

REPORT OF THE WORKING GROUP
ON
COAL & LIGNITE
FOR
FORMULATION OF TWELFTH FIVE YEAR PLAN
(2012-2017)



Government Of India
Ministry Of Coal
Shastri Bhawan
New Delhi

(November 2011)

Contents

Chapters	Particulars	Page No.
	Preface	i
	Executive Summary	1
1	Review of XI Plan performance	16
2	Coal Demand	22
3	Coal Production	39
4	Demand vis-à-vis Availability	60
5	Coal movement & Infrastructure development	64
6	Lignite	75
7	Coal Quality & Beneficiation of Coal	81
8	Exploration of Coal & Lignite	93
9	Mining Technology	107
10	Productivity & Benchmarking	116
11	Project formulation and Implementation	122
12	Environment Management, Land Acquisition and R&R	131
13	Clean coal technology	145
14	Automation & Application of Information technology	150
15	Research & Development	157
16	Safety & Welfare	163
17	Human resources requirements	178
18	Acquisition of Coal Assets Abroad	184
19	Investment envisaged	196
20	Policy initiatives on Coal Sector Reform	199
21	Marketing strategy & Mechanism for Greivance Redressal	209
22	Recommendation	220
	Annexure	

LIST OF ANNEXURES

Reference Chapter	Annexure No.	Subject	Page No.
Preface	A	Constitution of Working Group on Coal & Lignite for formulation of the XII Five Year Plan	237
	B	Constitution of Sub-Groups of Working Group by MOC	240
1	1.1	Year-wise Coal Demand and Supply : Sector-wise in X Plan	245
	1.2	Year-wise & Sector-wise demand and supply in XI Plan	246
	1.3	All India Coal Production Performance in XI Plan	247
2	2.1	Perspective Demand Analysis of XII Plan by Expert Committees	248
	2.2	List of coal based power plants to yield benefit in XII Plan	250
3	3.1	Coal Production Programme : Field-wise	261
5	5.1	Movement matrix of indigenous coal for XII Plan (2016-17)	262
	5.2	Movement matrix for imported coal for 2016-17	264
	5.3	List of on-going railway projects for augmenting coal routes	265
	5.4	Railway projects for port connectivity	269
6	6.1	State-wise projected lignite based power generation capacity	274
	6.2	Sector wise, State-wise projected lignite demand	275
	6.3	State-wise projected lignite production during XII Plan and at terminal year of XIII Plan	276
	6.4	State-wise, sector-wise & agency-wise investment proposal for Lignite	280
7	7.1	Performance of coking coal washeries in operation in the XI plan period	281
	7.2	Performance of non-coking coal washeries in operation in the XI plan period	282
	7.3	Projected washed coking coal production in XII plan from existing & proposed washeries	284
	7.4	Envisaged washed non-coking coal production during XII plan from existing & proposed washeries	287
8	8.1	Programme and Progress of Exploration Work during XI Plan	289
	8.2	Updated details of Coal Resources as on 1.4.2011	291
	8.3	State-wise Lignite Resources as on 01.04.2011	293
12	12.1	Master Plan for dealing with fire, subsidence, rehabilitation and diversion of surface infrastructure in Jharia and Raniganj coalfields	294
	12.2	Year-wise phasing of capital expenditure	295

Reference Chapter	Annexure No.	Subject	Page No.
	12.3	Pre-implementation activity chart for rehabilitation projects of JCF (BCCL)	296
	12.4	Phase-wise Rehabilitation Schedule for JCF (BCCL)	297
16	16.1	Statement for overall Welfare Expenditure	298
18	18.1	Country-wise reserve and reserve-production ratio	299
	18.2	Global coal trade flow chart	300
	18.3	Trend of import of coal by Asian countries	301
	18.4	Trend of export of coal by major exporting countries	302
19	19.1	Company-wise fund allocation & actual expenditure in X and XI Plans	303
	19.2	Fund allocation & actual expenditure in X and XI Plans with subsidiary-wise break-up for CIL	304
	19.3	Capital Outlay for XII Plan for CIL	305

PREFACE

In the context of the formulation of XII Five Year Plan (2012–17), the Planning Commission, has constituted a Working Group on Coal & Lignite under the chairmanship of Secretary, Ministry of Coal, vide Office Order No. M 12026/05/2011 – Coal dt.3rd March 2011 (Given at Annexure–A).

