

FAX

No. 43012/(63/2014-CPAM
Government of India
Ministry of Coal

New Delhi, the 19th February, 2015

To

Chairman,
Coal India Limited,
10-Netaji Subash Road,
Kolkata –700001 (W. B). [FAX: 033-22483373].

Subject	Record Note of Discussions and the Recommendations of the Workshop on “The Technology Development & Mechanization of Mines in CIL in the context of reaching 1 Billion Tonne Coal production in 2019-20” held on 20.01.2015.
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Sir,

I am directed to enclose herewith a copy of Record Note of Discussions and the Recommendations of the Workshop on “The Technology Development & Mechanization of Mines in CIL in the context of reaching 1 Billion Tonne Coal production in 2019-20” held on 20.01.2015 for information and necessary action. It is also requested that the same may kindly be circulated amongst all other participants of the Workshop as the presentation material has already been uploaded on the website of the Ministry of Coal.

Yours faithfully,

Encl: As above.



(I.P. Nagpal)

Under Secretary to the Govt. of India
23073937 (Tel)

Copy to: Technical Director (NIC), MoC for uploading the material on the website of Ministry of Coal.

**Record Note of Discussions and the Recommendations of the Workshop on
“The Technology Development & Mechanisation of Mines in CIL in the context
of reaching 1 Billion Tonne Coal Production in 2019-20”
held on 20.01.2015 at New Delhi**

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In order to bridge the increasing gap between the coal demand and domestic supply of coal, Government of India has directed Coal India Limited to enhance its coal production from the current level of about 500 million tonnes to 1000 million tonnes by 2019-20. This would not be possible for CIL unless the critical technology development issues and mechanization issues are addressed comprehensively. In this backdrop, Ministry of Coal in association with Indian National Committee of World Mining Congress has conducted a One Day Workshop inviting both CIL and its subsidiary companies; different equipment manufacturers and Members of World Mining Congress. List of participants is enclosed at **Annexure**.

2. The Workshop was inaugurated by the officials of INC, WMC, CMD, CIL and Adviser (Projects), Ministry of Coal. Secretary (Coal) joined the Workshop subsequently due to preoccupation and delivered his key note address. He emphasized the need for urgently addressing the gaps coming in the way of mechanization of mines and adoption of appropriate technologies in pursuing the goal of one billion tonne coal production by CIL.

3. The following companies participated in the Workshop.

Coal India Limited, ECL, BCCL, CCL, WCL, NCL, SECL, MCL and CMPDIL; NLC; SCCL; BEML; HEC; L&T; Komatsu; Caterpillar; Joy Global; Rio Tinto; Gmmco; Atlas Copco; Leibherr and Peabody.

4. In the first half of the Session, presentations were made by Coal India Limited and its subsidiary companies about their perspective on technology development in reaching the goal of one billion tonne coal production by 2019-20. This was followed by the presentations by different equipment manufacturers indicating their perspective.

5. CIL in its presentation mentioned about the volumes to be handled in the next five years through opencast mining and the enhancement in coal production.

By 2019-20, CIL has projected an OB removal of 2500 million cubic meters as against about 1000 million cubic meters currently. The average stripping ratio is envisaged to increase from the current level of 1.8 to 2.75 in 2019-20.

6. Towards strengthening exploration, CIL envisages usage of more numbers of hydrostatic drill rigs, adoption of 2D, 3D seismic surveys with high resolution and advance software tools for geological modeling and mine planning. Adoption of high capacity earthmoving equipment for OB removal and coal extraction, adoption of in pit crushing technology for OB and coal, deployment of surface miners, extensive use of high capacity graders and dozers for proper maintenance of haul roads is envisaged in enhancing the coal production. Adoption of high angle conveyers, skip conveyers and tube conveyers for transportation of coal from pit to surface and installation of more number of coal handling plants with large capacity silos for faster loading of coal into the wagons. In order to address the maintenance issues, CIL proposed to upgrade the existing workshops with modern facilities for condition monitoring of the equipment and online monitoring.

