102.41 thousand tonnes metal. Out of these, only 4.42 thousand tonnes ore fall under reserve category containing 154.2 tonnes metal and the balance 83,721 thousand tonnes ore are in remaining resource category containing 102.26 thousand tonnes metal.

All India scenario of tin ore and corresponding metal reserves, remaining resources and total resources as on 1.4.2015 vis-a-vis 1.4.2010 have been given in Tables - 1 and 2. The tables give an idea about the significant changes in terms of increase and decrease of resources as per lease status, grade and states. In Table-3 district-wise reserves/ resources as on 1.4.2015 have been given.

Almost entire tin ore resources estimated in the country comprising 83,718 thousand tonnes (99.99%) have been placed under freehold category. A meagre quantity of about 1.7 thousand tonnes of ore are placed under leasehold (public) and about 5.6 thousand tonnes under leasehold (private) category.

The state of Haryana is endowed with the largest share of total resources of tin ore in the country at 53,910 thousand tonnes (64%) containing 86.22 thousand tonnes metal situated in Bhiwani district. Chhattisgarh has 29,800 thousand tonnes (35.6%) tin ore resources containing 15.63 thousand tonnes metal, estimated in Bastar district (29,792 thousand tonnes tin ore, containing 14.26 thousand tonnes metal) and Dantewara district (7.35 thousand tonnes tin ore containing 1.37 thousand tonnes metal). Odisha has the remaining resources of 15 thousand tonnes tin ore containing 0.57 thousand tonnes metal estimated in Malkangiri district.

A net decrease of 1.03 thousand tonnes of tin ore resources has been recorded in comparison to the resources as on 1.4.2010. The entire decrease in the ore resources are reported from Bastar and Dantewada districts of Chhattisgarh, due to depletion of resources by production from the leasehold (private) deposits. Metal content, however, is reported to increase by a very small quantity (138.52 tonnes) due to reassessment of resources in Bade Bacheli area, Dantewada district.

A sizeable quantity of the total resources of tin ore, about 29,064 thousand tonnes (35%) has been estimated under inferred category. These resources are based on a limited and preliminary exploration. A detailed exploration in these areas may improve the confidence level of the resources.

A total 27 deposits have been covered in the inventory as on 1.4.2015. Out of these 13 deposits are in freehold and remaining 14 deposits are in leasehold areas (7 leasehold private and 7 leasehold public).

Table - 1 : Reserves/Resources of Tin as on 1.4.2015 vis-à-vis 1.4.2010
(By Lease Status/Grade)

(In tonne)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India : Total									
Ore	4419	7131	(-)2712	83720749	83719066	(+)1683	83725168	83726197	(-)1029
Metal	154.2	1132.43	(-)978.23	102259.16	101142.41	(+)1116.75	102413.36	102274.84	(+)138.52
Freehold									
Ore	-	-	-	83717814	83717979	(-)165	83717814	83717979	(-)165
Metal	-	-	-	101048.04	101129.66	(-)81.62	101048.04	101129.66	(-)81.62
Leasehold (Private)									
Ore	4419	3635	(+)784	1216	1086	(+)130	5635	4722	(+)913
Metal	154.2	60.06	(+)94.14	68.13	12.75	(+)55.38	222.33	72.81	(+)149.52
Leasehold (Public)									
Ore	-	3496	(-)3496	1719	-	(+)1719	1719	3496	(-)1777
Metal	-	1072.37	(-)1072.37	1142.99	-	(+)1142.99	1142.99	1072.37	(+)70.62

figures rounded off.

Table – 2 : Total Resources of Tin as on 1.4.2015 vis-à-vis 1.4.2010 (By States)

(In tonne)

State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India : Total			
Ore	**83725168**	**83726197**	**(-)1029**
Metal	**102413.36**	**102274.84**	**(+)138.52**
Chhattisgarh			
Ore	29799674	29800703	(-)1029
Metal	15625.15	15486.63	(+)138.52
Haryana			
Ore	53910000	53910000	No Change
Metal	86220.6	86220.6	No Change
Odisha			
Ore	15494	15494	No Change
Metal	567.61	567.61	No Change

figures rounded off.