The terms of reference of the Working Group, as articulated in the Office Order of Planning Commission are as under:

- (i) To review the status of reforms carried out in coal sector and make recommendations for continuation of reforms further.
- ii) To make a year-wise coal and lignite demand estimate for the period 2012–17 (XII Plan) and 2017–2022 (13th Plan), based on the requirement of the end users (of both coking and non-coking coal); their pattern of growth; technological improvements of the end users vis-a vis the specific consumption; import requirements of both coking and non-coking coal; possible inter fuel substitutions; etc.
- iii) Suggest measures to enhance acquisition of assets abroad and extent of complementing the domestic demand from these assets;
- iv) Review the exploration programme (regional/promotional & detailed exploration) under implementation and suggest measures to enhance the pace of exploration matching with the current and long term coal and lignite demand; to assess the capabilities of the existing exploration agencies to meet this exploration programme and the possibility of private sector participation to augment/supplement these capabilities.
- v) To assess the potentiality of methane content of each coalfield and suggest measures for successful exploitation of this resource.
- vi) To bring out a year wise, coal field wise and company wise coal and lignite production programme with related financial and economic implementations; to correlate this production programme in the projected demand and to suggest measures for dealing with the demand-supply mismatch, if any; study and suggest technological developments for suitable adoption in view of the large resources of untapped deep seated coal resources and resources in geologically disturbed areas, in particular.
- vii) To recommend industry structure that would enhance number of players, promote competition, provide consistent and transparent pricing regime and raise production, distribution, transportation and end use efficiency.
- viii) To establish benchmarks for different mining operations (opencast as well as underground) comparable with international standards and suggest measures to realize such levels in India.
- ix) To suggest measures for improved formulation and implementation of projects.
- x) To suggest measures for improving the availability of proper quality of coking coal from indigenous sources; improving the performance of coking coal washeries; measures to enhance supply of non coking coal of 34% ash for power generation in compliance with the MOEF's directive.

- xi) To suggest measures for improving the existing infrastructure for coal movement from collieries to consuming centres and also from ports;
- xii) To suggest measure to enhance the use of emerging IT technologies in the exploration, production, distribution and transportation of coal and lignite.
- xiii) To assess safety and welfare requirements for workers; to assess the current status of research and development activities in the coal and lignite sector and to formulate and recommend schemes and programmes for research and development in specified areas in view of the emerging energy scenario and environmental implications.
- xiv) To make assessment of year wise investment including foreign exchange component for achieving the XII Plan objectives and targets, including foreign assistance/loans/bilateral collaboration etc.
- xv) To review and assess the environmental management aspects for sustainable coal production in the XII Plan and beyond.

In order to formulate the document in a time-bound manner, the Planning Commission suggested the following:

1. In order to assist the Working Group in its task, separate Sub-Groups on specific aspects will be formed by the Working Group. These Sub-Groups will furnish their reports to the Working Group.
2. The Chairman of the Working Group may co-opt experts as members as and when deemed necessary.
3. The Working Group will submit its reports to the Planning Commission latest by 30th September, 2011.
4. Non-official members of the Working Group shall be entitled to payment of TA/DA by Planning Commission. The TA/DA of Government officials will be borne by their respective organizations as per the rules the establishments applicable to them.
5. Name(s) of the representative(s) of Organization(s) as mentioned in the composition of the Working Group may be communicated to the Member-Secretary of the Working Group under intimation to Dr. Arbind Prasad, Sr. Adviser (Energy), Planning Commission.
6. Shri I.A.Khan, Joint Adviser (Energy), Room No. 501, Yojana Bhawan, (Tel: 23327446) will be the Nodal Officer for this Working Group and any further query/correspondence in this regard may be made with him.

To assist the Working Group, Ministry of Coal has constituted four sub-groups to cover up all the areas indicated in the terms of reference vide Office Order No.17014/04/2011 PMS dated 18/5/2011. The composition & Terms of Reference of various Sub-Groups are given in Annexure-B.

The related major issues being covered by the four sub-groups are as under:

- | | | |
|---|-------------|---|
| 1 | Sub-Group-I | For review of the status of reforms carried out in coal sector and to |
|---|-------------|---|

make recommendations for continuation of reforms further.

