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STANDING COMMITTEE ON COAL AND STEEL (2016-2017) SIXTEENTH LOK SABHA

MINISTRY OF MINES

Action Taken by the Government on the Observations/ Recommendations contained in the Twenty-Second Report of the Standing Committee on Coal and Steel (Sixteenth Lok Sabha) on "Science & Technology/Research & Development in Mining Sector"

THIRTY-FIRST REPORT

LOK SABHA SECRETARIAT
NEW DELHI
MARCH, 2017/CHAITRA, 1939 (Saka)

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Presented to Lok Sabha on 27.03.2017

Laid in Rajya Sabha on 27.03.2017

LOK SABHA SECRETARIAT
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Shri Rakesh Singh- Chairperson

Name of the Member

Lok Sabha

2. Shri A Arunmozhithevan
3. Shri Kalyan Banerjee
4. Shrimati Jyoti Dhurve
5. Shri Nagesh Godam
6. Shri Shailesh Kumar
7. Dr. Banshilal Mahato
8. Shri Kamalbhan Singh Marabi
9. Shri Ajay Nishad
10. Shrimati Riti Pathak
11. Shrimati Ranjit Ranjan
12. Dr. Ravindra Kumar Ray
13. Shri Chandu Lal Sahu
14. Shri Tamradhwaj Sahu
15. Shri Tathagata Satpathy
16. Shri Janardan Singh "Sigriwal"
17. Shri Pashupati Nath Singh
18. Shri Rama Kishore Singh
19. Shri Sunil Kumar Singh
20. Shri Sushil Kumar Singh
21. Shri Krupal Balaji Tumane

Rajya Sabha

22. Shri Ali Anwar Ansari
23. Dr. Pradeep Kumar Balmuchu
24. Shri Ranjib Biswal
25. Shri Md. Nadimul Haque
26. Shri B.K Hariprasad
27. Shri Ranvijay Singh Judev
28. Shri Ram Vichar Netam
29. Shri Dilip Kumar Tirkey
30. Vacant
31. Vacant

SECRETARIAT

1. Shri U.B.S. Negi - Joint Secretary
2. Shri Ajay Kumar Garg - Director
3. Shri Arvind Sharma - Additional Director
4. Ms. Miranda Ingudam - Deputy Secretary
5. Smt. Madhu Tandon - Sr. Executive Assistant

INTRODUCTION

I, the Chairperson, Standing Committee on Coal and Steel having been authorised by the Committee to present the Report on their behalf, present this Thirty-First Report (Sixteenth Lok Sabha) on Action Taken by the Government on the observations/recommendations contained in the Twenty-Second Report of the Standing Committee on Coal and Steel (Sixteenth Lok Sabha) on "Science & Technology/Research & Development in Mining Sector" pertaining to the Ministry of Mines.

2. The Twenty-Second Report (Sixteenth Lok Sabha) of the Standing Committee on Coal and Steel was presented to Lok Sabha on 10.08.2016. Replies of the Government to all the observations/recommendations contained in the Report were received on 08.11.2016.

3. The Standing Committee on Coal and Steel considered and adopted this Report at their sitting held on 02.03.2017.

4. An analysis on the Action Taken by the Government on the observations/ recommendation contained in the Twenty-Second Report (Sixteenth Lok Sabha) of the Committee is given at **Annexure-II.**

5. For facility of reference and convenience, the observations and recommendations of the Committee have been printed in bold letters in Chapter-I of the Report.

NEW DELHI;
2 March, 2017
11 Phalguna, 1939(Saka)

RAKESH SINGH
Chairperson
Standing Committee on Coal and Steel

REPORT

CHAPTER I

This Report of the Standing Committee deals with Action Taken by the Government on the observations/recommendations contained in the Twenty-Second Report (Sixteenth Lok Sabha) of the Standing Committee on Coal and Steel(2016-17) on the Subject, "Science & Technology/Research & Development in Mining Sector" of the Ministry of Mines which was presented to Lok Sabha and laid in Rajya Sabha on 10.08.2016.

2. The Action Taken Notes have been received from the Ministry of Mines on 08.11.2016 in respect of all the 17 observations/recommendations contained in the Report. These have been categorised as follows:

(i) Observations/Recommendations which have been accepted by the Government: Serial Nos. 1, 2, 3, 4, 5, 6, 7, 8,10, 11, 12, 13, 15, 16 and 17

Total: 15
Chapter-II

(ii) Observations/Recommendations which the Committee do not desire to pursue in view of the replies of the Government :

Sl. No. Nil Total: 00
Chapter III

(iii) Observations/Recommendations in respect of which replies of the Government have not been accepted by the Committee:

Sl. No. 9 and 14

Total: 02
Chapter IV

(iv) Observations/Recommendations in respect of which final replies of the Government are still awaited

Sl.No. Nil

Total: 00
Chapter V

3. The Committee do hope and trust that utmost importance would be given to implementation of the Observations/Recommendations accepted by the Government. In case, where it is not possible for the Ministry to implement the recommendations in letter and spirit for any reason, the matter should be reported to the Committee with reasons for non-

implementation. The Committee desire that final Action Taken Replies on the Observations/Recommendations contained in Chapter-I of this Report be furnished to them within three months.

4. The Committee will now deal with the Action Taken by the Government on some of their observations/recommendations made in the Twenty-Second Report.

Recommendation at Serial No 3

Global Ranking In R&D

5. The Committee found that in R&D sector at the international level, India was ranked at 48th in capacity innovation, 52nd in scientific institution and 30th in R&D expenditure in the World. While observing that the parameters taken into consideration for ranking were percentage of economic output devoted to R&D investment, scientific and engineering researchers per capita and innovations measured as patents per capita, the Committee noted that India's poor ranking was mainly on account of lower percentage economic output devoted to R&D investment and lower scientific and engineering researchers per capita. The Committee felt unhappy to find that India spends a meager 0.81 percent of their GDP on R&D as compared to 2.05 percent by China, 4.36 percent by South Korea and 2.7 percent by USA. Further, India stands at a lowly 81 out of 141 countries in the Global Innovative Index. The Committee, therefore, were of the considered opinion that there was an imperative need to boost the R&D infrastructure across various sectors by allocation of more funds for R&D resources; making R&D jobs attractive to young talented scientists and professionals; greater institutional collaboration with renowned foreign universities/technology institutes; focus on future upcoming technologies to meet global challenges in value-added products, technology and cost competitiveness and development of indigenous cutting edge technologies.

6. The Ministry in its Action Taken Reply has stated as under:-

> "India lacks mostly in R&D (0.88% of GDP on R&D) expenditure as compared to developed countries (more than 2% of GDP). India has to garner more resources in terms of facilities and infrastructure for R&D needs of country. Although there are world class facilities and

infrastructure available for R&D in defence and space sector but other sectors are left behind. Country needs to have more investments in R&D setups and take a lead from international experience instead of starting from scratch or reinventing the wheel. More emphasis should be made for developing indigenous technologies. Importing technology should be the last option in order to promote R&D at national level.

In order to compete with the World the focus of the R&D should be not only to tackle the present situation but also cater to the needs for future upcoming technologies. It is the need of the hour to strengthen infrastructure facilities at Jawaharlal Nehru Aluminium Research and Development Design Centre (JNARDDC) for developing indigenous technologies in the field of alumina/aluminium. JNARDDC is the only R&D facility in India carrying out research and development from bauxite to finished product under one roof. As compared to other R&D facilities in the World like Rio Tinto R&D Centre ARDC, Canada, VAW Germany, Aluminium Pechiney, France & SNIR, China JNARDDC requires urgent capacity building to compete Worldwide. JNARDDC requires setup for developing indigenous alumina/aluminium technology for overall development of Indian aluminium sector other than doing mere testing and characterisation work. Centre proposes to buildup the necessary infrastructure for conducting research in energy reduction, environment friendly technologies and indigenization of aluminium alloys. With the renewed facilities of equipments and manpower the Centre will be able to make invaluable contribution in the research areas of value addition, energy and environment areas as compared to others Worldwide.

NIMH

As far as institutional collaboration is concerned, NIMH had previously signed the Memorandum of Agreement on Academic Exchange with Faculty of Medicine, University of Fukui, Japan & Central Chest Institute of Thailand and also Letter of Agreement for Education with University of California, San Francisco (UCSF).

Currently, NIMH has signed MoU with Manipal University, DattaMeghe Institute of Medical Sciences (Deemed University) and with Central India Institute of Medical Sciences (CIIMS) for collaborative research.

As far as the need to boost the R&D infrastructure is concerned, NIMH highlighted need to create and strengthen infrastructure facilities to evolve it as state-of-the-art centre of excellence on all health issues relating the miners and mining community in India."

7. Expressing concern at the inadequacy of R&D efforts in the country, the Committee in their original Report had emphasized on the need to boost R&D infrastructure across the country by allocation of more funds

making R&D jobs more attractive, collaboration with foreign universities/institutes etc. The Ministry in its Action Taken Reply while agreeing with the observations of the Committee have given the details of R&D initiatives being undertaken at Jawaharlal Nehru Research Development and Design Centre (JNRADDC) and National Institute of Miners' Health (NIMH). The Committee find the reply silent about allocation of more funds for R&D resources or making the R&D jobs more attractive. The Committee, therefore, reiterate their recommendation on all these aspects besides boosting R&D infrastructure across various sectors through institutional collaborations and allocation of more funds for development of indigenous technologies to improve India's global ranking in R&D. The Committee would like to be apprised of the specific time line of the action plan of the Government for the purpose.

Recommendation at Serial.No.5

R&D by Autonomous Bodies

8. The Committee had noted that there are three grant receiving autonomous bodies under the Ministry of Mines, namely, Jawaharlal Nehru Aluminum Research Development and Design Centre (JNARDDC); Nagpur, National Institute of Rock Mechanics (NIRM), Kolar and National Institute of Miners' Health (NIMH), Nagpur which were pioneering the R&D activities in the Mining Sector under the Science & Technology (S&T) Scheme of Ministry of Mines. These institutions receive partial financial support from the Ministry to meet around 80% of their expenditure and also get funding from research projects sponsored by other sources including private sector. At the same time, the Committee noted that these Institutions were carrying out the R&D related work with obsolete equipment and a need was felt to replace the capital equipment which have outlived their life. Since these bodies are unique from the view of national importance and keeping their core competence in mind, the Ministry

modified the S&T Scheme and considered to add one more component in the Scheme namely 'One Time Grant for Capacity Building' and grant to the tune of Rs. 13.70 crore was released to these Institutions during the year 2014-15. Additionally, timely and regular disbursal of non-plan grant will cater to the operational and maintenance related needs of these institutes besides meeting salary component of the researchers employed in these institutes. The Committee further noted that though the three autonomous institutes were trying to generate funds on their own, the fact remained that the same was just sufficient to run the institutes and not enough to carry out more extensive research. In the past, plan grant was not given to these institutes on a regular basis. The Committee had observed that plan grant on a regular basis for infrastructure upgradation was needed so that these institutes were able to properly channelize their focus on R&D activities. The Committee felt that these institutes can be used by Government for guided research work to help the Country to develop technologically. While observing that Ministry's S&T budget was just a small grant, the Committee recommended that it need to be enhanced in order strengthen the infrastructure facilities and capacity of these research institutions for developing indigenous cutting edge technologies in their respective field.

9. The Ministry in its Action Taken Reply has stated as under:-

"Suggestions of Hon'ble Committee have been noted by the Ministry for compliance."

10. The Committee in their Original Report had observed that the three grant receiving autonomous bodies under the Ministry of Mines *viz.* Jawaharlal Nehru Research Development and Design Centre (JNRADDC), Nagpur; National Institute of Miners' Health (NIMH), Kolar; and National Institute of Rock Mechanics (NIRM), Nagpur are bodies of national importance in terms of their core competence carrying out R&D related work. The Committee had observed that plan grant on a regular basis for infrastructure upgradation was needed so that these institutes were able

to properly channelize their focus on R&D activities. The Committee had also recommended that the Ministry's Science and Technology (S&T) budget needs to be enhanced to strengthen infrastructure facilities and capacity of these research institutions for developing indigenous cutting edge technologies in their respective field. The Committee are, however, dismayed to note the Ministry's reply which merely states that the suggestions of the Committee have been noted for compliance without specifying any concrete steps that the Ministry would be initiating in compliance of these recommendations. The Committee, therefore, reiterate their earlier recommendation and desire that the Ministry should furnish a detailed compliance note indicating the timeframe and the initiatives that the Ministry intend to take up. The Committee may be apprised of the action taken in the matter within three months of presentation of this Report.

Recommendation at Serial No 8

R&D in New Areas

11. The Committee had noted that NIRM is an autonomous research institute providing research and consultancy support in almost entire spectrum of rock mechanics for improving safety and productivity in the mining and civil engineering sectors at par with international standards. The Committee also observed that R&D expenditure of NIRM during 2012-13, 2013-14 and 2014-15 was Rs. 1222.34 lakh, Rs. 1683.25 lakh and 1409.84 lakh respectively. Admittedly, NIRM was expanding its activities into newer areas, such as oil & gas, metro rails, major river-linking projects and other infrastructure projects. Centers of Excellence were proposed to be established in core areas of rock mechanics. Presently, Centre for Testing Services and Centre for Site Characterization had been identified. In future, other Centers like Mining Technology, Excavation engineering, Design & Monitoring and Advanced Rock

Mechanics Training would be identified. NIRM had reported that occasionally there was delay in site preparation by the user agencies due to their internal issues and also in procuring/fabricating the required equipment/instruments in view of their specialized nature which needed to be imported at times. The Committee were also given to understand that as shallow deposits were exhausting, one had to go for deeper depths to extract the minerals, thereby facing more strata related problems. With environment restrictions becoming stringent, NIRM needed to look for hitherto uneconomical deposits and deposits in remote places, where one had to face complex strata conditions. The Committee felt that to deal with the above situations, NIRM needed for carrying out R&D in new areas, for which increased Government funding was needed. In view of the foregoing, the Committee recommended that not only the Government should grant more funds to NIRM for carrying out R&D in new areas but the NIRM should also make earnest efforts to successfully implement their projects/schemes in these new areas.