Table - 3 : District wise Reserves/Resources of Tin as on 1.4.2015

(In tonne)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total			
Ore	**4419**	**83720749**	**83725168**
Metal	**154.2**	**102259.16**	**102413.36**
Chhattisgarh			
Ore	**4419**	**29795255**	**29799674**
Metal	**154.2**	**15470.95**	**15625.15**
Bastar			
Ore	-	29792320	29792320
Metal	-	14259.83	14259.83
Dantewada			
Ore	4419	2935	7354
Metal	154.2	1211.12	1365.32
Haryana			
Ore	**-**	**53910000**	**53910000**
Metal	**-**	**86220.6**	**86220.6**
Bhiwani			
Ore	-	53910000	53910000
Metal	-	86220.6	86220.6
Odisha			
Ore	**-**	**15494**	**15494**
Metal	**-**	**567.61**	**567.61**
Malkangiri			
Ore	-	15494	15494
Metal	-	567.61	567.61

figures rounded off.

5.6 TITANIUM MINERALS

Introduction

Titanium minerals, particularly ilmenite and rutile are grouped as 'prescribed substances' as per notifications issued under the Atomic Energy Act, 1962. These mineral deposits are often referred to as heavy mineral deposits.

Ilmenite ($FeOTiO_2$) and Rutile (TiO_2) are the two chief minerals of Titanium. Anatase is one of the polymorphic forms in which titanium dioxide occurs. Leucoxene is an alteration product associated with ilmenite. Titaniferous magnetite is also the source of Titanium.

These minerals occur mainly along coastal stretches of the country and also in inland placers.

Ilmenite is mainly used for the manufacture of titanium dioxide, a white pigment for paints and also for manufacturing synthetic rutile. Rutile is used for coating welding electrodes and in the production of titanium metal sponge.

Basis of Grade Classification

Chemical analysis of the constituents of ilmenite and rutile is usually not carried out at the time of reporting of the resources. Hence, the resources are not classified according to the end-use grades but as their constituent mineral viz., ilmenite, rutile, leucoxene, anatase and titaniferous magnetite.

Basis of Categorization of Resources

As per the United Nations Framework Classification (UNFC), the resources are broadly classified into 'reserves' and 'remaining resources'.

According to the norms of this system, the reserves of titanium minerals have been placed under proved (111) and probable (122) categories.

The remaining resources have been placed under feasibility (211), pre-feasibility (221) & (222), measured (331), indicated (332) and inferred (333) categories.

Salient Features of the Inventory

The total resources of Titanium minerals in the country as on 1.4.2015 have been estimated at about 414 million tonnes. Out of these, 14 million tonnes (3.48%) have been placed under 'reserves' category and the balance 399 million tonnes (96.51%) under 'remaining resources' category. About 89% resources are estimated in freehold whereas 11% are estimated in leasehold public and private areas.

All India scenario of titanium minerals reserves, remaining resources and total resources as on 1.4.2015 vis-a-vis 1.4.2010 have been given in Tables - 1 and 2. The tables give an idea about the significant changes in terms of increase or decrease of resources as per lease status, grade, and states. In Table- 3, district wise reserves/resources as on 1.4.2015 have been given.

Out of the total resources, about 355 million tonnes (85.71%) are ilmenite, 14 million tonnes (3.42%) rutile, 1 million tonne (0.23%) leucoxene, 3 million tonnes (0.81%) Anatase and 41 million tonnes (9.82%) resources are comprised of titaniferous magnetite.

The resources are mainly distributed in Kerala (31%), Tamil Nadu (28%), Andhra Pradesh (19%) and Odisha (16%). The balance 6% resources have been reported from Karnataka, Jharkhand, Maharashtra, Meghalaya and West Bengal.

In the inventory as on 1.4.2015 the resources of titanium minerals registered an overall increase of 19.6 million tonnes as compared to the earlier inventory as on 1.4.2010. A total 7 new deposits with 12 million tonnes resources were reported in the inventory as on 1.04.2015. An increase of about 22 million tonnes has been recorded in Odisha mainly due to inclusion of 5 new freehold deposits and upward revision in resources of existing leasehold public deposits in Ganjam district and increase in resources of Andhra Pradesh recorded due to addition of one new leasehold (private) deposit in Visakhapatnam district. However, recources has been decreased in the state of Tamil Nadu by 2.4 million tonnes due to production and re-estimation of the same.