- | | | |
|---|---------------|---|
| 2 | Sub-Group-II | On Coal Demand, Supply, Movement, Quality, Import and Infrastructure Development. |
| 3 | Sub-Group-III | On Coal & Lignite Exploration and use of clean coal technologies |
| 4 | Sub-Group-IV | On productivity, information technology, mining technology, R&D, Safety, Welfare and Environmental Management |

✚ Sri A.K Bhalla, Joint Secretary, Ministry of Coal is the Chairman whereas Sri Gautam Dhar, CGM, Corporate Planning, Coal India Limited is the Member Secretary of Sub Group-I.

✚ Sri R.K Mahajan, Joint Secretary, Ministry of Coal is the Chairman whereas Sri H K Vaidya, CGM, Sales & Marketing, Coal India Limited is the Member Secretary of Sub Group-II.

✚ Sri A. K. Singh, Chairman, CMPDIL is the Chairman whereas Sri A K Debnath, Director (Technical), CMPDIL is the Member Secretary of Sub Group-III.

✚ Adviser (Projects), Ministry of Coal is the Chairman whereas Sri D N Prasad, Director (Tech), M/o Coal is the Member Secretary of Sub Group-IV.

Besides these, about 12 to 17 members drawn out from the different stakeholders of the coal & lignite sectors are included in each sub-group.

During the process of formulation, each sub-group had co-opted other than the members of Sub Group, some experts in the respective specified fields to imbibe valued feedback arising out of their experience & expertise to the issues. Following Officials & non-Officials experts have been co-opted for sub-group I:

1. Shri A. Acharya, Coal Controller
2. Shri S.K. Banerjee, Retd. Dy. Chief Manager, L&R, CIL
3. Prof. A.K. Ghose, Former Director ISM
4. Dr. Rajiv Kumar Garg, Adviser (E&F), CIL
5. Shri U Kumar, Advisor (Coal), Aditya Birla Group, Representative of CII
6. Shri Chankya Choudhary, CRE, Tata Steel
7. Shri Puneet Goel, Director, KPMG Advisory Services Pvt. Ltd.

Following Officials & non-Officials experts have been co-opted for sub-group II:

- a. Sri Gautam Dhar, CGM (Corporate Planning), CIL
- b. Sri Phalguni Guha, CGM (Coal Videsh), CIL
- c. Shri A. Acharya, Coal Controller

Consequent to receipt of draft reports of all the sub-group, an editorial committee was constituted to collate the information and formulate the final report vide letter F.No.

17014/04/2011–PMS dated 30th Sept 2011 of Ministry of Coal, which has been appended as Appendix III. The editorial committee comprises the following:

- | | | |
|--------|--|---------------|
| (i) | Sri A K Bhalla, JS (C), MoC | – Chairman |
| (ii) | Sri Kailash Pati, Economic Adviser, MoC | – Co-Chairman |
| (iii) | Sri D N Prasad, Director (T), MoC | – Member |
| (iv) | Sri Gautam Dhar, CGM (CP), CIL | – Member |
| (v) | Sri H K Vaidya, CGM (S & M)/ CGM (QC), CIL | – Member |
| (vi) | Sri N. Ahmed, GM (Exploration), CMPDIL | – Member |
| (vii) | Sri Y P Dhingra, DS (CPD), MoC | – Member |
| (viii) | Sri Sundeep Gupta, US (CPAM), MoC | – Member |
| (ix) | Sri G Srinivasan, US (CPD), MoC | – Member |

The committee has benefitted from the illuminating guidance of Shri Alok Perti, Secretary to the Government of India, Ministry of Coal in the course of preparation of this report.

Executive Summary

Review of XI Plan:

- The Eleventh Five Year Plan had envisaged a coal demand of 731.10Mt in the terminal year (2011–12), which was revised downward to 713.24Mt during Mid–Term Appraisal of the Plan (MTA) and further moderated to 696.03 Mt in the Annual Plan 2011–12.
- The initial planned coal production of 680 Mt in 2011–12, the terminal year of the XI Plan, has been revised to 629.91Mt in MTA and was further modified to 554 Mt in the Annual Plan 2011–12.
- The demand supply gap earlier envisaged at 51.10 Mt in WG on Coal & Lignite for XI Plan has been revised to 83.33 Mt in MTA, which in the Annual Plan document of 2011–12 has further widened to 137.03 Mt.
- As against coal based thermal capacity addition programme of 42,625 MW during XI Plan period, CEA envisages commissioning of 41,151MW. The actual capacity addition till the end of August, 2011 as reported by CEA, has been 29740 MW. CEA indicated another 11401 MW capacity, i.e.28% of the total capacity addition of XI Plan period will be commissioned during last seven months of the Plan. The generation programme of 690 BU by the end of XI Plan is now anticipated by CEA to be around 600 BU (13% less than the projection).