12. The Ministry in its Action Taken Reply has submitted as under:-

"The Ministry has awarded to NIRM the following two projects during the year 2012-13:

1. Development of a Technique for Assessment of Reclaimed Land and Structures under Settling Environment – Cost of the project ₹ 137 Lakhs; Status: continuing.

2. Estimation of Seismic Hazard in and around the mined out areas of Kolar Gold Fields – Cost of the project ₹63.57 Lakhs; Status: continuing.

As recommended by the Committee, NIRM proposes to pursue research in the following major thrust areas:

1) Development of innovative mining methods for optimum exploitation of complex and difficult coal and mineral reserves, and for improvement in production, productivity and quality.

2) Development of innovative excavation and rock fragmentation techniques, through introduction of modern methods of tunnel excavation and controlled blasting.

3) Development of underground space technology for oil and gas storage, and nuclear waste storage.

4) Development of a package for optimum exploitation of mineral deposits, both surface and underground, using improved techniques such as numerical modelling.

5) Development of techniques for production of high quality dimension stones at lower cost, and development of small scale mining for optimum exploitation of mineral resources.

6) Development of Information Technology for mining, the use of Virtual Reality Simulation, Expert Systems and Artificial Intelligence.

For this purpose, NIRM has identified six centres of Advanced Research to carry out R&D in the above frontier areas:

a) Centre for Testing Services (CTS)
b) Centre for Advanced Rock Mechanics Training (CARMT)
c) Centre for Sustainable Mining (CSM)
d) Centre for Design & Monitoring (CDM)
e) Centre for Excavation Engineering (CEE)
f) Centre for Site Characterization (CSC)

The first two Centers are already functioning at Kolar Gold Field (KGF). The other four Centers will start at Bengaluru during 2016-17.

These Centres will be multi-disciplinary in nature, and will serve as a focal point for industry-driven research. The major objectives of these Centres would be :

- to conduct applied research supporting the technical advances of the mining, civil and construction industry,
- to establish unique partnership between industry and the Institute,
- to perform research of direct benefit to the industry, and
- to transfer the technology directly to the user industries."

13. The Committee observe from the action taken reply of the Ministry that besides continuing with the two projects awarded by the Ministry during the year 2012-13, the NIRM in pursuance of the recommendation of the Committee proposes to pursue research in major thrust areas like development of innovative mining methods; innovative excavation and Rock fragmentation technologies; underground space technology; package for optimum exploitation of mineral deposits; techniques for production of high quality dimension stones; and Information Technology for Mining. The Committee have also been apprised that NIRM has

identified six centres of Advanced Research to carry out R&D in the above frontier areas. These centres will be multi disciplinary in nature and will serve as a focal point for industry-driven research. While appreciating the initiatives being taken up by NIRM, the Committee note that the Ministry has not offered any comments on their recommendation for grant of more funds to NIRM for carrying out R&D in new areas. The Committee, therefore, reiterate the same and would like to be apprised of the present status of the start of remaining of advanced research in Bengaluru.

Recommendation at Serial No. 9

National Institute of Miners' Health (NIMH)

14. The Committee had noted that National Institute of Miners' Health was established with the mandate to conduct applied research in the field of occupational health and hygiene of workers employed in mining and mineral industry with the vision of 'safe mines and healthy miners'. The R&D expenditure of NIMH during 2012-13, 2013-14 and 2014-15 were Rs. 236.64 lakh, Rs. 254.50 lakh and 257.04 lakh respectively. The Committee had observed that the key initiatives taken up by NIMH inter-alia include development of standard framework and guidelines for noise mapping in mines and surrounding community; Multi Centric Study of dust Related Diseases in Stone Mines and Development of Sustainable Preventive Programme; Identification of biomarkers for detection of Noise Induced Hearing Loss in the Miners; etc. While expecting that latest and advanced equipment are used by NIMH to analyse the human biological and environmental samples collected during field study, the Committee had also desired to be apprised of the mechanism with NIMH/Ministry of Mines to monitor that the recommendations of NIMH are implemented by all mining companies so that these initiatives fructify into tangible benefits.

15. The Ministry in its Action Taken Reply has submitted as under:-

> "The Directorate General of Mines Safety (DGMS), Ministry of Labour & Employment, is responsible for monitoring compliance of law and

monitors implementation of recommendations of NIMH given by the Institute from time to time. Guidelines for monitoring health/environmental hazards are sent to DGMS, after approval of the Ministry of Mines, for implementation of the same."

16. The Committee in their observation/recommendation made in the Original Report had desired that they be apprised of the mechanism available with the National Institute of Miner's Health (NIMH)/Ministry of Mines to monitor that the recommendations of NIHM are implemented by all the Mining Companies so that the research works of NIMH fructify into tangible benefits. The Committee note from the Action Taken Reply of the Ministry that the Directorate General of Mines Safety (DGMS), Ministry of Labour & Employment is responsible for monitoring compliance of law and also monitors the implementation of the recommendation of NIMH from time to time. The Committee find the reply of the Ministry unacceptable as the Ministry instead of going into the spirit of the recommendation has tried to wash off their hands of any responsibility to monitor the implementation of the recommendations of NIMH. The Committee, therefore, desire that the Ministry of Mines should develop some suitable mechanism in coordination with DGMS/Ministry of Labour to monitor implementation of NIMH guidelines regarding health and environmental issues by all mining companies and that they be apprised of the same.

Recommendation at Serial No 12

Hindustan Copper Limited (HCL)

17. The Committee had noted that R&D expenditure of Hindustan Copper Ltd. was Rs. 3.068 crore during 2013-14 and it was reduced to Rs. 2.34 crore during the year 2015-16. In spite of reduced budgetary outlays for R&D by HCL, the R&D expenditure with respect to Profit After Tax (PAT) has increased from

1.07% in 2013-14 to 7.0% during 2015-16. The Committee were apprised of the various R&D initiatives/studies undertaken by HCL like utilization of copper slag in cement industry, mineral processing test work of copper, recovery of valuable metals from copper waste, etc. The Committee, however, observe that HCL has cited lack of "state-of-the-art" testing facilities in the Country for beneficiation studies of copper ore as one of the major constraints in improving the efficiency of the existing process. The Committee also note that HCL lacks in-house talent for R&D activities and has plans to tie up with Non-Ferrous Materials Technology Development Centre (NFTDC), Hyderabad to impart requisite training. While stressing the need for infusing more funds for R&D activities by HCL, the Committee had also desired to be apprised of the future strategy of HCL to overcome the constraints faced by the company to improve its operating efficiency and become a market leader.

18. The Ministry in its Action Taken Reply has stated as under:

"The following are the future strategy of HCL under implementation to overcome the constraints faced by the company to improve its operating efficiency and become a market leader:

1. HCL has planned to recruit experienced scientist to strengthen in-house R&D team.
2. The R&D team of HCL will be given training in reputed scientific institution of India in areas like mining of copper ore, beneficiation of ore, processing of concentrate, refining of copper, extraction of associated minerals and metals from ore, energy efficiency, process efficiency, various testing methodology etc."

19. The Committee note with appreciation that in accordance with their observation and recommendation, Hindustan Copper Limited (HCL) has highlighted their future strategy for overcoming the constraints faced by the Company to improve its operating efficiency. The Committee, therefore, wish to re-emphasize that R&D project being a very important component, utmost priority need to be given to these R&D projects by HCL. The Committee, however, observe that the reply of the Government is silent about the need for infusing more funds for R&D activities in HCL.

The Committee, therefore, desire to be apprised of the details of funds earmarked by HCL to achieve the desired results in R&D activities.

Recommendation at Serial No. 14

Need to Increase R&D Investment

20. Keeping in view low expenditure for R&D activities by the PSUs of the Ministry of Mines the Committee desired that Mining Sector PSUs must look into this aspect seriously and take adequate steps to increase their R&D investment and achieve not only the stipulated target of 1% of their profit after tax as R&D expenditure but also take necessary steps to ensure utilization of 1% of the total turnover of the Company by the terminal year of the 12th Plan i.e. 2016-17. The Committee also recommended that the Ministry should issue necessary directions to PSUs as well as private sector companies to chalk out a strategy for increasing expenditure on R&D activities and desired that the Ministry should take necessary steps to ensure setting up of Centralized R&D organization like Steel Research and Technology Mission of India (SRTMI) in the steel industry to ensure concerted and coordinated system of R&D in Mining Sector in the Country.

21. The Ministry in its Action Taken Reply has stated as under:

"As per Department of Public Enterprises Guidelines, minimum expenditure on R&D activities by a Miniratna-II Category company is 0.5 % of PAT.

Expenditure on R&D activities by MECL which is a Miniratna-II company, in last 4 years i.e 2012-13 to 2015-16,stood at Rs. 85.01 lakh against the statutory requirement of Rs. 70.10 lakh.

During 2016-17, the 3 ongoing R&D projects which started during 2015-16 and where no expenditure was booked last year will continue and the expenditure shall be booked during the current year as a result MECL will achieve the expenditure targets of the XII Five Year Plan by the end of this year.

MECL has planned and is investing in modernisation of its age old laboratories, geophysical unit, drilling fleet, IT Centre and work shop with CAPEX of Rs.22.85crore. In addition, MECL also has ambitious plans for creation of infrastructure for the laboratories and workshop for an amount of Rs.33 crore.

Further, MECL is going to take up on experimental basis the application of Drone in mineral exploration in collaboration with IIT, Kanpur during the year.

Once these capacities are created, MECL will be in a position to take up advanced R&D projects in a more holistic manner."

Year	PAT of Pre. year	0.5 % of PAT of Pre. year	Actual Expenditure on R& D Activities by MECL during the year
2012-13	1732	8.66	15.73
2013-14	2066	10.33	29.95
2014-15	2546	12.73	39.33
2015-16	7676	38.38	Work in progress. No expenditure incurred during the year
Total	14020	70.10	85.01

22. The Committee in their original Report, while emphasizing for more concerted efforts on the part of mining sector PSUs on increasing their R&D investment besides taking necessary steps for ensuing 1% utilization of total turnover by 2016-17, had recommended for the Ministry of Mines to issue necessary directions to PSUs/private sector companies to chalk out a strategy for increasing R&D expenditure. Moreover, the Committee had also desired the Ministry for taking necessary steps for setting up of a centralized R&D organization on the line of SRTMS in Steel Industry; to ensure concerted and coordinated system of R&D in mining. The Committee, however, express their unhappiness at the Action Taken Reply received from the Ministry wherein all these important issues have not even been commented upon. Taking a strong note of this kind of disinterested approach of the Ministry, the Committee reiterate their recommendation and desire the Ministry to furnish a complete action taken reply within 3 months of the presentation of this Report.

Recommendation at Serial No 16

Indian Bureau of Mines (IBM)

23. The Committee had observed that one of the major developmental function of IBM was to play a role of a catalytic agency to promote and develop

the much needed R&D in mineral processing in the field of mineral beneficiation, mineral characterization, chemical analysis of ores and minerals and analysis of environmental samples. Against the RE of Rs. 5.91 crore for R&D investment in IBM during 2013-14, the actual expenditure was Rs. 5.56 crore and against RE of Rs. 6.56 crore during 2014-15, the actuals were Rs. 5.78 crore. According to the Ministry of Mines "Mineral Processing (Erstwhile Ore Dressing) Division of IBM carries out R&D studies in the field of mineral beneficiation. It's Modern Mineral Processing Laboratory (MMPL) and Pilot Plant comprising of Ore Dressing Laboratory, Mineral Beneficiation Pilot Plant, and Analytical Laboratory Complex established with the assistance of UNDP was well equipped with state-of-the-art facilities to carry out R&D studies in the field of mineral beneficiation and mineral characterization and analysis of environmental samples. The Bureau has zone-wise facilities in mineral testing and beneficiation with regional ore dressing laboratory and pilot plants at Ajmer and Bangalore which were also well equipped with sophisticated equipment. A 'Clay Laboratory' had also been established to cater to the needs of the north-eastern region exclusively. Taking note of the static performance of IBM for ore Dressing Investigation and Mineralogical examination varying from 55 to 65 and 2060 to 2509 during the last 5 years and declining Chemical Analysis carried out by Mineral Processing unit from 49,139 during 2011-12 to 34,660 during 2014-15, the Committee would like to be apprised of the reasons for the same. The Committee had also desired to be informed about the steps taken by the IBM to improve the performance of its Mineral Processing Division.

24. The Ministry in its Action Taken Reply has stated as under:

> "Reasons for static performance of IBM for Ore Dressing Investigations, Mineralogical Examination and Chemical Analysis are as follows:
>
> The R&D activities are carried out through IBM's Scheme No. 2 namely "Mineral beneficiation Studies - Utilization of Low grade and Sub-grade ores and analysis of Environmental samples". The activities, inter-alia, cover development of process flow sheet on low grade, ferrous, non-ferrous and precious metal ores as well as industrial minerals, techno-economic pre-feasibility reports for beneficiation of low-grade ores, Characterization/Mineralogical studies on ores, rocks, sinters, slags etc.
>
> The test work and consultancy services are carried out on promotional as well as on charge basis. In case of promotional work, IBM conducts test

work on the samples mainly collected during inspections of mines and R&D support provided towards fulfilling regulatory functions of IBM for systematic and scientific mining, which are prime importance from conservation and environmental aspects. The charge basis samples are received from the public and private sector mines and also from exploratory agencies such as GSI, MECL etc.

The Annual target of the Mineral Processing Division (MPD) envisages only quantitative approximation. The targets fixed are to conduct 60 ore dressing Investigation, 2300 Mineralogical studies and 40,000 chemical analysis per annum but do not elaborates the type & source of those samples to be generated from in advance. Thus, whatever projects received either from Regulatory or sponsored sources on first come first basis are taken up by the Division.

To encourage value addition and mineral conservation, during 2015-16, MPD of IBM carried out 57 Mineral Beneficiation Investigations, 2,423 Mineralogical Studies and chemical analysis for 35,376 radicals. Further, 22 Mineral Beneficiation Investigations, 65 Mineralogical Studies and chemical analysis for 3810 radicals were in progress at the end of the year. During 2015-16 there has been significant increase in the inflow of samples from exploratory agencies (GSI, MECL and State DGMs) and from mining sector as well.