7. For enhancing the coal production from underground mines, it is proposed to adopt high speed drivage equipment for shaft sinking and incline drivage. Deployment of high capacity continuous miners, low height continuous miners for thin seams, flexible conveyor trains and high capacity shuttle cars and adoption of power supported longwall/shortwall technology. Adoption of highwall technology and hydraulic mining is also envisaged. Use of raise borer for winning steep seams is also proposed. Extensive use of manriding systems, skip loading and belt conveyors is also proposed for matching mass production technologies. Deployment of universal drilling machines/hydraulic drills/jumbo drills to replace the handheld drills is one of the productivity improvement proposed. To address the shortage of sand for stowing operations, it is proposed to crush the overburden material and use it for filling of voids and use of fly ash.

8. Properly designed strata control management with online monitoring of strata movement and online monitoring of underground environment through chromatographs is also proposed. Use of advanced communication systems in underground mines along with radio frequency detectors are proposed for improving the communications and locating the miners. Satellite based subsidence monitoring systems, slope stability monitoring are proposed for improving the safety of operations. To address the inundation related dangers

directional drilling and seismic survey technologies are proposed. Improving the mine safety through using simulation training of all the workers/operators of machines, establishment of refuse chambers are some of the measures proposed. For improving the efficiency of blasting operations and control of ground vibrations, it is proposed to adopt advanced blasting technologies.

9. Extensive use of information technology for equipment monitoring, maintenance, inventory management and safety management is critical.

10. CIL in their presentation has mentioned about the projected requirement of major heavy earthmoving machinery for opencast mines and equipment for underground mines in the next five years.

11. CMD, BCCL mentioned about the business models they have adopted in developing underground mines with power supported longwall (PSLW) technology. Simultaneously, development of mines with continuous miner technology was also presented. The business models adopted have helped the company in taking up six underground projects, four with PSLW technology and two with continuous miner technology. He emphasized for indigenization of the longwall equipment manufacturing and continuous miner manufacturing which would help the industry in replicating the technologies.

12. CMD, ECL in its presentation emphasized the need for single stage extraction of more than 4.5 meter thick seams preferably upto 6 meters and to a maximum of 8 meters with continuous miner technology which is a practice in South Africa and USA. He also emphasized the need of using diesel operated multipurpose free steered vehicles for men and material transportation in underground gassy mines of Degree II and Degree III mines in order to improve the productivity. Longwall top caving methods for extracting thick seams deploying longwall technology and high speed stowing for extracting below waterlogged and heavily built up areas are important for ECL. High speed shaft sinking and incline drivage is also important for enhancing production from underground mines.

13. ECL envisages development of six continuous miner units and one longwall unit by 2019-20. He observed that performance of BEML supplied 35 tonne dumpers and L&T supplied hydraulic shovel and HEC supplied 5 cubic meter electric rope shovel are adversely affected for various reasons including delay in

supply of spares. In case of equipment supplied by Caterpillar, it was mentioned that spare parts supply is an issue for different equipment supplied by their conglomerates. He further emphasized for the need to incorporate proximity warning systems, rear vision cameras, vehicle help monitoring system, payload monitoring system, in the HEMM being supplied by various manufacturers. The consignment store concept for timely supply of quality spares with zero inventories as entered into by ECL with BEML is helping them in addressing the spare management issue. It was suggested for extensive use of surface miners and rippers near habitation and surface structures, in pit crushing for OB disposal, transport of coal to tube conveyors and adoption of highwall technology.

14. Representative of CCL in his presentation emphasized on deployment of surface miners in all projects with more than 5 MTPA capacities; conveyor transportation from face to surface and rapid loading systems. Adoption of continuous miner technology and information technology tools for planning and monitoring. Multi-skill development is essential for successful mechanization.

15. CMD, WCL mentioned about their plans for deployment of continuous miner in six of their underground mines and one longwall project. He emphasized the importance of man riding systems in underground mines. Since a number of projects are being taken up through MDO route, the issue of availability of experience contractors, availability of required numbers of excavators and dumpers with matching support equipment in a span of four to five years along with the trained manpower is conceived to be an area of concern.