Coal Demand:

- For the XII Pan period, CEA has indicated a coal based capacity addition plan of 79010 MW (14,560 MW in Central Sector, 12,080 MW in State Sector and 52370 MW in Private Sector). This apart, CEA has also indicated 38905 MW coal based capacity is under various stages of execution. CEA has indicated a coal based generation programme of 1155 BU in 2016–17. 17th Electric Power Survey projected energy requirement of 1392 BU in 2016–17. This excludes generation from captive power plants. After considering the capacity addition programme of CEA and going by the trend that around 70% of the projected energy requirement to be coal based, the Sub–Group assessed that the most likely coal based generation in the TY of XII Plan could be in the order of 975 BU. This indicates a CAGR of 10% in coal based generation programme which is in tune with the suggested growth rate in economy to the tune of 9% during XII Plan. Further, taking in view that there will be substantial increase in use of washed coal and imported coal at power plants, the specific coal consumption has been considered to be 0.70 Kg/Kwh. The coal requirement for power sector, thus works out to 682Mt in 2016–17.
- The estimated demand of steel is related to steel production programme. The optimistic projection of steel production in 2016–17 is 105 Mt. Based on the recommendation of the National Steel Policy that 0.64ton coking coal is required to produce 1 ton of steel, the corresponding coking coal requirement is worked out at 67.2 Mt in 2016–17. This excludes the demand of non–coking coal for captive power plants.

- The envisaged cement production programme in 2016–17 is 394.2 Mt and the assessed coal requirement is 47.31 Mt. This excludes the demand for captive power plants.
- The assessment of demand for captive power plants is 56.36 Mt, which includes the plants of the Fertilizer sectors. In absence of plant-wise consumption details, the demand is estimated on the basis of the past consumption trends.
- The coal demand for the sponge iron sector is assessed at 50.33 Mt on the basis of the optimistic production projection given by steel industry and coal consumption norm of the National Steel Policy.
- After consultation with the major consuming sectors, two scenarios for coal demand have been worked out for the TY of XII Plan. Under Scenario-I (Consumers' perspective demand) the demand works out to 1203.88 Mt implying a CAGR of 11.5% against the demand of 2011–12 projected in Annual Plan. Scenario-II is the realistic requirement of coal arrived at taking in to consideration the envisaged demand of end-use products and likely production of major coal consuming sectors and the trend of specific coal consumption by each of the sectors. The coal requirement in Scenario-II has been projected at 980.50 Mt implying a CAGR of 7.1%. In absolute term the incremental demand is projected at 284.5 Mt from a level of 696 Mt in 2011–12 to 980.5 Mt in 2016–17.
- Out of the projected demand of 980.5 Mt, the demand of power utilities is 682 Mt, which is almost 70%. If the demand of captive power to the extent of 56.36 Mt is included the projected demand for power sector works out to more than 75%. The share of steel sector at 67.2 Mt forms 7% of the total demand. The share of cement and sponge iron sectors works out to 4.7% and 5.1% of the total demand respectively.

Coal Production:

Business as Usual scenario:

- The coal production is envisaged to reach 715 Mt in the terminal year of XII Plan in 2016–17 against the likely production of 551.9 Mt in the TY of XI Plan in 2011–12 implying a CAGR of 5.08 %. The incremental coal production in the XII Plan is envisaged to be 163.1 against 121.07 Mt likely to be achieved in the XI Plan.
- The incremental production envisaged in the XII Plan from CIL is 109.4 Mt, SCCL 6.0 Mt and captive blocks & others 45.6 Mt.
- The potential increase in production of CIL is envisaged from MCL (34 Mt), CCL (32 Mt), SECL (18 Mt), NCL (11.5 Mt) and ECL (8 Mt).
- During XII Plan, CIL envisages taking up around 70 expansion/new projects beside around 50 XI Plan projects spill-over.