Further taking into consideration the low filled up strength the Performance of Mineral Processing Division during 2015-16 is impressive (as against the sanctioned strength of 75 Group A & 18 Group B officers, only 29 Group A & 09 Group B posts are presently filled). Action has already been initiated for filling up of the vacancies.

Thus, from the above explanation it is inferred that performance of IBM for Ore Dressing Investigations, Mineralogical Examination and Chemical Analysis is not static.

The steps taken by the IBM to improve the performance of its Mineral Processing Division are as follows:

In view of new MMDR Act, 2015 and National Mineral Exploration Policy (NMEP, 2016) the role of Mineral Processing Division of IBM has become more vital for Indian Mineral Industry.

As per the NMEP, 2016 Indian Bureau of Mines (IBM) is the principal agency for undertaking ore beneficiation studies. There are five major areas that need to be focused upon by IBM:

i. Identification of lean ores or waste of important technology metals and development of beneficiation mechanisms along with other labs and institutions.
ii. Identification of crucial apparatus/equipment that is dependent on imports. IBM needs to work on cost effective capital equipment development in the country.

iii. Energy efficiency studies in mineral processing.
iv. Water conservation and water recycling circuits in mineral processing.
v. Upgradation of existing processes to make them more environmental friendly.

Accordingly IBM have carried out detailed analysis of the facilities/Equipments/Infrastructure/Manpower available and required in addition for modernization and up-gradation of Mineral Processing capabilities of IBM.

The total funds estimated for modernization and up-gradation comes out to be Rs.216.62 crore. A comprehensive project proposal has been formulated on Capacity Building of Mineral Beneficiation laboratory and Pilot Plant of IBM and same is submitted to National Mineral Exploration Trust Secretariat as per the decisions taken in the 2nd meeting of the Executive committee of NMET held on 9.5.2016.

The Project Proposal inter-alia covers the following four major areas:

1. Procurement of new & energy efficient equipments and modern sophisticated instruments, replacement of old and obsolete instruments/equipments.
2. Development of infrastructure for additional facilities.
3. Collaboration with foreign organization and institutions for training & capacity building and technology infusion.
4. Immediate measures to be taken for filling-up of existing vacant posts and strengthening of Mineral Processing Division with additional man power."

25. In its Action Taken Reply, the Ministry has furnished detailed reasons justifying the performance of IBM for Ore Dressing Investigation, Mineralogical Examination and Chemical Analysis during 2015-16. While pointing out the under staffed Mineral Processing Division having only 29 Group 'A' officers against the sanctioned strength of 75 and only 9 Group 'B' officers against sanctioned strength of 18, the Ministry has stated that action has already been initiated for filling up the vacancies. The Committee note the various steps taken up by the IBM to improve the performance of its Mineral Processing Division as its role have statedly become more vital for the Indian Mineral Industry in view of the new MMDR, Act, 2015 and the National Mineral Exploration Policy (NMEP), 2016. The Committee further note that IBM have identified five major areas

which are needed to be focused upon and carried out a detailed analysis of the available resources required for the same like facilities/equipment/manpower vis-à-vis actual requirements. For this purpose, the total funds estimated for modernization and up-gradation comes out to be Rs. 216.62 crore and a comprehensive project proposal covering four major areas viz. procurement of new and energy efficient equipments; development of additional infrastructure; collaboration with foreign Organizations/Institutions; filling up of vacant posts and strengthening of Mineral Processing Division with additional manpower has been formulated and submitted to the National Mineral Exploration Trust Secretariat. The Committee hope that earnest efforts would be made for expeditious implementation of these project proposals so that tangible benefits are accrued from these laudable initiatives. The Committee would like to be apprised of the action taken in the matter.

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CHAPTER –II

OBSERVATIONS/RECOMMENDATIONS WHICH HAVE BEEN ACCEPTED BY THE GOVERNMENT

R&D in Mining Related Activities

Recommendation at Serial No. 1

The Committee note that in the mining and metal sector, the Ministry of Mines have a limited role in Research and Development (R&D) activities which is primarily driven by private sector and Public Sector Undertakings (PSUs), mainly for the purpose of development of value-added products, technology upgradation and cost competitiveness. However, the Ministry promotes R&D in mining-related activities viz. exploration of mineral deposits including deep seated and hidden minerals, extraction of minerals and rock mechanics, ore beneficiation and waste minimization metallurgy specially in non-ferrous metals, miners' health related issues etc. through its limited budgetary allocation under Science and Technology (S&T) scheme. In this context, the Committee find that the National Mineral Policy, 2008 recognizes the paramount importance of safety, economy, speed and efficiency in extraction of ore resources and its convergence into viable economic alloy and metals and has accorded higher priority to Research and Development (R&D) programmes. The Committee are happy to note that the Ministry of Mines has launched a comprehensive Science and Technology Programme inclusive of three main components *viz.* Research and Development (R&D); Information Education and Communication (IEC); and One-time Capital Component for up-gradation of R&D facilities in three autonomous bodies i.e. Jawaharlal Nehru Research Development and Design Centre (JNRADDC), National Institute of Miners' Health (NIMH) and National Institute of Rock Mechanics (NIRM). Besides, the three Mining PSUs *viz.* National Aluminum Company Ltd. (NALCO), Hindustan Copper Limited (HCL) and Mineral Exploration Corporation Limited (MECL) as well as attached office of Geological Survey of India (GSI) and subordinate office of Indian Bureau of Mines (IBM) also contribute to R&D sector. The Committee are happy to note that in order to fructify the principles enunciated in the National Mineral Policy, guidelines for support to 'Mining Research' were issued in May, 2013 which set forth the objectives and thrust areas of research and sought to provide renewed scientific impetus to address the emerging mining challenges. The Committee hope that earnest efforts will be made by the various bodies involved in R&D in the Mining Sector so that tangible results are achieved from these initiatives. To these extent, the Committee desire the Ministry to set clear targets to achieve the objectives as set out in the vision document within a broad timeframe. The Committee expect that the tangible results from all these R&D Programme foster greater utilization of the available mineral resources judiciously, economically and efficiently in an environmentally sustainable manner.

Action Taken

In an endeavourtowardssustainable development of mineral industry, the Ministry has formulated "Sustainable Development Framework" for

Indian mineral sector which, inter alia, include strengthening of infrastructure for research &development. As per 12th Five Year Plan Working Group Report, indigenous technology has to be upgraded through research and appropriate absorption and adoption of technological innovations abroad. R&D effortsare made to improve efficiency in process, operations and also the recovery of by-products and reduction in specifications and consumption norms. Efforts are directed to evolve low capital and energy saving/ efficient processing systems.

The Ministry of Mines is implementing a plan scheme, namely, Science and Technology Programme under which project proposals for science and technology and R&D are taken up which have significant impact in developing indigenous technology in the minerals and non-ferrous metal sector. Every approved project has a time period within which the project has to be completed. The time period is indicated in the project proposals and approved by Standing Scientific Advisory Group (SSAG). SSAG while approving the projects takes into account the applicability of project which should have direct application in near future besides new techniques and methods. SSAG also decides and approve on the grant-in-aid to each project and the number of instalments in which the funds are to be released. The release of installment of grants is linked with the progress made in the project and submission of utilization certificates of funds earlier released to them.

As per the revised guidelines of May 2013, the Principal Investigator through the implementing organization furnishes three hard copies and a soft copy of yearly progress reports every year (counting from the date of commencement of the project) for annual review of the project. The Principal Investigator is required to make a presentation on the progress of work carried out in the project to the PERC from time to time. The Ministry of Mines deputes empanelled Expert Peer Reviewers/Scientists/Specialists/Finance persons/staff of the Ministry to visit the organization periodically for reviewing the progress of the work and for suggesting measures to ensure early achievement of the objectives of the project.

[Ministry of Mines O.M. No.11/1/2014-M.IV (Pt.) dated 8.11.2016]

Science & Technology Programme in Mining Sector

Recommendation at Serial No. 2

The Committee note that there has been a quantum jump in the allocation of funds for Science and Technology Programme as evident in the Budget Estimates (BE) 2013-14 standing at Rs. 3.97 crore with expenditure of Rs. 1.97 crore which was increased to Rs. 6.60 crore in the Budget Estimates 2014-15 with 100% utilization of the funds. The BE 2015-16 was further increased to Rs. 7.30 crore. Admittedly, the scheme has become more broad based with the participation of a large number of Research Institutes and in the year 2015-16, 86 research proposal were received in the Ministry and are reported to the awaiting clearance as compared to the

16 approved project for the year 2014-15. The Committee observe that the Research Programme supported by the Ministry include important components pertaining to prospecting/exploration of strategic rare metals and rare earth minerals; Research in Mining Methods including roc k mechanics, mine designing, energy conservation, environmental protection and mine safety, and Mineral Beneficiation Techniques to utilize lower grade minerals and for quality improvement. Keeping in view the importance of R&D in the Mining Sector, the Committee feel that the Ministry's endeavour to synergise all the initiatives on these fronts would result in maximizing R&D outcomes. The Committee also stress on the need of putting into place an effective coordinating and monitoring mechanisms at a distinctly higher level in the hierarchy not only for achievement of targets set out in the National Mineral Policy, 2008 but also for ensuring effective utilization of R&D results to boost efficient, economic and safe mining activities in the country. The Committee would like to be apprised of the action taken by the Government in this regard. The Committee would also like to be apprised of the outcome of 16 projects approved during 2014-15 and the present status of 86 Research Projects received during 2015-16.

Action Taken

Suggestions of Hon'ble Committee have been noted by the Ministry for compliance. The Plan Scheme titled "Science and Technology Programme" of Ministry of Mines was launched with a view to encourage research and devopment of indigenous technology in the minerals and non-ferrous metal Sectors. Towards this end, the Ministry gives grant-in-aid to R&D institutions.

The Projects are approved by the Standing Scientific Advisory Group (SSAG) for a duration of two to three years. The grant is released toan Institute once in a year subject to the receiving of utilization certificate (UC) of the previous grants given to the Institute.

Every approved project has a time period within which the project has to be completed. The time period is indicated in the project proposals and approved by Standing Scientific Advisory Group (SSAG). SSAG also decides on the Grant-in-Aid given to every approved project and the number of instalments in which the funds are to be released. The release of installment of grants is linked to the progress made in the project and submission of utilization certificates of funds earlier released to them.

For monitoring/evaluation of research projects, a detailed project report is to be submitted by Principal Investigator under the S&T Programme. There is in built practice to monitor/evaluate the progress through Project Evaluation and Review Committee followed by second tier review and approval by Standing Scientific Advisory Group (SSAG). A system of Peer Group devised for evaluation of the completed projects is also in place for release of the remaining 10% of last installment of funds as per approval of SSAG.

As per the revised guidelines of May 2013, the Principal Investigator through the implementing Institute furnishes three hard copies and a soft

copy of yearly progress reports every year (counting from the date of commencement of the project) for annual review of the project. The Principal Investigator is required to make a presentation on the progress of work carried out in the project to the PERC from time to time. The Ministry of Mines deputes empanelled Expert Peer Reviewers/Scientists/Specialists/Finance persons/staff of the Ministry to visit the organization periodically for reviewing the progress of the work and for suggesting such measures as to ensure early realization of the objectives of the project.

During 2014-15, 11 projects were approved by the Standing Scientific Advisory Group. Projects were approved for the duration of 3 years.After completion of these projects, their outcomes would be known. The details are as under:

Sl. No	Name of the Project /Duration	Objective	Outcome
1.	Purification of commercial rare earth oxides, e.g. Ceria, by molten salt fusion and re-crystallization, Non-Ferrous Material Technology Development Centre (NFTDC), Hyderabad Duration:2 years	Application of molten salt fusion method to dissolve the impure, commercial grade ceria in melt and subsequent production of cerium sulphate, a starting precursor for all cerium based compounds, exploration of melting using induction/microwave heating. ii) Purification of ceric sulfates through multiple re-crystallizations. iii) Synthesis of gadolinia/samaria doped ceria, with sinter-active properties, through carbonate precipitation route etc.	On-going project, Interim and Final reports are still awaited.
2.	Integrated approach for development of process models and pilot production of aluminium alloy extrudates using porthole dies, Jawaharlal Nehru Aluminium Research Development & Design Centre (JNARDDC), Nagpur. Duration: 3 Years	1. Flow stress data generation for various grades of aluminum alloys at different strain rates and in temperature range of 350 degree C to 50 degree C. 2. Development of process models for 3xxx and 6xxx series aluminium alloy extrudates based on flow stress data, numerical simulation and extensive press trials.	On-going project, Interim and Final reports are still awaited.
3.	Development of low density emulsion explosives for energy efficient	1. To develop low density emulsion explosives for energy efficient blasting in environmentally sensitive areas. 2. An investigation into influence	On-going project, Interim and Final reports are still awaited.

	blasting in environmentally sensitive areas, Indian School of Mines, Dhanbad Duration: 3 years	of various properties of low density explosives on detonation behavior. 3. A comparative study between confined and unconfined VOD of explosives. 4. A study on influence of detonic behavior of developed explosive on blast fragmentation and blast performance.	
4.	Physico-chemical processing of low grade chromite ore for beneficiation and agglomeration of fines for recovery of metal values, JadavpurUniversity ,Kolkata Duration: 3Years	The demand of chromium is increasing due to more applications of chromium alloys in high temperature and corrosion resistant materials. To utilize the low grade ore the beneficiation of the ore is very important. The intention of this enrichment is to increase the chromium/iron ratio for the production of the high carbon ferrochrome/charge chrome. In addition to that the fines generated at the mine sites should be utilized by agglomeration of the fines in the form if briquettes. Further low grade ore need to be treated for the reduction of phosphorous content in the ore to make value added low phosphorous ferrochrome	On-going project, Interim and Final reports are still awaited.
5.	Synthesis, characterization and photo-catalytic performance of metal doped semiconductor nano-materials, Aligarh Muslim University, Aligarh Duration: 3 years	One of the major objectives of the present proposal is to synthesize nano-photo-catalyst which can operate under visible light by doping semiconductor with some metal/non-metal/transition metal by sol-gel and hydrothermal reaction technique. Yet another objective is to characterize the synthesized nano-photo-catalyst using standard analytical technique such as FTIR, UV/Vis, SEM, TEM and XRD. The third objective of the present proposal is to determine the efficiency of the photo-catalyst by monitoring the reaction of few selected organic compounds as a function of time under visible light.	On-going project, Interim and Final reports are still awaited.
6.	Development of hard and high temperature refractory material/aggregate from saprolite, Jawaharlal Nehru	To study the various process parameters for possible use of saprolite in refractory industries. To develop refractory material/aggregate from saprolite	On-going project, Interim and Final reports are still awaited.