16. CMD, NCL in his presentation mentioned about the constraints of long lead periods in supply of equipment by the manufacturers and acute spare part problems being faced by the company. Unlike other companies, the dragline operations are quite significant in NCL in view of the higher overburden volumes to be handled. The major supplier has been HEC and there is delay in their supplies which is adversely affecting production. Due to ageing of number of draglines and electric rope shovels, spare parts supply has become very critical and OEMs located overseas are the major sources of supply. Timely supply of spares has become an issue. It is therefore important that overseas suppliers should develop manufacturing facilities in India. Also, OEMs need to address long lead time for supply and commissioning of equipment which is taking about 18 months on an average in each case. Similarly, BEML are now not submitting offer for spare parts for the draglines supplied by them earlier. Electrical control

systems are also found to be obsolete before the machine completes its life. GEMMCO, the dealer of Caterpillar do not have adequate competent service people, service centres and spare parts in India to maintain the machines supplied by them. HEC is taking unduly long time in erection and commissioning of new draglines. On the whole, the service support being extended by OEMs is not upto the mark. It is therefore important for reliability improvement by the OEMs. Procurement of proven equipment based on life cycle cost is critical in future. Insurance coverage for HEMM also needs consideration.

17. In case of SECL, CMD presented that a large scale expansion of two of its major projects namely Gevra 40-70 MTPA and Kusmunda 15-50 MTPA has been taken up and major share of overburden removal from these projects is planned using high capacity shovels and dumpers. Surface miners are envisaged for coal extraction. Wide scale use of in pit crushing and conveying technologies is proposed for adoption. Introduction of high angle/flexible/pipe conveyor systems and skip hoisting systems are also being envisaged. Limited sources of high capacity equipment suppliers globally and difficulties in formulating suitable specifications and absence of indigenous capabilities for manufacturing of equipment are some of the constraints in technology development.

18. Online equipment condition monitoring systems, development/strengthening of workshops to deal with the envisaged high capacity equipment, spares management, etc. need to be addressed by the equipment suppliers for improving availability of the equipment and productivity. Rapid loading systems are equally important for efficient dispatch of the production.

19. CMD, MCL in his presentation mentioned about the issues coming in the proper performance of equipment supplied by various manufacturers either due to failure of engines, hydraulics or due to frequent breakdowns for the want of spares. He also observed that there is a delay in supply of equipment or spares by many of the manufacturers. This has adversely affected maintenance of the equipment and thus the coal production. He strongly advocated that all HEMM should be supplied with guaranteed spare parts and maintenance and repair contracts for lifetime. He suggested that the satisfactory performance should cover at least four to five years instead of the existing one year condition and about 30 to 40 percent of the tendered quantity to be considered for meeting the provenness criteria instead of at least one as per the existing NIT condition. It was also suggested that tender finalization should be 60: 40 basis as per earlier system

to have a check on L1 Bidder both in price and performance. Preference may be given to the companies with manufacturing base in the country.

20. CMD, CMPDIL emphasized the need for planning of large capacity opencast mines with matching infrastructural support and introduction of higher size equipment. Need for in pit crushing and conveying systems and satellite surveillance for slope stability and land reclamation. Advanced blasting technologies and strata control measures are critical. Adoption of IT tools for planning and operations is also equally important. Advanced technologies for coal washing, CBM extraction, etc. are also required to be adopted. He further mentioned that the exploration requirements in reaching one billion tonne coal production have already been taken care of and geological reports are available.

21. CMD, NLC in his presentation mentioned about technology adoption by NLC over the years and the current level of operations being carried out by them with due regard to environment sustainability.

Presentations by OEMs

22. CMD, HEC in his presentation mentioned about the strengths in manufacturing of mining equipment, coal handling equipment, washery equipment. HEC is in a position to supply 150 numbers of 5 cubic meter electric shovels and 20 numbers of electric rope shovels and 4 numbers of 24 cubic meter dragline in next five years' time as per their capacity. They are also envisaging to take up joint manufacturing 20 cubic meter rope shovel in association with BEML and tying up with some foreign companies for manufacture of dozers, loaders, hydraulic excavators and continuous miners. They are also reviving their capacity for taking up manufacture of shaft winders. They also contemplate taking up turn key projects for coal handling and coal washing.

23. Director (Marketing), BEML in his presentation mentioned about the range of equipment for both opencast and underground being offered by them and their efforts in strengthening the regional offices and district level offices near coal company for improved after sales and service. He mentioned about the model depot agreements entered into them with coal companies and requested for making available advanced projections for improving their spare parts management.