Optimistic Scenario:

- The coal production is envisaged to reach 795 Mt in 2016–17, the terminal year of XII Plan, against the anticipated production of 551.9 Mt in the TY of XI Plan in 2011–12 implying a CAGR of 7.57 %. The incremental coal production in the XII Plan is envisaged

to be 243.10 Mt against 121.07 Mt likely to be achieved in the XI Plan. This production is achievable only if the requisite clearances are processed in fast-tracked route and delivered within the specified time schedule. The issues affecting land acquisition, R & R, law and order and evacuation infrastructure will also have to be addressed in a time bound manner.

- The envisaged incremental production in the XII Plan is 168 Mt, 6 Mt and 63.85 Mt from CIL, SCCL and 'captive blocks & others' respectively.

Demand vis-a-vis Availability

In overall terms the gap between the projected demand of 980.50 Mt and the projected domestic availability of 715.0 Mt works out to 265.5 Mt in 2016–17. This comprises of 35.50 Mt of coking coal and 230.0 Mt of thermal coal. If the production is enhanced to the level visualized in the optimistic scenario, the demand–availability gap would reduce to 185.50 Mt (Coking: 35.50 Mt & Non–coking 150.0Mt). This requirement would need to be met from imports.

Coal movement & Infrastructure development

- In the year 2010–11, the share of rail in movement of coal in the Country had been 52%. The share of other mode of transportation had been 27% by road, 15% by MGR and 7% by belt/rope. Against this, the coal movement matrix in the TY of XII plan (2016–17) is envisaged to be with 58 % share of rail, 25% share of road, 11% of MGR and 6% of Belt/rope. This includes movement of 800Mt of indigenous coal and coal products and 265.50Mt of imported coal. The plan for increased movement of imported coal is the reasons for increased share of railways in the XII Plan.
- In the end of XII Plan the average wagon requirement is envisaged at 446.4 rakes/day out of which 165.6 rakes/day will be required on account of imported coal. Wagon loading in 2010–11 had been 295.6 rakes/day. The annualized growth in rail loading, thus envisaged to be 7.1%.
- It is proposed to augment rail movement of coal through dedicated freight corridors, matching wagon volumes and matching loading and unloading facilities at colliery and power station ends.
- A few railway infrastructure projects were identified for development at North Karanpura, Mand–Raigarh and Gopalpur–Monoharpur block at Ib–Valley coalfields in the XI Plan for evacuation of incremental coal production. However, constraints like land acquisition, clearance from Environment Ministry have delayed the same. These needs to be expedited in XII Plan. In addition to these a few more feeder lines have been suggested for improving rail movement in the XII Plan in potential coalfields.
- Transportation of coal to railway sidings would be of vital importance to ensure movement of indigenous coal. It is proposed that infrastructure capacity for transportation of coal needs to be planned, which includes conversion of fair weather road into heavy duty all weather express coal corridor to cope up daily transportation requirement of 1.24Mt of coal to sidings, which would involve about 1.24 lakh trips/day. In order to cope up with the increasing pressure on transportation of coal, it is proposed

that the transportation of coal from new projects and also from washeries in pipeline to railway sidings should be planned through CHP/conveyor system. Sizing of coal is also identified as a thrust area for movement of planned quantity of indigenous coal.

- The total coal traffic at ports is envisaged to be 305Mt in the year 2016–17, which includes 40Mt of indigenous coal for movement through coastal shipment. The port infrastructure, particularly in respect of hinterland connectivity and maintenance of draft are identified as critical issues for handling exponential growth in imported coal traffic. The handling and stacking capacity at ports are also identified as critical issues.
- To ease out the load on railway infrastructure, development of alternative mode of transportation, particularly inland waterways has been identified as a thrust area.

Lignite

- As against projected demand of 55.93 Mt in 2011–12, TY of XI Plan, the likely demand would be about 49.35 Mt.
- At the end of XI Plan (2011–12), the original XI Plan envisaged a total production of 54.96 Mt (Tamil Nadu –24.23 Mt, Gujarat – 22.26 Mt, Rajasthan – 8.47 Mt). It is now anticipated that lignite production would be 41.64 Mt (Tamil Nadu – 22.85, Gujarat – 15.14 Mt, Rajasthan – 3.65 Mt) in 2011–12. The total production of lignite in the XI Plan period is anticipated to be 179.85 Mt against projection of 223.99 Mt, implying 80% achievement.
- In the XII Plan period, production in 2016–17 is envisaged to be 68.60 Mt and the total envisaged lignite production in the plan period would be 290.16 Mt.
- The demand of lignite is envisaged to be 71.96Mt in the TY of XII Plan, out of which demand from power sector is envisaged to be 53.86Mt.
- From a level of 5211MW in the TY of XI Plan, the capacity of lignite-based power plant in the country is envisaged to be 7491MW in the TY of XII Plan, implying a CAGR of 7.5%.