	Aluminium Research Development & Design Centre (JNARDDC), Nagpur Duration:3 Years		
7.	Study of alkaline-carbonatite complexes as potential resource for REEs, NB-TA and U-TH, Institute of Technology, Roorkee-Uttarakhand Duration: 3years	The main objective of the study is to characterize carbonatite and related rocks as potential resource for REEs (mainly LREE), Nb-(Ta) and U-TH through comprehensive mineralogical and geochemical study. ii) The other objective is to prepare comprehensive exploration models for these mineralization.	On-going project, Interim and Final reports are still awaited.
8.	Development of Nickel containing steel from chromite over burden, Indian Institute of Technology, Kharagpur and Institute of Minerals & Materials Technology, Bhubaneswar (Jointly) Duration: 3years	The main objective of the proposed project is to develop a nickel containing steel from chromite over burden.	On-going project, Interim and Final reports are still awaited.
9.	Production of geopolymer based construction material from pond ASH: an industrial waste, Gandhi Institute of Engineering and Technology, Gunupur, Odisha. Duration: 3 years	1. To replace cement by industrial waste such as pond ash based geopolymer as a novel construction material. 2. To study the effect of alkali on geopolymer (GP) for high compressive strength to establish cost effective and quality technology. 3. To study the corrosion behavior of the pond ash based geopolymer.	On-going project, Interim and Final reports are still awaited.
10.	Development of TDR based	To monitor the slope movements in NALCO and MOIL opencast	On-going project, Interim and Final

	wireless system for slope stability monitoring in opencast mines, National Institute of Technology, Rourkela - Odisha Duration: 2Years	mines using time domain reflectometry (TDR). 2. Development transmission of TDR readings using RF/wireless communication in opencast mines for online monitoring.	reports are still awaited.
11.	Prospecting/Exploration of Platinum group of metals within Naga Hills ophiolite at Thengahu Ridge-Moke area, Phek District, Nagaland, Directorate of Geology and mining, Government of Nagaland,Dimapur Duration: 3years	To demarcate the potential zones of PGE in the area. 2. To estimate PGE contents in mafics and ultramafics by Nickel-Sulphide fire-assay in combination with Inductivity couple Plasma Mass spectrometry (ICP-MS). 3. To establish the petrogenetic relationships of the rocks with major, trace and REE data.	On-going project, Interim and Final reports are still awaited.

During 2015-16, 86 project proposals were received for consideration. A preliminary meeting of 14th Project Evaluation and Review Committee (PERC) was held on 14th September, 2015 and 20 project proposals were found to be not falling under the thrust areas given in the call for proposal and as per guidelines.

The broad thrust areas for supporting research in mining are given below:

i) Prospecting/exploration for strategic rare and rare earth minerals.
ii) Development of new technology for mineral exploration and mining on land and deep sea to locate and exploit new mineral resources.
iii) Research in mining methods. This includes rock mechanics, mine designing, mining equipments, energy conservation, environmental protection and mine safety.
iv) Improve efficiency in process, operations, recovery of by-products and reduction in specification and consumption norms.
v) Research in metallurgy and mineral beneficiation techniques to utilize lower grade and finer size ores.
vi) Extraction of value added products from mine waste, plant tailings etc.
vii) Development of new alloys and metal related products, etc.
viii) Evolve low capital and energy saving processing systems.
ix) Production of materials of high purity.
x) Cooperative research among organizations associated with the mineral sector.

The remaining 66 projects were regrouped as per categorization namely (i) Exploration related (ii) Mining related (iii) Beneficiation, Ore Dressing and Mineral Processing (iv) Metal Extraction (v) High Purity

Materials, Specialty Materials Revised Estimates (REs) and sent to expert groups drawn from PERC. After receiving the comments from expert reviewers, 35 project proposals were short listed and Principal Investigator of the Institutes were called up for power Point Presentation. A total of 11 projects were approved by the Standing Scientific Advisory Group in its 46th Meeting held on 2.12.2015. Projects were approved for the duration of 3 years. After completion of these projects, their outcomes would be known. The details are as under:

Sl. No	Name of the Project /Duration	Objective	Outcome
1.	Thin Film and Thin wire sensors for metallurgical industries, Non-ferrous technology development centre, Hyderabad Duration:3 year	The present project aims to fill the technology gap. The road map that we have evolved could be summarized in figure5. This can only be done by establishing a facility that has adequate thin film producing capability, property measuring facilities and excellent electronics capabilities.	On-going project, Interim and Final reports are still awaited.
2.	Synergistic utilization of aluminium industrial wastes for development ofgeopolymeric building material, Jawaharlal Nehru Aluminium Research Development & Design Centre (JNARDDC), Nagpur and Swarnalata Holdings, Raipur, Chattisgarh (Jointly) Duration:3 year	1. To study the synergistic effect of underutilized industrial rejects on geopolymerization process with red mud/flu ash as base materials. 2. To develop marketable building materials such as brick, block and tiles from geopolymerized raw material combinations.	On-going project, Interim and Final reports are still awaited.
3.	Recyclability strategy or value-added utilization of iron/ manganese ore tailing/low grade ore:evaluation of energy storage capacities, Institute of Mineral & Materials Technology, Bhubaneswar Duration:3year	1. Determining the leaching condition of iron/manganese ore tailings or low grade ores and comparing the results with the conventional method. 2. Insituexsitu precipitation of main metal value with selective removal of other impurities. 3. Determining the electrochemical properties of precipitated product including detail characterization etc.	On-going project, Interim and Final reports are still awaited.
4.	Assessment and prediction of land surface deformation due to underground metal mining in northern Aravali range of hills using microwave remote sensing data sets and ground based observations, Indian School of Mines,	1. Detection of land surface deformation due to underground metal mining, using microwave remote sensing data sets. 2. Assessment of surface subsidence in mining area using differential interferometric synthetic aperture radar (D-InSAR) technique etc.	On-going project, Interim and Final reports are still awaited.

	Dhanbad Duration:3 year		
5.	Rare earth mineral concentration in the beach sands of Uttara Kannada Coast:theireconomic viabilities and sustainable mining, SDM College of Enginerring and technology, Dhavalagiri, Dharward Duration:3years	1. Detailed sedimentogical mineralogical and geochemical studies on the heavy minerals to identify the source material, transport pattern and mode of concentration of the rare earth minerals. 2. Delineate pockets of zones of placer and rare earth minerals concentration and estimate their economic viability etc.	On-going project, Interim and Final reports are still awaited.
6.	Development of standard protocol of field audiometry for notifying noise induced hearing loss, National Institute of Miners' Health, Nagpur Duration 3 year	1. Scientific validation of field audiometry with standard protocol. 2. to prescribe maximum permissible background noise levels for conducting audiometry in Indian scenario. 3. To propose guidelines for conducting audiometry to enforcement agency i.e. DGMS	On-going project, Interim and Final reports are still awaited.
7.	Study the feasibility of treatment of seepage water from chromite mine quarries of Odisha, National Institute of Telchnology, Rourkela, Odisha Duration:3 year	1. Identification of the specific locations of contaminations. 2. Develop the spatial contamination level of the region. 3. Isolate and identify chromium degrading organism. 4. Provide an optimum condition for consortium organism to reduce chromium contamination etc.	On-going project, Interim and Final reports are still awaited.
8.	Developing downstream application of strip cast aluminium alloys (AA8011 & AA3004), JNARDDC, Nagpur, VNIT, Nagpur and NALCO, Bhubaneswar (Jointly) Duration 2 year	Main objective of the proposed work is to develop processing parameters to develop texture suitable for increasing the formability by optimizing the cold reduction and annealing temperature and to improve the surface characteristics by anodizing.	On-going project, Interim and Final reports are still awaited.
9.	Mineralogical and geochemical characterization of Indian glauconites for alternative potassium fertilizers, Indian Institute of Technology, Bombay and National Geophysical Research Institute, Hyderabad (Jointly) Duration 3 year	1. Mineralogical and geochemical characterization of selected Indian glauconites. Attempts will be made to prepare a database containing major, trace and REE characteristics of glauconite. 2. Understanding sedimentological and stratigraphical influence on glauconite composition etc.	On-going project, Interim and Final reports are still awaited.
10.	Sumulation of simultaneous rock fractures at multiple	The objective of this project is to build a scaling-based FEM software which can analyze the simultaneous	On-going project, Interim and Final reports are still

	scales, Birla Institute of Technology & Science, Pilani, K K Birla Goa Campus, Goa Duration 3 year	crack growths at multiple-scales. This will enhance a mining engineer's ability to predict the rock-fragment size after rock blasting, optimizing the cost of rock clearance before mining excavation.	awaited.
11.	Enhanced recovery of Manganese as electrolytic manganese dioxide (EMD) from ferro manganese mine tailings through bioleaching, Siksha O Anusandhan University, Khandagiri, Bhubaneswar Duration 3 year	The present investigation aims for biological synthesis of electrolytic manganese through bioleaching from ferro manganese mine tailings utilizing the manganese biomining microorganisms through bioleaching technique.	On-going project, Interim and Final reports are still awaited.

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Global Ranking In R&D

Recommendation at Serial No. 3

The Committee find that in R&D sector at the international level, India is ranked at 48th in capacity innovation, 52nd in scientific institution and 30th in R&D expenditure in the World. While observing that the parameters taken into consideration for ranking were percentage of economic output devoted to R&D investment, scientific and engineering researchers per capita and innovations measured as patents per capita, the Committee note that India's poor ranking was mainly on account of lower percentage economic output devoted to R&D investment and lower scientific and engineering researchers per capita. The Committee feel unhappy to find that India spends a meager only 0.81 percent of their GDP on R&D as compared to 2.05 percent by China, 4.36 percent by South Korea and 2.7 percent by USA. Further, India stands at a lowly 81 out of 141 countries in the Global Innovative Index. The Committee, therefore, are of the considered opinion that there is an imperative need to boost the R&D infrastructure across various sectors by allocation of more funds for R&D resources; making R&D jobs attractive to young talented scientists and professionals; greater institutional collaboration with renowned foreign universities/technology institutes; focus on future upcoming technologies to meet global challenges in value-added products, technology and cost competitiveness and development of indigenous cutting edge technologies.

Action Taken

India lacks mostly in R&D (0.88% of GDP on R&D) expenditure as compared to developed countries (more than 2% of GDP). India has to garner more resources in terms of facilities and infrastructure for R&D needs of country. Although there are world class facilities and infrastructure available for R&D in defence and space sector but other sectors are left behind. Country needs to have more investments in R&D setups and take a lead from international experience instead of starting from scratch or reinventing the wheel. More emphasis should be made for developing

indigenous technologies. Importing technology should be the last option in order to promote R&D at national level.

In order to compete with World the focus of the R&D should be not only to tackle the present situation but also cater to needs for future upcoming technologies. It is the need of the hour to strengthen infrastructure facilities at Jawaharlal Nehru Aluminium Research and Development Design Centre (JNARDDC) for developing indigenous technologies in the field of alumina/aluminium. JNARDDC is the only R&D facility in India carrying out research and development from bauxite to finished product under one roof. As compared to other R&D facilities in World like Rio Tinto R&D Centre ARDC, Canada, VAW Germany, Aluminium Pechiney, France & SNIR, China JNARDDC requires urgent capacity building to compete Worldwide. JNARDDC requires setup for developing indigenous alumina/aluminium technology for overall development of Indian aluminium sector other than doing mere testing and characterisation work. Centre proposes to buildup the necessary infrastructure for conducting research in energy reduction, environment friendly technologies and indigenization of aluminium alloys. With the renewed facilities of equipments and manpower the Centre will be able to make invaluable contribution in the research areas of value addition, energy and environment areas as compared to others Worldwide.

NIMH

As far as institutional collaboration is concerned, NIMH had previously signed the Memorandum of Agreement on Academic Exchange with Faculty of Medicine, University of Fukui, Japan & Central Chest Institute of Thailand and also Letter of Agreement for Education with University of California, San Francisco (UCSF).

Currently, NIMH has signed MoU with Manipal University, DattaMeghe Institute of Medical Sciences (Deemed University) and with Central India Institute of Medical Sciences (CIIMS) for collaborative research.

As far as need to boost the R&D infrastructure is concerned, NIMH highlighted need to create and strengthen infrastructure facilities to evolve it as state-of-the-art centre of excellence on all health issues relating the miners and mining community in India.

Ministry of Mines O.M.No.11/1/2014-M.IV (Pt.) dated 8th November 2016

Comments of the Committee

(Please see para 7 of Chapter I of the Report)

Recommendation at Serial No. 4

The Committee also note that the Indian Mining Sector is fragmented and dominated by a large number of players mostly belonging to the private sector. India's capacity for innovation is far lower than that of many countries like USA, UK, South Korea and even other BRICS countries such as Brazil, China and South Africa as per the Global Competitiveness Report 2014-15. This is also evident in the poor score on industry collaboration on

R&D. The Committee have been apprised that the Ministry of Mines has only a supplementary role in improving the standard parameters of scientific research and the nodal Ministry responsible for taking action to improve R&D standards is the Ministry of Science & Technology. The Committee are, therefore, of the firm view that to sustain and improve the competitiveness of India's Mining Sector, adoption of modern and state-of-the-art technologies both in existing and new plants is required by pursuing appropriate R&D programmes. The Committee, therefore, desire that a holistic approach encompassing the various aspects of shortcomings affecting the Indian R&D sector in mining should be followed besides bringing out a roadmap towards tackling the ground level impediments and constraints. The Committee further desire the Ministry of Mines to make sustained efforts in coordination with Ministry of Science and Technology to raise India's low ranking in R&D at the international fora. The Committee would like to be apprised of the action taken by the Govt. in this regard.