24. M/s Caterpillar in their presentation mentioned that coal companies should reduce the tender periods and consider only bonafide and proven suppliers. They further suggested that the feasibility reports of the projects would need to be revisited for incorporation of latest technologies, upgrading of the equipment, etc. particularly at the time of replacement of equipment. Adoption of international standards for testing and certification of underground equipment was also suggested. For improving the machine utilization, it was suggested that product linked technology deployment and analysis of operating hour leakages are important. Further, use of electrically powered hydraulic mining shovels was suggested for improving the productivity of the equipment. Adoption of high wall mining technology and plough technology for underground mines in thin seams and use of appropriate mining equipment with long term replacement cycles and long term outsourcing contracts has been suggested. Extraction of coal from locked up pillars without surface rights needs to be explored. Equipment survey off norms has been suggested to be increased for lowering the ownership cost. Package approach for purchase of equipment is envisaged to reduce number of suppliers, tenders and purchase time. Incorporation of clauses in tenders to reward suppliers for exceeding conditions of guaranteed availability, higher utilization, longer survey of life need consideration by the coal companies. Use of long distance conveyors from face to loading points, customizing the truck bodies to maximize the payload, etc. are some of the productive approaches.

25. M/s Joy Global in their presentation mentioned that the current purchase procedures are posing challenges to capture build quality through L1 model. They are also time-consuming. They suggested to adopt new bidding procedures like Swiss challenge. They further suggested for partnership approach for developing mines with best technologies. They emphasized the need for sharing future plans of machine procurement with the manufacturers to bring in transparency in governance. Adopting total mining cycle approach and collaborating with reputed mining consultants for better planning on regular basis and partnering with equipment suppliers would provide a better approach in adoption of technologies. They suggested that coal companies should invest in reliable and compatible equipment and invest in world's best technology.

26. M/s Larsen & Turbo in their presentation suggested that Coal India should incorporate in their tenders the information and communication technology component for monitoring equipment availability, utilization, operator's skill, maintenance practices, etc. They further mentioned that the tenders being

floated by coal companies are extremely broad based and no weightage for technical superiority is being considered. They suggested that the technical merit rating system (TMR) with adjusted bid price mechanism may be re-introduced. Similarly, the availability guarantee may be specified for at least 50% of the economic life of the equipment instead of 1-3 years being mentioned in the bid documents. This would help in improving the reliability of the equipment by the suppliers. It was also suggested to introduce MTBF and MTTR for measurement of equipment reliability and after sales support strength of the suppliers in bid documents. The latest safety standards and environment friendly features with better emission norms, etc. should also be factored in bid documents. It was suggested that instead of basing the selection of bidder on L1 basis, the successful bidder should be determined by adjusted bid price mechanism. Considering technical merit score, availability guarantee over and above the NIT norms and after sales support capabilities. For outsourced operations, they suggested to increase the contract periods to at least 8 to 10 years from the current level of 3 to 4 years. Also, the bid document should mention the minimum size of the equipment to be deployed by the bidder for OB and coal.

27. M/s Liebherr – Mining Equipment SAS in their presentation mentioned about the range of products being offered by them including the large capacity excavators matching the 360 tonne dump trucks. Their services include custom built maintenance and repair contract, technical assistance contract with or without parts site depot and conventional periodic field service and parts supply. All sites are connected to their head office through BAAN and online service documentation is being done.

28. M/s Atlas Copco Drilling Solutions in their presentation mentioned about the advancement in the drill rigs being offered by them for blast hole drilling with the communication interfaces. The Rig Control System (RCS) products provide for safety interlocks, auto leveling, auto drilling, GPS hole navigation, rig remote access and communications, measurement while drilling, tele remote operations, auto tramming, etc. These provisions are envisaged to improve productivity of the drills.