Of the total resources of titanium minerals, a substantial quantity of about 325 million tonnes (79%) are estimated under inferred category. The detailed exploration of these resources may improve confidence level of resource estimation in the country.

Table - 1 : Reserves/Resources of Titanium Minerals as on 1.4.2015 vis-à-vis 1.4.2010
(By Lease Status/Grade)

(In tonne)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India : Total	**14420716**	**22030223**	**(-)7609507**	**399204829**	**371965694**	**(+)27239135**	**413625545**	**393995917**	**(+)19629628**
Ilmenite	13813510	19669211	(-)5855701	340702590	315919861	(+)24782729	354516100	335589072	(+)18927028
Rutile	594291	1249840	(-)655549	13536871	12147688	(+)1389183	14131162	13397528	(+)733634
Leucoxene	-	700217	(-)700217	968846	343943	(+)624903	968846	1044160	(-)75314
Anatase	-	-	No Change	3345000	3345000	No Change	3345000	3345000	No Change
Titaniferous Magnetite	-	410955	(-)410955	40620157	40209202	(+410955	40620157	40620157	No Change
Not Known	12915	-	(+)12915	31365	-	(+)31365	44280	-	(+)44280
Freehold	**-**	**-**	No Change	**369162644**	**351691329**	**(+)17471315**	**369162644**	**351691329**	**(+)17471315**
Ilmenite	-	-	No Change	313799147	297034860	(+)16764287	313799147	297034860	(+)16764287
Rutile	-	-	No Change	11866009	11158981	(+)707028	11866009	11158981	(+)707028
Leucoxene	-	-	No Change	1994	1994	No Change	1994	1994	No Change
Anatase	-	-	No Change	3345000	3345000	No Change	3345000	3345000	No Change
Titaniferous Magnetite	-	-	No Change	40150494	40150494	No Change	40150494	40150494	No Change
Leasehold (Private)	**-**	**-**	No Change	**31365**	**-**	**(+)31365**	**31365**	**-**	**(+)31365**
Not Known	-	-	No Change	31365	-	(+)31365	31365	-	(+)31365
Leasehold (Public)	**14420716**	**22030223**	**(-)7609507**	**30010820**	**20274365**	**(+)9736455**	**44431536**	**42304588**	**(+)2126948**
Ilmenite	13813510	19669211	(-)5855701	26903443	18885001	(+)8018442	40716953	38554212	(+)2162741
Rutile	594291	1249840	(-)655549	1670863	988707	(+)682156	2265154	2238547	(+)26607
Leucoxene	-	700217	(-)700217	966852	341949	(+)624903	966852	1042166	(-)75314
Titaniferous Magnetite	-	410955	(-)410955	469663	58708	(+)410955	469663	469663	No Change
Not Knwon	12915	-	(+)12915	-	-	No Change	12915	-	(+)12915

figures rounded off.

A comparative analysis of grade wise resources reveals an overall increase in the resources of ilmenite, rutile and not known while the resources of leucoxene shows a slight decrease. There is no change in resources of Anatase and titaniferous magnetite.

A total of 110 deposits of titanium minerals have been covered in National Mineral Inventory as on 1.4.2015. Out of these, 100 deposits are in freehold and 9 deposits are in leasehold public and one deposit in leasehold private areas.

Table – 2 : Total Resources of Titanium Minerals as on 1.4.2015 vis-à-vis 1.4.2010 (By States)

(In tonne)

State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India : Total	**413625545**	**393995917**	**(+)19629628**
Andhra Pradesh	76733874	76702509	(+)31365
Jharkhand	4385000	4385000	No Change
Karnataka	13862094	13862094	No Change
Kerala	128712668	128712668	No Change
Maharashtra	4426277	4426277	No Change
Meghalaya	3345000	3345000	No Change
Odisha	65478984	43504178	(+)21974806
Tamil Nadu	114402648	116779191	(-)2376543
West Bengal	2279000	2279000	No Change

figures rounded off.