Action Taken

With a view to sustaining and improving the competitiveness of India's Mining Sector, the mining companies especially the PSUs need to invest more in R&D for adoption of modern and state-of-the-art technologies both in existing and new plants. The Ministry of Mines is already working in close association with the Ministry of Science & Technology by evaluating and sanctioning R&D projects through Standing Scientific Advisory Group (SSAG).

Jawaharlal Nehru Aluminium Research and Development Design Centre (JNARDDC)undertakes R&D projects in the areas of bauxite, alumina and aluminium for the overall benefit of the aluminium industry and the nation as a whole by making key contributions in the areas of energy, environment and waste utilization of aluminum Industry. With regards to mining sector the Centre has undertaken the following R&D programs for the overall benefit of the mining sector:

1. JNARDDC has developed a process for the selective dissolution of alumina and silica bearing mineral phases in bauxite at room temperature for in-situ quantitative geo-analytical applications. The portable Analytical Kit (in-situ analytical kit) is very effective for field analysis of two major and decisive mineral components viz. alumina (Al_2O_3) and silica (SiO_2) from the samples which have originated from bore hole or blast hole mining site. It's a rapid and cost effective determination technique of their concentrations in bauxite and Laterite. A patent has been recently filed.

2. JNARDDC has recently completed the R&D project titled ""Up-gradation and Utilization of Laterite of East and West coast deposits". The beneficiation studies indicate that iron content can be reduced substantially from ferruginous laterite which shall lead to increase in alumina percentage. JNARDDC has suggested the optimized process parameters for utilization of low grade laterite. This can be blended with good quality bauxite for alumina production. It will increase the life of mines and also improve the supply of raw material for alumina production.

3. JNARDDC has undertaken a project on "Development of hard and high temperature refractory material/aggregate from Saprolite" , Raw material sources (calcined clay) available are insufficient to meet the growing demand of refractory castables. Hence, the project aims to characterize Saprolite (unutilised material generated during bauxite mining) thoroughly and develop a product which can be suitable for refractory and other wide range of industrial applications.

4. JNARDDC has also undertaken a project and developed ceramic proppant from PLK and fly ash which can be used in oil and gas industries. In comparison to high grade bauxite, partially lateritisedkhondalite (PLK) and fly ash is cheaper and readily available.

5. Subsequent to inhouse R & D efforts, the JNARDDC has successfully demonstrated the utilization of the rapid analytical Kit for onsite analysis of manganese ores in the mining sector.

Thus sustained R&D efforts from all quarters will lead to improvement in the R&D ranking of India in the International fora.

NIMH

The institute has already submitted two research proposals to the Department of Science & Technology for their consideration. The details are as under:

Title of the Project	**Submitted to**	**Years**	**Amount (in Lakhs)**
Health Impact Of Coal Mining And Fly Ash Exposure On The Population Residing In The Vicinity Of Chandrapur District, Central India	DST (Serb) Empowerment And Equity Opportunities For Excellence In Science	3 years	46.08
Screening And Establishment Of Serum Biomarkers In Silica-Exposed And Silicosis Populations By Proteomics"	DST Women Scientist Scheme – B (WOS-B)	3 years	5 lakhs/yr

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R&D by Autonomous Bodies of Ministry of Mines

Recommendation at Serial No. 5

The Committee note that there are three grant receiving autonomous bodies under the Ministry of Mines, namely, Jawaharlal Nehru Aluminum Research Development and Design Centre (JNARDDC); Nagpur, National Institute of Rock Mechanics (NIRM), Kolar and National Institute of Miners' Health (NIMH), Nagpur which are pioneering the R&D activities in the Mining Sector under the Science & Technology (S&T) Scheme of Ministry of Mines. These institutions receive partial financial support from the Ministry to meet around 80% of their expenditure and also get funding from research projects sponsored by other sources including private sector. At the same time, the Committee note that these Institutions were carrying out the R&D related

work with obsolete equipment and a need was felt to replace the capital equipment which have outlived their life. Since these bodies are unique from the view of national importance and keeping their core competence in mind, the Ministry modified the S&T Scheme and considered to add one more component in the Scheme namely 'One Time Grant for Capacity Building' and grant to the tune of Rs. 13.70 crore was released to these Institutions during the year 2014-15. Additionally, timely and regular disbursal of non-plan grant will cater to the operational and maintenance related needs of these institutes besides meeting salary component of the researchers employed in these institutes. The Committee further note that though the three autonomous institutes are trying to generate funds on their own, the fact remain that the same is just sufficient to run the institute and not enough to carry out more extensive research. In the past, plan grant was not given to these institutes on a regular basis. The Committee observe that plan grant on a regular basis for infrastructure upgradation is needed so that these institutes are able to properly channelize their focus on R&D activities. The Committee feel that these institutes can be used by Government for guided research work to help the Country to develop technologically. While observing that Ministry's S&T budget is just a small grant, the Committee recommend that it needs to be enhanced in order to strengthen to the infrastructure facilities and capacity of these research institutions for developing indigenous cutting edge technologies in their respective field.

Action Taken

Suggestions of Hon'ble Committee have been noted by the Ministry for compliance.

[Ministry of Mines O.M. No.11/1/2014-M.IV (Pt.) dated 8.11.2016]

Comments of the Committee

(Please see para 10 of Chapter I of the Report)

Recommendation at Serial No. 6

The Committee have been apprised that Science and Technology Scheme of the Ministry also needs to be up scaled allowing researcher or institute to form consortium and undertake research at Technology Readiness Level (TRL) 5 and 6 level while continuing support to the researchers. Admittedly, the Ministry was already in the process of consultations with stakeholders to identify problem areas for specific research. The Committee desire that the Mining Sector need to focus on R&D for better resource utilization, better cost efficiency and production of world class products. The Committee may be apprised of the sustained efforts made by the Ministry of Mines/ PSUs and Autonomous bodies to undertake research covering various aspects *viz.* ore beneficiation for better recovery of mineral from ores; developing indigenous cutting edge technologies in their respective field; exploration of mineral reserves including deep seated and hidden minerals; extraction of minerals and rock mechanics; minimization metallurgy specially in non-ferous metals miners' health related issues; etc. The Committee, therefore, recommend that the Government should take necessary steps so that the pace of R&D activities gains adequate momentum to sustain a high growth in mineral exploration and extraction.

The Committee would like to be apprised of the action plan of the Government to bring the mine exploration and extraction in the Country to international standards in the near future.

Action Taken

The action plan in order to bring the mine exploration and extraction in the country to the international standard in the near future are the following:

1. In order to enhance the impact of R&D, the project necessarily has to reach at least Technology Readiness Level (TRL)-6 /7 which corresponds to pilot plant or engineered prototypes with field testing as the output. Two important approaches are being encouraged and are being pursued by the ministry in its R&D endeavour and in the future call for proposals in to achieve this goal, namely (i) leading PSUs in non-ferrous metals such as HCL, NALCO, IREL, NMDC etc. are encouraged to form consortia with leading laboratories so as to address their specific R&D requirements with a mandate to reach pilot plant level maturity in the project; (ii) Technology Centres, such as NFTDC, which are well versed in handling TRL 6/7 projects shall mentor other laboratories such as JNARDDC and NIRM and shall take up joint consortia projects which will specifically address problems that are directly related to applications.

Recent example has been in the area of Super Thermal Aluminium Conductor (STAL) project in which JNARDDC and NFTDC are jointly executing the project leading up to the final product with all process equipments designed and made in India. In the area of Rare Earths, NFTDC is working towards process development and design and engineering of pilot plants at TRL - 7 level which can be transferred to industry in the next two years.

Thus these two approaches are based on technology PUSH and user industry/customer/market PULL factors being brought in to simultaneous play for impactful R & D with a higher degree of matured output in a shorter time frame.

2. Similar approach has to be taken in the area of ore dressing and mineral processing with up gradation of IBM and encouraging IBM to follow the above example via collaboration with industry as well as other institutions to reach TRL - 6/7 level projects.

3. For NIMH, translational researches require their partnership with other medical research laboratories such as TB centres, Orthopaedic research groups, ENT, other occupational health research groups and hospitals as partners in the project proposals. In order to achieve this aim, a committee comprising of medical research experts in respiratory, orthopaedics and ENT specialists shall be considered for mentoring the laboratory to handle lab to practice translation. The participation of mining companies in these projects is vital for success even though these companies do not always view such R & D efforts favourably.

[Ministry of Mines O.M. No.11/1/2014-M.IV (Pt.) dated 8.11.2016]

Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC)

Recommendation at Serial No 7

The Committee find that R&D by Autonomous Bodies under the Ministry of Mines partially depend upon plan and non-plan grant from the Ministry and these Bodies also cover substantial activities of research through their clientele and associated services. The Committee observe a considerable increase in R&D expenditure from Rs. 635.68 lakhs in 2013-14 to Rs. 1550.00 lakhs in 2015-16 by JNARDDC. Further, 23 projects during the year 2013-14 to 2015-16 were completed by JNARDDC and 35 projects were reported to be under implementation. The Ministry of Mines extends all possible support to JNARDDC for fulfilling its requirement of necessary infrastructure and equipment for development indigenous alumina/aluminum technology including research in energy reduction, environment friendly technologies and indigenization of special utility aluminum alloys for overall development of Indian aluminum sector. Admittedly, JNARDDC not only provides a major R&D support system for the emerging modern aluminum industry in India but also caters to R&D needs of both primary and secondary producers. The Committee also note that JNARDDC has made key contributions in the area of beneficiation, characterization and technological evaluation, up-gradation of bauxite and reduction of energy consumption and utilization of residual material such as red mud. The Committee appreciate the research work undertaken by JNARDDC during the last 3 years which *inter-alia* include indigenization and development of wrought aluminum alloys for defence, development of Super Thermal Aluminum (STAL) conductor for Power Sector, Development of hard and high temperature refractory material/aggregate from Saprolite, Development of instrument for measuring liquidus temperature of the smelting cells, Process developed for production of low soda (Na_2O) hydrate in Bayer Circuit, Development of a suitable process for preparation of low ferric alum and ceramic aggregate from waste or low grade aluminum dross, etc. While appreciating the JNARDDC for promoting in-house R&D, the Committee desire that attention should also be paid for completion of the ongoing schemes like upgradation of its state-of-art facilities and installation of new alloy development set up for attending to the needs of the downstream sectors like automobile sector, building and construction industry and packaging industry. The Committee would also like to be apprised of the steps taken to ensure commercial use of the outcomes of various R&D projects implemented by mine PSUs and Private Sector Mining Companies.

Action Taken

JNARDDC is taking all outeffort for timely completing the upgradation of state-of-art facilities and installation of new alloy development set up for attending to the needs of the downstream sectors like automobile sector, building and construction industry and packing industry.

The status is being regularly monitored by the Research Advisory Committee (RAC) on half yearly basis.

The following R&D products and process developed by JNARDDC have been commercialized and implemented by various agencies.

a) JNARDDC has successfully developed the breakthrough process for detoxification, safe disposal and recovery of valuables (carbon & sodium) of Spent Pot Lining (SPL), the most hazardous solid waste product, containing cyanides and fluorides, generated during the aluminum production process. Two commercial ventures (M/s Green Energy Resources, Odisha and M/s. OMMCEE Pvt. Ltd, Jharkhand) based on the process developed by JNARDDC, will shortly be operational.

b) JNARDDC has developed a portable (in-situ) analytical Kit for field analysis of bauxite using colorimetric method based on solid phase extraction. The kit has great application for mineral prospecting, mineral exploration and mining activities at remote areas and is being used by the PSU company- NALCO, Odisha.

c) JNARDDC has developed an instrument for measuring liquidus temperature of the smelting cells: This instrument helps to reduce the energy consumption and improve upon the cell operation. It is being used by the PSU company, NALCO, Odisha.

d) JNARDDC has successfully developed a unique process for preparation of low ferric alum from waste/low grade aluminium dross which is a significant feat in safe disposal and utilization of industrial waste and is proving major boon to aluminium industries. Centre is actively interacting with VEDANTA and other entrepreneurs for commercialization of the process.

The Centre has filed eight (8) nos. patents in the last five years for the various innovative R&D process/products developed.

S N	Application Number	Date of filling	Title of Patent
1	1045/KOL/2011	08/08/2011	Process for preparation of glass ceramic tiles utilizing red mud as the main base material
2	1051/KOL/2011	10/08/2011	Process for preparation of light weight Foamed bricks (LWFBs) utilizing red mud and fly ash admixture
3	1381/KOL/2012	03/12/2012	Controlled heat treatment process for destruction of leachable toxic cyanide in first cut aluminium
4	280/KOL/2013	12/03/2013	Process for preparation of low ferric alum from waste or low grade aluminium dross
5	995/KOL/2013	28/08/2013	Liquidus /Superheat Temperature Measurement System for Molten Cryolite Bath
6	3582/MUM/2014	12/11/2015	Development of process for selective insitu dissolution of alumina & silica bearing mineral phases in bauxite at room temperature for geo -analytical application
7	3585/MUM/2014	12/11/2015	'Development of process for conversion of Saprolite into refractory aggregate'
8	201621005485	17/02/2016	A process for preparation of aluminium hydroxide with low soda content.

All efforts are being made to commercialize the above R&D outcomes.