29. M/s Peabody Energy Corporation in their presentation mentioned about their operations in different continents particularly in USA and Australia. The company sold about 252 million tonnes in 2013 and holds 8.3 billion tonnes of proven and probable coal reserves. They are currently operating 27 mines across

USA and Australia and include 20 surface mines and 7 underground mines. They mentioned about their strengths in safety, productivity and environmental excellence in conducting the coal mining operations and operating large scale opencast mines. Their model of mining covers resource recovery, conservation, environmental excellence, advanced mining techniques, state-of-the-art training, safety and efficiency. In this backdrop, they mentioned that their world class experience in development of coal resources both through opencast and underground mining can be considered by CIL for association. They invited to visit their operations for better understanding of the mining technology and land reclamation and environmental sustainability.

30. On the basis of the presentations and deliberations held in the Workshop, the following recommendations have been made for consideration of MoC/CIL for technology development and modernization towards the goal of reaching one billion tonne of coal production in 2019-20.

1. Respective stake holders in different tiers – right from the Ministry of Coal down to the mine level, shall implement and complete the tasks assigned to each with a coordinated and effective manner.
2. Special Task Force shall be set up at each tier to monitor, report, correct and help complete the tasks related to land acquisition, obtaining clearances, and project construction so that required additional mine capacity is created year after year.
3. Review the mining method/ technology decided for each new project and bring in more of innovative mechanization in mining operations- both U/g and O/c. In case of the existing mines, plan to mechanize operations, at shortest possible time, is to be decided and implemented. This task has to be taken up and completed for each mine within 3 months. 'Surface Miners' are to be deployed wherever feasible. Use of 'Ripper Dozers', especially near habitation & near to sensitive structures, is to be encouraged.
4. Feasibility of OB disposal through belt after sizing through in pit crushers in opencast mines.

5. High speed drivage of inclines / sinking of shafts as also high speed stowing /void filling technology in the underground mines should be explored and applied in projects that are suitable for such technology. Also, man riding systems should be installed in all the mechanized underground mines.
6. Similarly, review the equipment (HEMM for open cast mines and mass production machines for underground operations) deployment plan for each mine and add highly productive / large size equipment to reap quick results in terms of higher production and productivity for each mine.
7. Exercise for Identification of locations for the enhanced use of High-wall Miners and transporting coal through tube conveyors has to be intensified and appropriately decided.
8. Selection and procurement of equipment having greater reliability, higher / consistent availability and better performance; and NOT only on lowest price offered (L1) basis, is vital for having quantum jump in production and productivity. The following parameters may be introduced / followed to procure the right / reliable equipment:
 - Re-introducing Technical Merit Rating (TMR) system along with adjusted price bid mechanism by considering vital parameters such as (a) Productivity, reliability & safety criterion, (b) Availability Guarantee, over and above the NIT requirement and (c) After-sales service capabilities (Mean Time to Repair).
 - Putting a condition requiring the availability guarantee period to at least 50% of economic life of the equipment.
 - Incorporating past-experience for evaluating the same equipment model in a new tender
 - Expanding proven-ness criteria by incorporating global norms like Mean Time Between Failure (MTBF) and Mean Time To Repair (MTTR)
 - Introducing 'cost cap' instead of the current 'guaranteed parts consumption'
 - Opting for long-term Maintenance & Repair Contract (MARC)
 - Providing for distribution of orders between L1 and L2
 - Asking for the latest safety standards, environment-friendly norms and operator comfort and IT based monitoring systems of equipment should be suitably addressed in the NITs.

- Binding the supplier to assure for providing timely and reliable spare parts / after sale service support, without any failure whatsoever.
9. For this, a Task Force/Working Committee is to be constituted to address /review the terms and conditions to be incorporated so as to recommend suitable enabling provisions in the NITs for procuring equipment, in line with the above mentioned suggestions, for right procurement of equipment/ spares for the HEMM. Such provisions must have the weighted importance to quality and not simply going for L1 for purchase. In doing so, the committee may examine the best global practices being adopted elsewhere in the industry for the procurement of mining equipment and come up with an appropriate recommendation which can be considered by the Ministry of Coal for approval/adaptation. The Task Force/Working Committee may comprise of (i) Director (Tech.), Coal India Ltd, (ii) CMD, CMPDIL, (iii) CMD, SECL and (iv) CMD, NCL.
 10. OEMs must be made to keep/store enough quantities of equipment spares in each subsidiary HQ.
 11. Outsourcing / Offloading mining operations is to be done with due care, so that such operators have required resources and equipment in hand to provide reliable services and do not fail in fulfilling the targets. To ensure getting reliable contractors, with better credentials, at a competitive rate it is necessary to (a) increase the contract duration to 8~10 years, (b) Specify minimum equipment size in NIT, depending upon material to be handled per year and (c) Incentivize higher coal/OB production, over contracted quantities.
 12. With mechanization, deploying large size equipment/machines, the importance and need to have the right number of highly skilled workforce goes without saying. Plan and actions are to be taken, on war footing, to enhance skill of the workmen/supervisors, through proper training programmes.
 13. Upgrade the workshop facilities in all the major projects.
 14. Proper construction and maintenance of haul roads.