Coal quality & Beneficiation

- Growth in production of indigenous coking coal from 32.1 Mt in 2006–07 to 49.5 Mt in 2010–11. Metallurgical coking coal production remained at about 18 Mt. Efforts are being made to build washeries for low volatile coking coal to enhance the supply of washed coking coal to steel plants.
- Total installed capacity of coking coal washeries is projected to increase to 48.98 MTY in 2016–17 from the present capacity of 29.88 MTY. Washed coking coal production of 6.37 Mt in 2010–11 is projected to increase to 13.9 Mt in 2016–17.
- Total installed capacity of non coking coal washeries is projected to increase to 174.96 MTY in 2016–17 from the present capacity of 95.96 MTY. Washed non coking production of 32.64 Mt in 2010–11 is projected to increase to 114.46 Mt in 2016–17.

- CIL has initiated action to set up 20 coking and non coking coal washeries with a total capacity of 111 MTY in 1st phase and thereafter 17 coking & non coking coal washeries with 128.80 MTY capacity in 2nd phase.
- Capacity addition required for non coking coal washeries by the XIIth plan is 161 Mt which will reduce further with construction of some new washeries in private sector.
- Environment clearance relating to disposal of washery rejects is one of the main issues causing delay in commencing construction of the washeries. Setting up new FBC plants using washery rejects as fuel need to be encouraged supported by tax holidays.

Exploration of Coal & Lignite

As on 1.04.2011, the national coal inventory stands at 285.8 Bt, out of which 114 Bt are in 'Proved' category. The inventory of lignite resources stands at 40.90 Bt as on 1.04.2011 with 6.14 in 'Proved' category.

Performance in XI Plan:

- Regional Exploration:* Against a target of 1.94 lakh meters (revised to 1.47 lakh m during mid-term review of core group, CGPB-Com-V in 2009) in coal, 1.14 lakh meters (60%) of drilling is likely to be achieved and 7.07Bt of coal resources likely to be established. In Lignite, 1.85 Bt resources established by drilling 1.04 lakh meters.
- Promotional Exploration:* 5.69 lakh meters (76%) is expected to be achieved, against a target of 7.50lakh meters of exploratory drilling expected to establish 20.05 Bt of coal and 3.22Bt of lignite resource.
- Detailed Exploration:* Against a target of 5.00 lakh meters in CIL areas, 11.28 lakh meters (226%) of exploratory drilling will be achieved by CMPDI and its contractual agencies including MECL and 8.52 Bt of reserves expected to be proved during XI Plan. In SCCL area, 2.34 lakh meters of drilling (47%) will be achieved against a target of 5.0 lakh meters, expected to establish 0.50 Bt of reserves under 'Proved' category. In Non-CIL areas, 8.15 lakh meters (60%) of drilling against a target of 13.5 lakh meters is envisaged to be carried out expected to establish 5.20 Bt of reserves by the end of XI Plan. In addition 0.55 Bt of reserves are envisaged to be 'Proved' by different agencies in their own blocks against exploratory drilling of 1.44 lakh meters. In lignite, 1.309 lakh meters (94.75) of exploratory drilling will be achieved against target of 1.38 lakh meters may establish 2.46 Bt of resources.

Exploration programme for XII Plan:

- Regional Exploration:* GSI has drawn up a plan for drilling of 1.05 lakh meters in coal sector for XII Plan. GSI will be able to establish resource base of about 5.789Bt in coal. DMGR and CGMG have drawn up plan to establish 0.30 Bt of lignite resource by drilling 0.74 lakh meter.