Table - 3 : District wise Reserves/Resources of Titanium Minerals as on 1.4.2015

(In tonne)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total	**14420716**	**399204829**	**413625545**
Andhra Pradesh	**-**	**76733874**	**76733874**
Godavari (East)	-	34000000	34000000
Krishna	-	4950000	4950000
Nellore	-	330000	330000
Srikakulam	-	21782509	21782509
Visakhapatnam	-	15671365	15671365
Jharkhand	**-**	**4385000**	**4385000**
Ranchi	-	755000	755000
Singhbhum (East)	-	3630000	3630000
Karnataka	**-**	**13862094**	**13862094**
Hassan	-	742430	742430
North Kanara	-	5292664	5292664
Shimoga	-	7827000	7827000

(contd.)

Table-3 (Concld.)

State/District	Reserves	Remaining Resources	Total Resources
Kerala	**-**	**128712668**	**128712668**
Alapuzha (Alleppy)	-	537191	537191
Kasargod	-	114550	114550
Kollam	-	119602347	119602347
Pathanamthitta	-	8154330	8154330
Thiruvananthapuram	-	304250	304250
Maharashtra	**-**	**4426277**	**4426277**
Gondia	-	1898063	1898063
Ratnagiri	-	2528214	2528214
Meghalaya	**-**	**3345000**	**3345000**
Khasi Hills East	-	3345000	3345000
Odisha	**13719720**	**51759264**	**65478984**
Dhenkanal	-	2700000	2700000
Ganjam	13719720	11150000	24869720
Jajpur	-	4150000	4150000
Mayurbhanj	-	21230000	21230000
Puri	-	12529264	12529264
Tamil Nadu	**700996**	**113701652**	**114402648**
Kanyakumari	700996	7704453	8405449
Nagapattinam	-	1114880	1114880
Ramnathapuram	-	6680320	6680320
Thiruvallur	-	68920	68920
Tirunelveli	-	22267231	22267231
Tuticorin	-	75865848	75865848
West Bengal	**-**	**2279000**	**2279000**
Purulia	-	2279000	2279000

figures rounded off.

5.7 TUNGSTEN

Introduction

Tungsten is a metal of strategic importance in times of war and is essential for the industrial development of the country. Tungsten is heavy (Sp. Gr.19.3) and highly refractory metal (melting point 3422^0 C). It has good corrosion resistance, good thermal and electrical conductivity and low co-efficient of expansion. At temperature above 1650^0C, it has the highest tensile strength of all metals. The major sources of tungsten are minerals scheelite ($CaWO_4$) and Wolframite [$(Fe,Mn)WO_4$].It is a hard steel-gray shiny metal.

Tungsten is mainly used in the manufacture of ferro-tungsten and in certain non-ferrous alloys. These alloys are used for high speed tools, cutting tools, etc. Tungsten is also used in making filament in electrical lamps.

Tungsten occurs either as scheelite or wolframite in granite/pegmatite and quartz veins. The only experience of producing tungsten ore in the country is from Degana area of Nagaur district, Rajasthan and Chendapathar in West Bengal. The area was mined first by RSMDC and then by HZL till recent past. Presently, there is no production of tungsten ore in the country due to economic non-viability.

Basis of Grade Classification

The tungsten ore is converted into WO_3 concentrate and then marketed for manufacture of various products. Therefore the reserves/ resources have broadly been classified into ore and contained WO_3.

The concentrate specifications for commercial purpose are determined in terms of WO_3 content. Any concentrate with 65% or more WO_3 content is considered saleable material. However low grade concentrate can also be used to make intermediate product provided the product can be obtained at an economic cost.

In Degana area of Rajasthan & Chendapathar,West Bengal, the minimum economic grade of tungsten ore considered was 0.1% WO_3 content for production of saleable concentrate. Incidence of WO_3 in the tungsten ore in the different areas of the country is as under :

At Degana, Rajasthan, out of 7 blocks minimum and maximum value of WO_3 was noticed 0.09% & 1.62% respectively. At Balda of Sirohi district, Rajasthan, average WO_3 content ranges from 0.24 to 0.48 per cent. In Dewa-Ka-Bera of Sirohi district the average WO_3 is 0.03% and in Udwarya of Sirohi that is 0.27%. In West Bengal, Bankura deposit contains on an average, 0.1% WO_3. In Kuhi-Khobana-Agargaon belt of Maharashtra, GSI has estimated resources in Sakoli basin in Bhandara and Nagpur district, Maharashtra. The analysis showed 0.01 to 0.19% WO_3 in Kuhi block, 0.13 to 0.38% WO_3 in Khobana block and 0.48% WO_3 in Pardi-Dahegaon-Pipalgaon block. Gold ore at Mysore mine of BGML in Karnataka has been reckoned as a potential source of scheelite. The tailing dumps at Kolar Gold Fields(as per NMI sheet available) contain about 0.01 to 0.05% WO_3.