[Ministry of Mines O.M. No.11/1/2014-M.IV (Pt.) dated 8.11.2016]

National Institute of Rock Mechanics (NIRM)

Recommendation at Serial No 8

The Committee note that NIRM is an autonomous research institute providing research and consultancy support in almost entire spectrum of rock mechanics for improving safety and productivity in the mining and civil engineering sectors at par with international standards. The Committee also observe that R&D expenditure of NIRM during 2012-13, 2013-14 and 2014-15 was Rs. 1222.34 lakh, Rs. 1683.25 lakh and 1409.84 lakh respectively. Admittedly, NIRM is expanding its activities into newer areas, such as oil & gas, metro rails, major river-linking projects and other infrastructure projects. Centers of Excellence are proposed to be established in core areas of rock mechanics. Presently, Centre for Testing Services and Centre for Site Characterization have been identified. In future, other Centers like Mining Technology, Excavation engineering, Design & Monitoring and Advanced Rock Mechanics Training will be identified. NIRM has reported that occasionally there was delay in site preparation by the user agencies due to their internal issues and also in procuring/fabricating the required equipment/instruments in view of their specialized nature which need to be imported at times. The Committee were also given to understand that as shallow deposits were exhausting, one has to go for deeper depths to extract the minerals, thereby facing more strata related problems. With environment restrictions becoming stringent, NIRM needs to look for hitherto uneconomical deposits and deposits in remote places, where one has to face complex strata conditions. The Committee feel that to deal with the above situations, NIRM needs to carryout R&D in new areas, for which increased Government funding is needed. In view of the foregoing, the Committee recommend that not only the Government should grant more funds to NIRM to carryout R&D in new areas but the NIRM should also make earnest efforts to successfully implement their projects/schemes in these new areas.

Action Taken

The Ministry has awarded to NIRM the following two projects during the year 2012-13:

1. Development of a Technique for Assessment of Reclaimed Land and Structures under Settling Environment – Cost of the project ₹ 137 Lakhs; Status: continuing.

2. Estimation of Seismic Hazard in and around the mined out areas of Kolar Gold Fields – Cost of the project ₹63.57 Lakhs; Status: continuing.

As recommended by the Committee, NIRM proposes to pursue research in the following major thrust areas:

1) Development of innovative mining methods for optimum exploitation of complex and difficult coal and mineral reserves, and for improvement in production, productivity and quality.

2) Development of innovative excavation and rock fragmentation techniques, through introduction of modern methods of tunnel excavation and controlled blasting.

3) Development of underground space technology for oil and gas storage, and nuclear waste storage.

4) Development of a package for optimum exploitation of mineral deposits, both surface and underground, using improved techniques such as numerical modelling.

5) Development of techniques for production of high quality dimension stones at lower cost, and development of small scale mining for optimum exploitation of mineral resources.

6) Development of Information Technology for mining, the use of Virtual Reality Simulation, Expert Systems and Artificial Intelligence.

For this purpose, NIRM has identified six centres of Advanced Research to carry out R&D in the above frontier areas:

a) Centre for Testing Services (CTS)
b) Centre for Advanced Rock Mechanics Training (CARMT)
c) Centre for Sustainable Mining (CSM)
d) Centre for Design & Monitoring (CDM)
e) Centre for Excavation Engineering (CEE)
f) Centre for Site Characterization (CSC)

The first two Centres are already functioning at Kolar Gold Field (KGF). The other four Centres will be started at Bengaluru during 2016-17.

These Centres will be multi-disciplinary in nature, and will serve as a focal point for industry-driven research. The major objectives of these Centres would be :

- to conduct applied research supporting the technical advances of the mining, civil and construction industry,
- to establish unique partnership between industry and the Institute,
- to perform research of direct benefit to the industry, and
- to transfer the technology directly to the user industries.

[Ministry of Mines O.M. No.11/1/2014-M.IV (Pt.) dated 8.11.2016]

Comments of the Committee

(Please see para 13 of Chapter I of the Report)

Recommendation at Serial No 10

According to NIMH to develop the institute as a state-of-art centre catering to the comprehensive occupational health research for miners like international organizations working in the field of occupational health, there is a need to further add services such as drinking water quality, ergonomics

assessment and intervention, environmental health impact assessment of mining activities and intervention for prevention of workplace related diseases. The PradhanMantriKhanijKshetraKalyanYojana (PMKKKY) will be implemented by the District Mineral Foundations (DMFs) of the respective districts using the funds accruing to the DMF. Under this scheme, it was envisaged that the expertise available with NIMH may also be drawn upon to design special infrastructure needed to take care of mining related illnesses and diseases. The Committee would like to be apprised of the perspective plan of Ministry of Mines/NIMH to implement the same.

Action Taken

NIMH will provide support for designing special infrastructure needed to take care of mining related illnesses and diseases whenever any such request or proposal is received from District Mineral Foundation (DMF).

[Ministry of Mines O.M. No.11/1/2014-M.IV (Pt.) dated 8.11.2016]

R&D by PSUs

National Aluminium Company Limited (NALCO)

Recommendation at Serial No 11

The Committee note that expenditure on R&D by NALCO during 2012-13 was Rs. 18.92 crore which came down to Rs. 13.87 crore during 2013-14 and was further reduced to Rs. 7.31 crore during 2014-15. During 2015-16, the projected expenditure on R&D has been Rs. 13.22 crore. The Committee also note that as a part of its International Collaboration Strategy, NALCO has collaborated with CSIRO, Australia, on extraction of Alumina from low grade ore/fly ash and also collaborated with Aluminum Pechiney/Rio Tinto Alcan to take up various developmental R&D projects. As regards the major achievements of the Company in R&D, the Committee are happy to note that NALCO has so far filed 27 patent applications and 9 (nine) patents, have already been granted and 5 (five) have been commercialized and 1 (one) patent has been filed in 2015-16 on the process for the production of alumina with additional recovery of calcium silicate from fly ash. The Committee are concerned to note that though the Profit After Tax (PAT) of the company, increased from Rs. 642 crore during 2013-14 to Rs. 1322 crore during 2014-15, there was a reduction in R&D expenditure from 2.16% of PAT to 0.55% of PAT during the two years. The Committee note that as a part of R&D initiative, NALCO has undertaken works like prospecting/exploration of strategic rare metals and rare earth minerals, research in mining methods including rock mechanics, mine designing mining equipment, energy, conservation, environment protection and mine safety etc.The Committee appreciate the concerted efforts made towards completion of R&D activities by NALCO and desire that NALCO should augment steps towards ensuring full utilization of allotted funds for R&D Projects with a systemic periodical assessment mechanism. To this end, the Committee feel that NALCO should set up a separate centre for R&D activities and research facilities with requisite diagnostic and research facilities, pilot plants and simulation facilities. The Committee also desire that

the Company should take necessary steps to ensure minimum allocation of 1% of its PAT for R&D activities and would like to be apprised of the perspective plan of NALCO to increase its R&D expenditure as well as tangible outcomes from its R&D projects.

Action Taken

The Committee's observation on reduction in R&D expenditure of NALCO from 2.16% of profit after tax (PAT) in 2013-14 to 0.55% of PAT in FY 2014-15, it may be mentioned that as per DPE guidelines, the R&D expenditure should be at least 1% of PAT of previous year. Accordingly the target for 2014-15 was 1% of profit for 2013-14 i.e 1% of Rs 642 crore, which is Rs 6.42 crore. The actual R&D expenditure for the same period was Rs 7.31 crore, which is 1.13% of PAT 2013-14.

It may be noted that due to the increase in profit (PAT) for the year 2014-15 to Rs.1322 crore the R&D expenditure target for NALCO for the year 2015-16 was increased to 13.22 crore (1% of PAT 2014-15). The R&D expenditure of NALCO for 2015-16 is Rs.15.75crore, which is 1.2% of PAT-2014-15. Thus, the R&D expenditures are as per the DPE Guidelines.

NALCO has consistently been utilizing more than 100% of the funds for R&D works, which is assessed by an independent Committee, the Research and Scientific Advisory Committee (RSAC). All the 5 members of RSAC are independent experts in their fields.

NALCO is already in the process of setting up of a separate R&D center atBhubaneswar, which willbe dedicated as R&D center in the field of Bauxite, Alumina and Aluminium. The center is named as Nalco Research and Technology Center (NRTC) and shall have the requisite research facilities, facilities for pilot plants, developments of samples etc. The center is likely to start functioning from 2017.

[Ministry of Mines O.M. No.11/1/2014-M.IV (Pt.) dated 8.11.2016]

<u>Hindustan Copper Limited (HCL)</u>

Recommendation at Serial No 12

The Committee note that R&D expenditure of Hindustan Copper Ltd. was Rs. 3.068 crore during 2013-14 and it was reduced to Rs. 2.34 crore during the year 2015-16. In spite of reduced budgetary outlays for R&D by HCL, the R&D expenditure with respect to Profit After Tax (PAT) has increased from 1.07% in 2013-14 to 7.0% during 2015-16. The Committee were apprised of the various R&D initiatives/studies undertaken by HCL like utilization of copper slag in cement industry, mineral processing test work of copper, recovery of valuable metals from copper waste, etc. The Committee, however, observe that HCL has cited lack of "state-of-the-art"

testing facilities in the Country for beneficiation studies of copper ore as one of the major constraints in improving the efficiency of the existing process. The Committee also note that HCL lacks in-house talent for R&D activities and has plans to tie up with Non-Ferrous Materials Technology Development Centre (NFTDC), Hyderabad to impart requisite training. While stressing the need for infusing more funds for R&D activities by HCL, the Committee would like to be apprised of the future strategy of HCL to overcome the constraints faced by the company to improve its operating efficiency and become a market leader.

Action Taken

The following are the future strategy of HCL under implementation to overcome the constraints faced by the company to improve its operating efficiency and become a market leader:

3. HCL has planned to recruit experienced scientist to strengthen in-house R&D team.
4. The R&D team of HCL will be given training in reputed scientific institution of India in areas like mining of copper ore, beneficiation of ore, processing of concentrate, refining of copper, extraction of associated minerals and metals from ore, energy efficiency, process efficiency, various testing methodology etc.

[Ministry of Mines O.M. No.11/1/2014-M.IV (Pt.) dated 8.11.2016]

Comments of the Committee

(Please see para 19 of Chapter I of the Report)

<u>Mineral Exploration Company Limited (MECL)</u>

Recommendation at Serial No.13

The Committee noted that MECL is engaged in detailed mineral exploration for various minerals such as Coal, Lignite, Copper, Lead, Zinc, Gold, Iron Ore, Lime Stone and Bauxite etc. except Oil & Natural Gas. MECL projects are executed as promotional exploration for Ministry of Mines and Ministry of Coal and contractual work for Central / State Governments, PSUs and Private Sectors. The R&D expenditure by MECL during 2012-13, 2013-14 and 2014-15 are Rs. 15.75 lakh, Rs. 29.95 lakh and Rs. 39.33 lakh respectively. MECL has identified the limitation of a single method of Surface Geophysical survey technique due to complicated Geological set up. Research and Development Projects have been conceived with a basic objective to establish an integrated method of different techniques which can be fruitfully adapted for exploration of any type of Sulphide ore deposit such as massive/ disseminated and map their subsurface disposition, continuation and structural features in comparatively lesser time as well as at lesser cost. Under the scheme of R&D work, all the projects were formulated with the help of National Geophysical Research Institute (NGRI), Hyderabad. According to the Ministry there are no such sanctioned posts of Scientists

/Engineers for R&D in MECL. The Scientists and Engineers in MECL carry out R&D work as and when required. Taking note of the reported lack of adequate infrastructure and manpower as the main constraint faced in the implementation of R&D projects by MECL, the Committee recommend that MECL should start recruiting scientists and depute them for R&D work in mineral exploration to improve the quality of drilling activity and reducing the wear and tear of drill machines and other tools/equipments.

Action Taken

Besides recruitment of regular geologists and mechanical engineers, MECL has started recruiting petroleum geoscientists and engineers who are well acquainted with utilisation of drilling fluid in drilling technology. These petroleum geoscientists and engineers will be utilised in execution of R&D in drilling activities.

During 2016-17, MECL has planned and is investing in modernisation of its age old laboratories, geophysical unit, drilling fleet, IT Centre and work shop.

Regarding creation of infrastructure, MECL is in a process of construction of new laboratory and workshop buildings through NBCC(India) Ltd. for housing newly procured high end laboratory and workshop plants and equipments. These equipments will be of great help in taking up R&D projects.

MECL is also creating an R&D Cell which will take care of regular monitoring and execution of R&D projects.

[Ministry of Mines O.M. No.11/1/2014-M.IV (Pt.) dated 8.11.2016]

Attached and Subordinate Offices

Geological Survey of India (GSI)

Recommendation at Serial No. 15

The Committee note that GSI's main focus is to establish subsurface behavior of the mineralization, tonnage and methodology to obtain best yield of concerned commodity. The three National Centers for Geoscience Research (NCEGR) of GSI situated at Kolkata, Bengaluru and Faridabad are engaged in research on mineral characterization and ore beneficiation. GSI has taken up research projects on Platinoid Group of Elements (PGE) Exploration, Polymetallic minerals, coal, gold exploration etc. Another area of research related to the exploration of minerals is National Geochemical Mapping (NGCM). Further, new concept oriented approach in the form of Hyper Spectral Mapping has been initiated to understand the nature of ore deposit and alteration pattern. The Committee were also informed that the State-of-the-art scientific vessel R.V. SamudraRatnakar has been procured by GSI in 2013 having 27 scientific equipment fitted on-board for geological, geophysical and geochemical exploration of the sea bed for establishment off shore marine mineral resource and research in Exclusive Economic Zone (EEZ) of India. The Committee are, however, concerned to note that against

the sanctioned strength of 6665 personnel in S&T streams in GSI as on 31.1.2016, the actual filled strength is only 3466. There are 1486 vacancies in the stream of Geology, 371 in Geophysics, 622 in Chemistry and 720 vacancies in Engineering stream. Although, the Ministry have informed that a perspective plan for recruitment to various posts in S&T stream has been prepared, the Committee feel that such a huge shortage of personnel in S&T stream will adversely affect the various fundamental research projects of GSI and these projects cannot be carried out in mission-mode. The Committee, therefore, recommend that the sanctioned strength of GSI in S&T stream be immediately filled up and they be apprised of the action taken in the matter.