15. Improve blasting technology for achieving proper fragmentation of OB and coal for improving the productivity of equipment.
 16. Mobilize the transport (rail as well as road) logistics on a fast track mode so that additional coal produced during these years is evacuated in time from the mines to the consumers. Any delay in putting the bulk evacuation facility in position, would affect the coal production. The major rail projects in hand to move coal from 3 major coalfields has to be made operational within 2 years.
 17. Mining Safety, Coal Quality assurance and Sizing of coal at the pit head has to go hand in hand if the mission is to be fulfilled in totality. The famous slogan that "Safe mines are the productive mines" has to be remembered and safety standards in mines have to be improved to maximum extent.
 18. Peace and harmony in the mining areas makes any operation more productive and this applies more to mining operations. Besides the efforts that all managers must take to maintain cordial relations, the law and order maintenance also need to be given due importance by taking coordinated steps with the State Governments.
31. While proper equipment and skilled manpower for carrying out the operations are essential, at the same time, it is equally important the coal companies should take all appropriate measures to motivate the workmen, supervisors and executives for boosting their morale in accomplishing the mission of one billion tonne.

LIST OF PARTICIPANTS

Sl. No.	Name	Designation
1.	S/Shri ANIL SWARUP	SECRETARY, MOC
2.	S. BHATTACHARYA	CHAIRMAN, CIL
3.	D.N. PRASAD	ADVISER (P), MOC
4.	M.R. ANAND	ECONOMIC ADVISER, MOC
5.	B. SURENDRA MOHAN	CMD, NLC
6.	R.R. MISHRA,	CMD, WCL
7.	A.N. SAHAY,	CMD, MCL
8.	T.K. NAG	CMD, NCL
9.	T.K. LAHIRY	CMD, BCCL
10.	R. SINHA	CMD, ECL
11.	A.K. DEBNATH	CMD, CMPDIL
12.	P. DWARKANATH	CMD, BEML
13.	AVIJIT GHOSH	CMD, HEC
14.	Mhsaaki Khiyrou	VP, KOMSTSU INDIA
15.	TARUN KUMAR	GM, NCL
16.	M. B. V. SHIVAKUMAR	GM, NCL
17.	SANJAY KUMAR	CHIEF MANAGER, NCL
18.	S. RAMASWAMY	SENIOR MANAGER, NCL
19.	BHARTENDU KUMAR	CHIEF MANAGER, NCL
20.	C. B. SAHAY	GM (MINING), CCL
21.	D. B. REVATKAR	GM, CCL
22.	S. C. VISHWAKARMA	CHIEF MANAGER, CCL
23.	ALOK KUMAR SINGH	SR. MANAGER, CCL
24.	P.K. GUIN	CGM(OPR), CCL
25.	MANOJ SANWAL	TS TO DIRECTOR (T), CCL
26.	R. GANESH	GM, WCL
27.	A.P. DESHPANDEY	GM, WCL
28.	M.K. MAJUMDAR	AREA GM, WCL
29.	V.K. GUPTA	GM(PMD), WCL
30.	T.K. SRIVASTAVA	CHIEF MANAGER (P&P), WCL
31.	K.B. KHANNA	GM (E&M), WCL