Basis of Categorisation of Resources

As per United Nations Framework Classificaton (UNFC), resources area broadly classified into 'reserves' and 'remaining resources'.

According to the norms of this system, resources of tungsten ore and corresponding contained WO_3 have been placed under feasibility (211), pre-feasibility (222), measured (331), indicated (332), inferred (333) and reconnaissance (334) of remaining resources category.

Salient Features of the Inventory

The total resources of tungsten ore in the country as on 1.4.2015 are estimated at 87.39 million tonnes containing 142.1 thousand tonnes WO_3. The entire estimated quantity has been placed under remaining resources category are in freehold areas.

All India scenarios of tungsten reserves, remaining resources and total resources as on 1.4.2015 vis-a-vis 1.4.2010 is given in Tables - 1 and 2. The tables give an idea about the significant changes if any in terms of increase and

Table - 1 : Reserves/Resources of Tungsten as on 1.4.2015 vis-à-vis 1.4.2010
(By Lease Status/Grade)

(In tonne)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India : Total									
Ore	**-**	**-**	**-**	**87387464**	**87387464**	**No change**	**87387464**	**87387464**	**No change**
Contained WO_3	**-**	**-**	**-**	**142094.35**	**142094.35**	**No change**	**142094.35**	**142094.35**	**No change**
Freehold									
Ore	-	-	-	87387464	87387464	No change	87387464	87387464	No change
Contained WO_3	-	-	-	142094	142094	No change	142094	142094	No change

figures rounded off.

decrease of resources as per lease status, grade and states. In Table-3 district-wise reserves/ resources as on 1.4.2015 have been given.

Of the total resources, Karnataka is leading with 36.68 million tonnes ore (42%) containing 6.2 thousand tonnes of WO_3, Rajasthan 23.93 million tonnes ore (27%) containing 93.7 thousand tonnes of WO_3, Andhra Pradesh 14.80 million tonnes ore (17%) containing 20.26 thousand tonnes of WO_3.Remaining 14% resources are in Maharashtra,Haryana,Uttarakhand,Tamil Nadu and West Bengal.

A total 21 deposits (freehold) have been

Table – 2 : Total Resources of Tungsten as on 1.4.2010 vis-à-vis 1.4.2005 (By States)

(In tonne)

State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India : Total			
Ore	**87387464**	**87387464**	**No Change**
Contained WO_3	**142094.35**	**142094.35**	**No Change**
Andhra Pradesh			
Ore	14802300	14802300	No Change
Contained WO_3	20262.57	20262.57	No Change
Haryana			
Ore	2230000	2230000	No Change
Contained WO_3	3568	3568	No Change
Karnataka			
Ore	36677818	36677818	No Change
Contained WO_3	6235	6235	No Change
Maharashtra			
Ore	8077250	8077250	No Change
Contained WO_3	16035	16035	No Change
Rajasthan			
Ore	23928294	23928294	No Change
Contained WO_3	93707.94	93707.94	No Change
Tamil Nadu			
Ore	250000	250000	No Change
Contained WO_3	50	50	No Change
Uttarakhand			
Ore	658000	658000	No Change
Contained WO_3	705	705	No Change
West Bengal			
Ore	763802	763802	No Change
Contained WO_3	1530.84	1530.84	No Change

figures rounded off.

covered in National Mineral inventory as on 01.04.2015. Of the total resources of tungsten,about 42 million tonnes (48%) have been estimated under inferred (333) & reconaissance (334) categories. These resources are based on limited & preliminary exploration.If theses resources are explored,further, the confidence level of resource estimation may improve.