Action Taken

The total sanctioned strength of GSI under Geology, Geophysics, Chemistry and Engineering falling under Scientific & Technical (S&T) streams is6665 whereas the total filled in strength as on 30.06.2016 is 3440 (51.61%) and vacant posts are 3225 (48.39%). The details of sanctioned strength and filled in strength of Group A, B & C of GSI inS&T streams as on 30.06.2016 are as given below:

Table1: Sanctioned &filled strength of various streams in GSI as on 30.06.2016

	Stream	Sanctioned strength				Filled strength				Total vacant post
		Gr. A	Gr. B (including NG)	Gr. C	Total	Gr. A	Gr. B (including NG)	Gr. C	Total	
S&T	Geology	2786	660	150	3596	1979	135	79	2193	1403
	Geophysics	555	220	70	845	225	73	32	330	515
	Chemistry	509	315	150	974	214	117	82	413	561
	Engineering	90	416	744	1250	60	178	266	504	746
	Total	**3940**	**1611**	**1114**	**6665**	**2478**	**503**	**459**	**3440**	**3225**

Steps taken by GSI for filling up of vacant posts in S&T streams:

The Recruitment Rules of all Grades in GSI have been revised. Recruitment Rules for the Geology Stream were notified in 2010 and for Geophysics, Chemistry and Engineering Stream were notified in 2013 after which filling up the posts as per new sanctioned strength was initiated.

Based on the recommendations of the High Power Committee, the Cabinet has approved a road map for filling up the posts on staggering basis over a ten year period in three Organized Stream i.e. Geology, Geophysics & Chemical.As per the proposed perspective plan of GSI the total sanctioned strength in Geology stream is to be achieved by FY.2019-20; in Geophysics stream by FY.2017-18 and in Chemical stream by FY.2018-19 progressively. In the other organized stream i.e.in engineering, the sanctioned strength is to be achieved by 2017-18.

After the new recruitment rules came into foce, which wasduring the middle of the year 2013, redistribution of posts was carried out in respect of all

regional offices in GSI. In many grades, merger has taken place and revised seniority listshave been worked out. Recruitment process as per new Recuriment Rules has started.

The status of filing up vacancies in different S&T streams is as given below.

Status of filling up of vacancies in (Group-A) as on 31.08.2016

A **Geology Stream:-**

a 150 DR vacancies reported to UPSC for Examination, 2015 and 138 dossiers received from UPSC. Offer of appointment issued to 135 candidates out of which 133 candidates have already joined and two are yet to join. Candidature in respect of three candidates has been cancelled as they did not join within the stipulated joining time.

b 100 DR vacancies have been reported to UPSC for Combined Geo-scientist & Geologist Examination, 2016.

c Remaining vacancies in DR/DPC are to be filled up as per the Perspective Plan by 2019-20.

B **Geophysics Stream:-**

a 40 DR vacancies reported to UPSC for Examination, 2015 and30 dossier received from UPSC. Offer of appointment issued to 28 candidates and all 28 candidates joined. Offer to be issued to rest two candidates after observation of official formalities.

b 50 DR vacancies have been reported to UPSC for Examination, 2016.

c Remaining vacancies in DR/DPC are to be filled up as per the Perspective Plan by 2017-18.

C **Chemical Stream:-**

a 50 DR vacancies reported to UPSC for Examination, 2015 and 41 DR dossier received from UPSC. Offer of appointment issued to 38 candidates and 35 candidates have joined. Offer to be issued to rest of the candidates after observation of official formalities.

b 30 DR vacancies have been reported to UPSC for Examination, 2016

c) Remaining vacancies in DR/DPC are to be filled up as per the Perspective Plan by 2018-19.

D Engineering Streams:-

a) Offer of appointment issued to 07 candidates of Exam 2014, out of which 6 candidates have joined and extension for joining time has been given to one candidate.

b) 07 DR vacancies reported for Exam 2016.
c) 09 DR vacancies are to be reported in 2017.
d) 12 DPC vacancies are to be filled up by 2017-18.

Status of filling up of vacancies of Group-B Gazetted

Group-B

A **Geology Stream:-**

a 139 DR vacancies reported to UPSC.

b 76 DR vacancies (approx.) to be reported.

c 09 DPC vacancies to be filled up by 2017-18.

B **Geophysics Stream:-**

a 25 DR vacancies shall be reported after completion of ongoing recruitment process.
b 03 DPC vacancies- no eligible candidates available in the feeder grade.

C **Chemical Stream:-**

a 04 DR vacancies reported to UPSC and 03 DR vacancies to be reported to UPSC.
b 07 dossiers requested and received from reserve panel for the Exam 2013. Official formalities are under process.
c 07 DPC vacancies likely to be filled 2017-18.

D **Engineering Stream:-**

a 09 DR vacancies to be reported.

b 11 DPC vacancies for which no eligible candidates available in the feeder grade.
c 30 DPC vacancies are held up due to Court Order.

Table 2: Status on vacancies of DR/DPC in respect of Group 'B' (non-gazetted) & Group 'C' posts coming under S&T streams in GSI (as on 31.08.2016)

Sl. No.	**Name of the post**	**Gr. of Post**	**Sanctioned Strength**	**Filled Strength as on 30.04.2016**	**Vacancy**		**Steps taken to fill the vacancies**			**Remarks**
					DR	**DPC**	**DR**		**DPC**	
							Already reported to SSC	**To be reported to SSC**		
	GEOLOGY									
1	Senior Technical Assistant	Group B (NG) (Tech)	162	10	38	114	114	0	38 DPC vacancies kept for 2016-17	76 DPC vacancies converted to DR quota under '**failing which'** clause

2	Junior Technical Assistant	Group B (NG) (Tech)	198	47	136	15	136	0	15 DPC vacancies kept for 2016-17	
3	Lab. Asstt.Gr.I	Group C (NG) (Tech)	35	16	9	10	9	0	10 DPC vacancies kept for 2016-17	
4	Lab. Asstt.Gr.II	Group C (NG) (Tech)	35	24	0	11	7	0	4 DPC vacancies kept for 2016-17	7 DPC vacancies converted to DR quota under '**failing which'** clause
5	Lab. Asstt.Gr.III	Group C (NG) (Tech)	80	43	27	8	10	0	10 DPC vacancies kept for 2016-17	
	SubTotal		**510**	**140**	**210**	**160**	**293**	**0**		

	CHEMICAL									
1	Senior Technical Assistant	Group B (NG) (Tech)	115	21	68	26	70	0	24DPC vacancies kept for 2016-17	2 DPC vacancies converted to DR quota under '**failing which'**clause
2	Junior Technical Assistant	Group B (NG) (Tech)	125	46	69	10	69	0	10 DPC vacancies kept for 2016-17	
3	Lab. Asstt. Gr.I	Group C (NG) (Tech)	30	26	0	4	0	0	4 DPC vacancies kept for 2016-17	
4	Lab. Asstt. Gr.II	Group C (NG) (Tech)	45	17	0	28	12	0	16 DPC vacancies kept for 2016-17	12 DPC vacancies converted to DR quota under '**failing which'** clause
5	Lab. Asstt. Gr.III	Group C (NG) (Tech)	75	40	25	10	25	0	10 DPC vacancies kept for 2016-17	
	SubTotal		**390**	**150**	**162**	**78**	**176**	**0**		
	GEOPHYSICS									
1	Senior Technical Assistant	Group B (NG) (Tech)	50	4	8	38	28	0	18 DPC Vacancies kept for 2016-17	20 DPC vacancies converted to DR quota under '**failing which'** clause
2	Junior Technical Assistant	Group B (NG) (Tech)	80	7	66	7	70	0	3 DPC vacancies kept for 2016-17	4 DPC vacancies converted to DR quota under '**failing which'** clause
3	Lab. Asstt.Gr.I	Group C (NG) (Tech)	17	12	2	3	0	5		3 DPC vacancies converted to DR quota under '**failing which'** clause
4	Lab. Asstt.Gr.II	Group C (NG) (Tech)	18	9	0	9	0	3	6 DPC vacancies kept for 2016-17	3 DPC vacancies converted to DR quota under '**failing which'** clause
5	Lab. Asstt.Gr.III	Group C (NG) (Tech)	35	12	18	5	18	0	5 DPC vacancies kept for 2016-17	
	SubTotal		**200**	**44**	**94**	**62**	**116**	**8**		

	ENGINEERING									
1	Junior Technical Assistant (Drilling)	Group B (NG) (Tech)	356	182	137	37	155	0	19 DPC vacancies kept for 2016-17	18 DPC vacancies converted to DR quota under '**failing which'**clause
2	Drilling Asstt. Gr.I	Group C (NG) (Tech)	214	128	44	42	77	0	9 DPC vacancies kept for 2016-17	33 DPC vacancies converted to DR quota under '**failing which'**clause
3	Drilling Asstt. Gr.II	Group C (NG) (Tech)	260	110	75	75	115	0	35 DPC vacancies kept for 2016-17	40 DPC vacancies converted to DR quota under '**failing which'**clause
4	Technical Operator (Drilling)	Group C (NG) (Tech)	270	65	154	51	171	0	34 DPC vacancies kept for 2016-17	17 DPC vacancies converted to DR quota under '**failing which'**clause
	SubTotal		**1100**	**485**	**410**	**205**	**518**	**0**		

N.B. Total DR vacancy reported to SSC: **1103**
To be reported to SSC: **08**
Total DR Vacancy reported/ to be reported: **1111**
Total DR Vacancy **876**
DPC vacancies converted to DR quota by**235**
Invoking **"Failing which clause":**

[Ministry of Mines O.M. No.11/1/2014-M.IV (Pt.) dated 8.11.2016]

Indian Bureau of Mines (IBM)

Recommendation at Serial No.16

The Committee observe that one of the major developmental function of IBM is to play a role of a catalytic agency to promote and develop the much needed R&D in mineral processing in the field of mineral beneficiation, mineral characterization, chemical analysis of ores and minerals and analysis of environmental samples. Against the RE of Rs. 5.91 crore for R&D investment in IBM during 2013-14, the actual expenditure was Rs. 5.56 crore and against RE of Rs. 6.56 crore during 2014-15, the actuals were Rs. 5.78 crore. According to the Ministry of Mines "Mineral Processing (Erstwhile Ore Dressing) Division of IBM carries out R&D studies in the field of mineral beneficiation. It's Modern Mineral Processing Laboratory (MMPL) and Pilot Plant comprising of Ore Dressing Laboratory, Mineral Beneficiation Pilot Plant, and Analytical Laboratory Complex established with the assistance of UNDP is well equipped with state-of-the-art facilities to carry out R&D studies in the field of mineral beneficiation and mineral characterization, and analysis of environmental samples. The Bureau has zone-wise facilities in mineral testing and beneficiation with regional ore dressing laboratory and pilot plants at Ajmer and Bangalore which are also well equipped with sophisticated equipment. A 'Clay Laboratory' has also been established to cater to the needs of the north-eastern region exclusively. Taking note of the static performance of IBM for ore Dressing Investigation and Mineralogical examination varying from 55 to 65 and 2060 to 2509 during the last 5 years and declining Chemical Analysis carried out by Mineral Processing unit from 49,139 during 2011-12 to 34,660 during 2014-15, the

Committee would like to apprised of the reasons for the same. The Committee would also like to be informed about the steps taken by the IBM to improve the performance of its Mineral Processing Division.

Action Taken

Reasons for static performance of IBM for Ore Dressing Investigations, Mineralogical Examination and Chemical Analysis are as follows:

The R&D activities are carried out through IBM's Scheme No. 2 namely "Mineral beneficiation Studies - Utilization of Low grade and Sub-grade ores and analysis of Environmental samples". The activities, inter-alia, cover development of process flow sheet on low grade, ferrous, non-ferrous and precious metal ores as well as industrial minerals, techno-economic pre-feasibility reports for beneficiation of low-grade ores, Characterization/Mineralogical studies on ores, rocks, sinters, slags etc.

The test work and consultancy services are carried out on promotional as well as on charge basis. In case of promotional work, IBM conducts test work on the samples mainly collected during inspections of mines and R&D support provided towards fulfilling regulatory functions of IBM for systematic and scientific mining, which are prime importance from conservation and environmental aspects. The charge basis samples are received from the public and private sector mines and also from exploratory agencies such as GSI, MECL etc.

The Annual target of the Mineral Processing Division (MPD) envisages only quantitative approximation. The targets fixed are to conduct 60 ore dressing Investigation, 2300 Mineralogical studies and 40,000 chemical analysis per annum but do not elaborates the type & source of those samples to be generated from in advance. Thus, whatever projects received either from Regulatory or sponsored sources on first come first basis are taken up by the Division.

To encourage value addition and mineral conservation, during 2015-16, MPD of IBM carried out 57 Mineral Beneficiation Investigations, 2,423 Mineralogical Studies and chemical analysis for 35,376 radicals. Further, 22 Mineral Beneficiation Investigations, 65 Mineralogical Studies and chemical analysis for 3810 radicals were in progress at the end of the year. During 2015-16 there has been significant increase in the inflow of samples from exploratory agencies (GSI, MECL and State DGMs) and from mining sector as well.

Further taking into consideration the low filled up strength the Performance of Mineral Processing Division during 2015-16 is impressive (as against the sanctioned strength of 75 Group A & 18 Group B officers, only 29 Group A & 09 Group B posts are presently filled). Action has already been initiated for filling up of the vacancies.

Thus, from the above explanation it is inferred that performance of IBM for Ore Dressing Investigations, Mineralogical Examination and Chemical Analysis is not static.

The steps taken by the IBM to improve the performance of its Mineral Processing Division are as follows:

In view of new MMDR Act, 2015 and National Mineral Exploration Policy (NMEP, 2016) the role of Mineral Processing Division of IBM has become more vital for Indian Mineral Industry.

As per the NMEP, 2016 Indian Bureau of Mines (IBM) is the principal agency for undertaking ore beneficiation studies. There are five major areas that need to be focused upon by IBM:

vi. Identification of lean ores or waste of important technology metals and development of beneficiation mechanisms along with other labs and institutions.
vii. Identification of crucial apparatus/equipment that is dependent on imports. IBM needs to work on cost effective capital equipment development in the country.
viii. Energy efficiency studies in mineral processing.
ix. Water conservation and water recycling circuits in mineral processing.
x. Upgradation of existing processes to make them more environmental friendly.