32.	AJAY SINGH	DY GM, WCL
33.	GOPAL PRASAD	REGIONAL DIRECTOR, CMPDIL
34.	B.C. DEY	CGM (OC), CMPDIL
35.	MANOJ KUMAR	REGIONAL DIRECTOR, CMPDIL
36.	A.V. SAHAY	GM, CMPDIL
37.	TUSHAR VARMA	SENIOR MANAGER, CMPDIL
38.	A.K. CHAKRABORTY	GM, CMPDIL
39.	H.R. ROUTRAY	GM, MCL
40.	B.N. SHUKLA	GM, MCL
41.	A.K. SINGH	GM, MCL
42.	NARAYAN JHA	GM, ECL
43.	D. GANGOPADHYAY	GM (CMC), ECL
44.	M. MITRA	GM (E&M), ECL
45.	P.S. MISHRA	GM, BCCL
46.	S.K. AGARWAL	SENIOR MANAGER, BCCL
47.	S.S. SINHA	GM (CS), SECL
48.	B.K. MISHRA	GM, SECL
49.	U.K. SINGH	GM, SECL
50.	D. SRINATH	GM, SECL
51.	A.S. BAPAT	CHIEF MANAGER, SECL
52.	BINAY DAYAL	GM(P&P), SECL
53.	ALOK KUMAR NATH	TS TO DIRECTOR (T), CIL
54.	A.GHATAK	CHIEF MANAGER, CIL
55.	P.K. NATH	SENIOR MANAGER, CIL
56.	PRADEEP KUMAR	GM, CIL
57.	S.S. MALHI	DIRECTOR (T), WCL
58.	R.R. SINHA	ASSTT MANAGER, BCCL
59.	J.P. SINGH	DIRECTOR (T), MCL
60.	N.P. NARAYAN	GM, MCL
61.	S.P. DUTTA MAJUMDAR	CGM/TS, CIL
62.	MAHABIR MUKHOPADHYA	GM, GIL
63.	R.K. SWAIN	Engineer, Sales, BEML
64.	ARVIND K. GAUR	VP & Head C & Mining Div. L&T
65.	P. MOOKHERJEE	Head Mining, L&T
66.	A.K. DATTA	Zonal Manager, L&T
67.	C.N. DURGESH	Director (M&C), BEML
68.	A.K. HALDER	ED (M), BEML

69.	RAVI CHANDER	CGM, BEML
70.	K.V. KRISHNAMOORTHY	CGM, BEML
71.	A.K. SRIVASTAV	GM, BEML
72.	GAURAV SAXENA	Senior, Manager, BEML
73.	D. BANERJEE	CEO, T/M
74.	AISHED SAYEED	President, Peabody
75.	DAN MITTER	VP, Indonesia, Peabody
76.	P. CHATTERJEE	DGM, Caterpillar
77.	ANUJ KEOLIYA	AVP. GMMCO
78.	R. TIPIRRNEMI	GM, Caterpillar
79.	A. CHINNADURAI	GM MINES, NLC
80.	S. MITRA	NSM, JOY GLOBAL
81.	S. BHOWMIK	COMPANY HEAD JOY GLOBAL
82.	R.K. CHOWDHARY	SE WRD, RAJASTHAN JOB GLOBAL
83.	PRALABH BHARGAVA	SPECIALIST, RIO TINTO, INDIA
84.	N. BHASKAR	RO, SCCL
85.	CH. NARASIMHAR RAO	GM, SCCL
86.	K. SAH	DIRECTOR PROJECTS, HEC
87.	A.S. DATTARA	CBDO HEC
88.	SAMAR PAL	NATIONAL HEAD, LIEBHERR
89.	S. BASU	NATIONAL SALES HEAD LIEBHERR
90.	RAJESH KUMAR	ENGR. IN CHIEF, WRD BIHAR
91.	NAVEEN KR. SINGH	CHIEF OF TECHNOLOGY HEC
92.	R.N. SINGH	GM PROJECTS, MMTC
93.	DINESH KR. MITTAL	ACM, NLC
94.	YASHIKA SINGH	ECONOMIST, RIO TINTO
95.	A. KAPUR	GM, ATLAS GROUP
96.	A.V. KRISHNA	DIRECTOR, MARKETING, HEC
97.	SURJEET KUMAR	MARKETING MANAGER, ATLAS COPCO.
Members of INC/WMC		
98.	Dr. M.P. Narayanan	Vice-Chairman, INC, WMC
99.	Shri S.K. Chaudhary	Member, INC, WMC
100.	Shri B. Akala	Member, INC, WMC