Table - 3 : District wise Reserves/Resources of Tungsten as on 1.4.2015

(In tonne)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total			
Ore	**-**	**87387464**	**87387464**
Contained WO_3	**-**	**142094.35**	**142094.35**
Andhra Pradesh			
Ore	**-**	**14802300**	**14802300**
Contained WO_3	**-**	**20262.57**	**20262.57**
Godavari (East)			
Ore	-	14802300	14802300
Contained WO_3	-	20262.57	20262.57
Haryana			
Ore	**-**	**2230000**	**2230000**
Contained WO_3	**-**	**3568**	**3568**
Bhiwani			
Ore	-	2230000	2230000
Contained WO_3	-	3568	3568
Karnataka			
Ore	**-**	**36677818**	**36677818**
Contained WO_3	**-**	**6235**	**6235**
Gadag			
Ore	-	300000	300000
Contained WO_3	-	360	360
Kolar			
Ore	-	33675889	33675889
Contained WO_3	-	4392	4392
Raichur			
Ore	-	2701929	2701929
Contained WO_3	-	1483	1483
Maharashtra			
Ore	**-**	**8077250**	**8077250**
Contained WO_3	**-**	**16035**	**16035**
Nagpur			
Ore	-	8077250	8077250
Contained WO_3	-	16035	16035
Rajasthan			
Ore	**-**	**23928294**	**23928294**
Contained WO_3	**-**	**93707.94**	**93707.94**
Nagaur			
Ore	-	23775123	23775123
Contained WO_3	-	93179	93179
Sirohi			
Ore	-	153171	153171
Contained WO_3	-	528.94	528.94

(Contd.)

Table-3 (Concld.)

State/District	Reserves	Remaining Resources	Total Resources
Tamil Nadu			
Ore	**-**	**250000**	**250000**
Contained WO_3	**-**	**50**	**50**
Madurai			
Ore	-	250000	250000
Contained WO_3	-	50	50
Uttarakhand			
Ore	**-**	**658000**	**658000**
Contained WO_3	**-**	**705**	**705**
Almora			
Ore	-	658000	658000
Contained WO_3	-	705	705
West Bengal			
Ore	**-**	**763802**	**763802**
Contained WO_3	**-**	**1530.84**	**1530.84**
Bankura			
Ore	-	763802	763802
Contained WO_3	-	1530.84	1530.84

figures rounded off.

5.8 VANADIUM

Introduction

Vanadium is a rare element even though its concentration in earth's crust is more than those of some common metals. It occurs in trivalent form; i.e. V^{+++} in the earth's crust but it being geochemically similar to trivalent iron ; i.e., Fe^{+++}, it generally substitutes the ferric iron and consequently forms few minerals of its own. Thus, there is a direct relation between vanadium and iron. It occurs in association with titaniferrous magnetite and recovered as a by-product during iron and steel manufacture. Vanadium is also concentrated in many end-products of organic material including coal and oil. In addition, vanadium present in bauxite can also be recovered as vanadium sludge from red mud during the production of aluminium. On an average, it contains 0.26 to 0.4 per cent V_2O_5.

Basis of Grade Classification

Vanadium ore as mined is not used directly in the industry. Therefore, the end use classification at the time of resource estimation is not possible. Hence in the inventory as on 1.4.2015, resources have been classified as ore and its metal content.

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC) resources have broadly been classified into 'reserves' and 'remaining resources'.

According to the norms of this system, reserves of vanadium ore and metal have been placed under proved (111) and probable (121) & (122) categories. The remaining resources have been placed under measured (331), indicated (332) and inferred (333) categories.

Salient Features of the Inventory

The total resources of vanadium ore in the country as on 1.4.2015 are estimated at 24,633,855 tonnes having 64,594.01 tonnes of metal. The entire 24,633,855 tonnes of ore containing 64,594.01 tonnes of metal are in Remaining Resources category.

All India scenarios of vanadium reserves, remaining resources and total resources as on 1.4.2015 vis-à-vis 1.4.2010 have been given in Tables - 1 and 2. The Tables give an idea about changes in terms of increase or decrease of resources as per lease status, grade and state. In Table-3 district wise reserves/resources have been given.