Accordingly IBM have carried out detailed analysis of the facilities/Equipments/Infrastructure/Manpower available and required in addition for modernization and up-gradation of Mineral Processing capabilities of IBM.

The total funds estimated for modernization and up-gradation comes out to be Rs.216.62 crores. A comprehensive project proposal has been formulated on Capacity Building of Mineral Beneficiation laboratory and Pilot Plant of IBM and same is submitted to National Mineral Exploration Trust Secretariat as per the decisions taken in the 2nd meeting of the Executive committee of NMET held on 9.5.2016.

The Project Proposal inter-alia covers the following four major areas:

5. Procurement of new & energy efficient equipments and modern sophisticated instruments, replacement of old and obsolete instruments/equipments.
6. Development of infrastructure for additional facilities.
7. Collaboration with foreign organization and institutions for training & capacity building and technology infusion.
8. Immediate measures to be taken for filling-up of existing vacant posts and strengthening of Mineral Processing Division with additional man power.

[Ministry of Mines O.M. No.11/1/2014-M.IV (Pt.) dated 8.11.2016]

Comments of the Committee

(Please see para 25 of Chapter I of the Report)

Vision Document to Promote R&D

Recommendation at Serial No. 17

The Committee find that Research and Development in the mining sector holds the key to maximize efforts towards more productivity in the exploration and extraction of many minerals which the Country is abundantly blessed with. The Committee observe that India's ranking is poorly placed on many parameters pertaining to R&D sector in the global scenario. While it is recognized that only a holistic approach towards meeting the various challenges facing and constraints being faced in the R&D initiatives of Indian Mining Sector would only result in a positive outcomes, the Committee desire that the Government come out with a Vision Document to promote R&D in mining sector, which goes beyond the objectives and targets set out in the National Mineral Policy, 2008 as well as in the Guidelines for Mineral Research Support, 2013. The Committee appreciate the laudable initiatives put in place by various institutes working in the R&D sector of the Mining Industry and hope that earnest efforts are made to raise the dismal position of India's ranking in the Global scenario. The Committee may be apprised of the action taken in the matter.

Action Taken

NIRM Vision 2030

To optimize the Institute's resources in the threshold of the new millennium, it is essential to redesign and reorient the priorities. This will be a new and constructive phase in the development of the Institute, to achieve greater effectiveness, and to meet the immediate and long-term challenges posed by the industry. Accordingly, our vision is that, by the year 2030, NIRM shall become:

Ø An established and acknowledged Institute in the whole gamut of rock engineering, and one of the world leaders in selected technologies of rock mechanics.

Ø A global R & D player providing high quality knowledge based, value added services for mining, civil, construction, infrastructure, energy and other socially relevant areas.

Ø A Centre of Excellence for innovations, design, development and training.

Ø A model research institute and a path setter.

As a first step to achieve the above, it is proposed to establish six centres of Advanced Research to carry out R&D in the following specialized frontier areas:

a) Centre for Site Characterization (CSC)
b) Centre for Excavation Engineering (CEE)
c) Centre for Design & Monitoring (CDM)
d) Centre for Sustainable Mining (CSM)

e) Centre for Testing Services (CTS)
f) Centre for Advanced Rock Mechanics Training (CARMT)

The work under each Centre will lead to PhD degrees for aspiring Research Scholars. Officers and Scientists from industry, academic and R & D institutions will be inducted for short term assignments on deputation. This will lead to effective technology transfer.

NIMH, Nagpur

Timeline	Key Actions Planned
2016-2020	i) To undertake studies on postural risk assessment of mining equipment operators. (ii) To undertake studies of Pulmonary Tuberculosis among tribal population-inquest into role of occupational silica exposure. (iii) Up-gradation of Noise Mapping Laboratory. (iv) Establishment of NABL certified Mine water analysis laboratory. (v) Establishment of Occupational Ergonomics laboratory. (vi) To undertake health impact assessment of mining projects.
2021-2025	i) To develop ambient air quality monitoring facility as per NAAQ standards. ii) To develop soil testing laboratory. iii) To undertake studies on environmental impact assessment and preparation of environmental management plan for mines. iv) To undertake studies on evaluation of effectiveness of personal protective equipments used in prevention of Noise Induced Hearing Loss (NIHL) v) To undertake studies on prevalence of musculoskeletal diseases among mine workers
2026-2030	i) To undertake studies on societal impact of mining. ii) To undertake studies of occupational exposure of silica on occurrence of chronic renal diseases in mining population. iii) To undertake study of burden of lifestyle diseases in mining population.

JNARDDC

Jawaharlal Nehru Aluminium Research Development and Design Centre, Nagpur is conceptualized as centre of excellence and its activities are focused to develop it as state-of-the-art centre of excellence on indigenous technology development, alloy development, energy and environment relating to alumina / aluminium and provide technical support services to industry and regulatory agencies to meet national and international obligations.

There are about 3000 aluminium applications worldwide and India has limited itself to about 10% of these applications due to lack of alloy development facilities, increasing energy prices and more stringent emission laws. The per capita consumption of aluminium in India is about 2.0 kg as compared to other countries where it is in range of 15-20 kg. Due to its properties, aluminium has been able to replace steel in various industries over the past several years. In the construction and transportation industries

in particular, aluminium has been preferred due to its lighter weight, robustness and lesser time that is required.

JNARDDC aims to develop specialized metal alloys which will not only boost the aluminium industry growth in India but also make key contribution to sectors of energy and environment. Indigenization and development of aluminium alloys will be one of the primary focuses of JNARDDC. The electrical sector continues to be the biggest user of aluminium while demand from transport, construction, packaging and consumer durables sectors are on the rise.

The Vision 2030 proposal envisages:

- To develop JNARDDC as a "Centre of Excellence" in the field of alumina/aluminium technology development, development alloy development, environment and energy for sustainable development of mineral industries.
- To conduct research in validation of national standards and provide support to enforcement agencies in setting up new standards relating to energy, environment and aluminium alloys.
- To collaborate with national/international agencies in research areas relating to alloy development, energy, environment and provide training / development skills to personnel from primary and secondary aluminium industry.
- To create a national data base on bauxite deposits relevant to refineries, benchmarking standards for aluminium industries in field of energy, environment and aluminium alloys.
- To provide alloy indigenization solutions to secondary aluminium industries in country and also provide the best R&D solutions to them for value addition to the product.

[Ministry of Mines O.M. No.11/1/2014-M.IV (Pt.) dated 8.11.2016]

CHAPTER – III

RECOMMENDATIONS/OBSERVATIONS WHICH THE COMMITTEE DO NOT DESIRE TO PURSUE IN VIEW OF THE GOVERNMENT'S REPLIES

-NIL-

CHAPTER – IV

RECOMMENDATIONS/OBSERVATIONS IN RESPECT OF WHICH REPLIES OF THE GOVERNMENT HAVE NOT BEEN ACCEPTED BY THE COMMITTEE

National Institute of Miners' Health (NIMH)

Recommendation at Serial No. 9

The Committee note that National Institute of Miners' Health was established with the mandate to conduct applied research in the field of occupational health and hygiene of workers employed in mining and mineral industry with the vision of 'safe mines and healthy miners'. The R&D expenditure of NIMH during 2012-13, 2013-14 and 2014-15 were Rs. 236.64 lakh, Rs. 254.50 lakh and 257.04 lakh respectively. The Committee observe that the key initiatives taken up by NIMH inter-alia include development of standard framework and guidelines for noise mapping in mines and surrounding community; Multi Centric Study of dust Related Diseases in Stone Mines and Development of Sustainable Preventive Programme; Identification of biomarkers for detection of Noise Induced Hearing Loss in the Miners; etc. While expecting that latest and advanced equipment are used by NIMH to analyse the human biological and environmental samples collected during field study, the Committee would like to be apprised of the mechanism with NIMH/Ministry of Mines to monitor that the recommendations of NIMH are implemented by all mining companies so that these initiatives fructify into tangible benefits.

Action Taken

The Directorate General of Mines Safety (DGMS), Ministry of Labour& Employment, is responsible for monitoring compliance of law and also monitors implementation of recommendations of NIMH given by the Institute from time to time. Guidelines for monitoring health/environmental hazards are sent to DGMS, after approval of the Ministry of Mines, for implementation of the same.

[Ministry of Mines O.M. No.11/1/2014-M.IV (Pt.) dated 8.11.2016]

Comments of the Committee

(Please see para 16 of Chapter I of the Report)

Need to Increase R&D Investment

Recommendation at Serial No. 14

Keeping in view low expenditure for R&D activities by the PSUs of the Ministry of Mines the Committee desire that Mining Sector PSUs must look into this aspect seriously and take adequate steps to increase their R&D investment and achieve not only the stipulated target of 1% of their profit after tax as R&D expenditure but also take necessary steps to ensure utilization of 1% of the total turnover of the Company by the terminal year

of the 12th Plan i.e. 2016-17. The Committee also recommend that the Ministry should issue necessary directions to PSUs as well as private sector companies to chalk out a strategy for increasing expenditure on R&D activities and desire that the Ministry should take necessary steps to ensure setting up of Centralized R&D organization like Steel Research and Technology Mission of India (SRTMI) in the steel industry to ensure concerted and coordinated system of R&D in Mining Sector in the Country.

Action Taken

As per Department of Public Enterprises Guidelines, minimum expenditure on R&D activities by a Miniratna-II Category company is 0.5 % of PAT.
Expenditure on R&D activities by MECL which is a Miniratna-II company, in last 4 years i.e 2012-13 to 2015-16,stood at Rs. 85.01 lakh against the statutory requirement of Rs. 70.10 lakh.
During 2016-17, the 3 ongoing R&D projects which started during 2015-16 and where no expenditure was booked last year will continue and the expenditure shall be booked during the current year as a result MECL will achieve the expenditure targets of the XII Five Year Plan by the end of this year.
MECL has planned and is investing in modernisation of its age old laboratories, geophysical unit, drilling fleet, IT Centre and work shop with CAPEX of Rs.22.85crore. In addition, MECL also has ambitious plans for creation of infrastructure for the laboratories and workshop for an amount of Rs.33 crore.
Further, MECL is going to take up on experimental basis the application of Drone in mineral exploration in collaboration with IIT, Kanpur during the year.
Once these capacities are created, MECL will be in a position to take up advanced R&D projects in a more holistic manner.

(Rupees in lakh)

Year	**PAT of Pre. year**	**0.5 % of PAT of Pre. year**	**Actual Expenditure on R& D Activities by MECL during the year**
2012-13	1732	8.66	15.73
2013-14	2066	10.33	29.95
2014-15	2546	12.73	39.33
2015-16	7676	38.38	Work in progress. No expenditure incurred during the year
Total	14020	70.10	85.01

[Ministry of Mines O.M. No.11/1/2014-M.IV (Pt.) dated 8.11.2016]

Comments of the Committee

(Please see para 22 of Chapter I of the Report)

CHAPTER – V

OBSERVATIONS/RECOMMENDATION IN RESPECT OF WHICH FINAL REPLIES OF THE GOVERNMENT ARE STILL AWAITED

-NIL-

NEW DELHI;
_____, 2017
_____, 1939 (Saka)

RAKESH SINGH
Chairperson
Standing Committee on Coal and Steel

Annexure-I

MINUTES OF THE SITTING OF THE STANDING COMMITTEE ON COAL AND STEEL HELD ON 2 MARCH, 2017 IN HON'BLE CHAIRPERSON'S CHAMBER, ROOM NO. '210', B-BLOCK, PHA EXTENSION BUILDING, NEW DELHI.

The Committee sat from 1130 hrs. to 1200 hrs.

PRESENT

Shri Rakesh Singh - Chairperson

Lok Sabha

2. Shri A Arunmozhithevan
3. Shrimati Jyoti Dhurve
4. Shri Shailesh Kumar
5. Shri Ajay Nishad
6. Shrimati Riti Pathak
7. Shri Chandu Lal Sahu
8. Shri Sunil Kumar Singh
9. Shri Sushil Kumar Singh
10. Shri Krupal Balaji Tumane

Rajya Sabha

11. Shri Ali Anwar Ansari
12. Dr. Pradeep Kumar Balmuchu
13. Shri Ranjib Biswal
14. Shri B.K Hariprasad
15. Shri Ranvijay Singh Judev

SECRETARIAT

1. Shri U.B.S. Negi - Joint Secretary
2. Shri Ajay Kumar Garg - Director
3. Shri Arvind Sharma - Additional Director
4. Ms. Miranda Ingudam - Deputy Secretary

2. At the outset, Chairperson welcomed the Members to the sitting of the Committee.

3. The Committee thereafter took up for consideration the following Draft Reports:-

(i) ** ** ** **

(ii) Report on Action Taken by the Government on the observations / recommendations contained in the 22nd Report (16th Lok Sabha) of the Committee on "Science & Technology/Research & Development in Mining Sector" relating to the Ministry of Mines.

4. The Committee adopted the Reports without any changes/modifications. The Committee then authorized the Chairperson to finalise the Reports and present the same to both the Houses of Parliament.

The Committee then adjourned.

** Do not pertain to this Report.

ANNEXURE- II

(Vide Para IV of Introduction)

ANALYSIS OF ACTION TAKEN BY THE GOVERNMENT ON THE RECOMMENDATIONS CONTAINED IN THE TWENTY-SECOND REPORT OF THE STANDING COMMITTEE ON COAL AND STEEL

I.	Total No. of Recommendations made	17
II.	Recommendations that have been accepted by the Government *(vide* recommendation at Sl. Nos. 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 15, 16, and 17)	15
	Percentage of total	83.33%
III.	Recommendations which the Committee do not desire to pursue in view of the Government's replies (vide Recommendation at Sl. No. Nil)	00
	Percentage of total	0%
IV.	Recommendations in respect of which replies of the Government have not been accepted by the Committee *(vide* recommendation at Sl. Nos. 9 and14)	02
	Percentage of total	11.77%
V.	Recommendations in respect of which final replies of the Government are still awaited (*vide* recommendation at Sl. No. Nil)	00
	Percentage of total	0%