Out of the total 24,633,855 tonnes of ore, 24,249,225 tonnes have been estimated in the freehold category and remaining 384,630 tonnes are estimated in the lease hold (public) category. The resources of vanadium ore have been estimated in the state of Karnataka, Maharashtra and Odisha. Out of these, Karnataka is credited with 19,384,430 tonnes (79%) of ore containing 49,497.55 tonnes of metal followed by Odisha with 4,864,795 tonnes (19%) of ore containing 13,557.94 tonnes of metal and Maharashtra with 384,630 tonnes (2%) of ore having 1,538.52 tonnes metal.

The resources of vanadium ore have been marginally decreased by 85,033 tonnes (0.35%) and that of metal have been decreased by 293.16 tonnes (0.45%) as compared to the inventory as on 1.4.2010. This decrease has occurred due to re-estimation of resources in 1 leasehold (public) deposit in Gondia district of Maharashtra.

About 18,297,225 tonnes resources of vanadium ore (74%) containing 54,133.29 tonnes of metal have been estimated under inferred (333) category. These estimates are based on a limited and preliminary exploration. If these areas are examined for further detailed exploration the confidence level of the vanadium resources in the country may improve.

A total of 24 deposits of vanadium have been covered in NMI as on 1.4.2015. Out of which 23 deposits are in freehold and 1 deposit is in leasehold (public) areas.

Table - 1 : Reserves/Resources of Vanadium as on 1.4.2015 vis-à-vis 1.4.2010 (By Lease Status/Grade)

(In tonnes)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India : Total									
Ore	**-**	**410955**	**-410955**	**24633855**	**24307933**	**(+) 325922**	**24633855**	**24718888**	**(-)85033**
Contained V_2O_5	**-**	**1602.72**	**-1602.72**	**64594.01**	**63284.45**	**(+) 1309.56**	**64594.01**	**64887.17**	**(-)293.16**
0									
Freehold									
Ore	-	-	-	24249225	24249255		24249225	24249255	-
Contained V_2O_5	-	-	-	63055.49	63055.49		63055.49	63055.49	-
Leasehold (Public)									
Ore	-	**410955**	**(-)410955**	384630	58708	(+)325922	384630	469663	(-)85033
Contained V_2O_5	-	**1602.72**	**(-)1602.72**	1538.52	228.96	(+) 1309.56	1538.52	1831.68	(-)293.16

figures rounded off.

Table – 2 : Total Resources of Vanadium as on 1.4.2015 vis-à-vis 1.4.2010 (By States)

(In tonnes)

State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
Total			
Ore	**24633855**	**24718888**	**(-)85033**
Contained V_2O_5	**64594.01**	**64887.17**	**(-)293.16**
Karnataka			
Ore	19384430	19384430	No Change
Contained V_2O_5	49497.55	49497.55	No Change
Maharashtra			
Ore	384630	469663	(-)85033
Contained V_2O_5	1538.52	1831.68	(-)293.16
Odisha			
Ore	4864795	4864795	No Change
Contained V_2O_5	13557.94	13557.94	No Change

figures rounded off.

Table - 3 : District wise Reserves/Resources of Vanadium as on 1.4.2015

(In tonne)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total			
Ore	-	**24633855**	**24633855**
Contained V_2O_5	-	**64594.01**	**64594.01**
Karnataka			
Ore	-	**19384430**	**19384430**
Contained V_2O_5	-	**49497.55**	**49497.55**
Hassan			
Ore	-	904430	904430
Contained V_2O_5	-	1840.55	1840.55
North Kanara			
Ore	-	5150000	5150000
Contained V_2O_5	-	21058	21058
Shimoga			
Ore	-	13330000	13330000
Contained V_2O_5	-	26599	26599
Maharashtra			
Ore	-	**384630**	**384630**
Contained V_2O_5	-	**1538.52**	**1538.52**
Gondia			
Ore	-	384630	384630
Contained V_2O_5	-	1538.52	1538.52
Odisha			
Ore	-	**4864795**	**4864795**
Contained V_2O_5	-	**13557.94**	**13557.94**
Balasore			
Ore	-	73920	73920
Contained V_2O_5	-	236.54	236.54
Mayurbhanj			
Ore	-	4790875	4790875
Contained V_2O_5	-	13321.40	13321.40

figures rounded off.