- b) *Promotional Exploration*: 4.80 lakh meters of drilling in coal and 3.34 lakh meters in lignite has been envisaged in XII Plan to establish 16.64Bt of coal and 5.30Bt of lignite resource.
- c) *Detailed Exploration*: Keeping the coal production requirement beyond the XII Plan in view, a drilling programme has been drawn up for 54.46 lakh meters in CIL, SCCL and Non CIL areas. It is expected that 76.80 Bt of coal reserves will be 'Proved' through Detailed Exploration. Similarly, a programme for Detailed Exploration for lignite involving 0.85 lakh meters of drilling has been drawn up. However, major part of the exploration activity will need to be outsourced. 19.03 lakh m of drilling has been envisaged to be undertaken during XII Plan targeting 16.22 Bt of resources to be brought in 'proved' category.
- The enhancement of drilling activities during XII Plan will require substantial capacity build up for coal core analysis and enhancement of capacities of exploration agencies in Govt/PSU to provide technical support for exploration to taken up by agencies in private sector.
 - For development of Clean Coal/Lignite resource NLC will undertake 0.185 Lakh m of drilling for Underground Coal Gasification. GSI and CMPDI will carry CBM related test studies and allied studies in 40 and 20 Boreholes respectively. CMPDI will conduct Shale gas studies in 25 Boreholes during XII Plan.
 - 150 Lakh m of 2D HRRS and 50 Sq.km of 3DHRRS will be undertaken in different Coal/Lignite field by different agencies during XII Plan.
 - The total fund requirement of Preliminary/Regional, Promotional and Detailed Exploration in different coal, lignite, CBM and shale gas prospects for XII Plan has been estimated at Rs. 4,507.88 crores, out of which Rs. 1,521.21crores will be required from MOC for promotional, detailed Non CIL and other related exploration projects.

MINING TECHNOLOGY

- Technology is the key to higher production, productivity and safety. In India around 90% of the coal is produced by opencast method and only 10% by underground methods. Bigger size of HEMM is finding greater application for higher production and productivity in opencast mines. 42 cum rope shovel shovels, 240 T rear dumpers and 33 cum Dragline have already been deployed. Future mines need to be planned for a maximum depth of 300 to 500 m with still larger sizes of HEMM, e.g. 56 cum Shovels 400/320/260 T dumpers and crushing conveying of coal and OB. More than 25 % of OC production comes from Surface Miners, eliminating the need for drilling, blasting as well as sizing.

- The prevailing underground technology is semi-mechanised operation through Load Haul Dumps (LHDs) and Side Discharge Loaders (SDLs). Still about 12% of underground production comes from manual loading operation which needs to be totally phased out through suitable mechanisation during XII Plan period.
- The mechanised underground operation has come a long way over the years overcoming initial failures especially due to typical Indian strata condition. Considerable change has taken place around the globe in development of roof support design and capacity and other equipment and machinery. The Powered Support Longwall and Continuous Miner technology is being applied with success in many mines and there is a need to popularise and establish these as predominant underground technology especially for greater depth. The allied areas like tele-communication, transport, ventilation, manriding system should also keep pace with the development.

PRODUCTIVITY AND BENCH MARKING

- The increase in productivity aims at efficient and effective utilization of resources. Though the opencast mines have recorded a consistent increase in productivity over the years, the underground OMS is hovering around 0.7 tonne. The lower mechanization and automation of underground mines is the main cause of low productivity. Though average manpower productivity in opencast mines is around 10 tonne per manshift, some coal companies have attained a level of 20 tonne/ manshift. This calls for a proper analytical approach like benchmarking. The lower availability and utilization of machinery in some mines and coal companies need to be addressed by Cutting down the idle and breakdown time of machinery, better maintenance and timely procurement of spares, eliminating mismatch between excavating and transportation capacities and better discipline and training of workmen.
- Use of mass production underground technology like longwall, continuous miner, road headers etc. in underground mines, OITDS for all big opencast mines, rapid loading system for coal dispatch, Modern communication and reporting system and proper monitoring at every level are required better productivity.

FORMULATION AND IMPLEMENTATION OF COAL PROJECTS

- Formulation of coal/ lignite projects is the most vital area to meet the growing demand of the nation. Being site specific a new project involves large area of land and R&R. Varied conditions of geology, geography, resource, quality, production potential need to be carefully assessed and addressed to during project formulation. The development of infrastructure, evacuation system has to be suitably planned keeping in mind the future potential and the entire coalfield.
- Analysis of Cost and Time overruns in Coal Projects in India reveal the main reasons as, delay in forestry and Environment clearance, problems faced during land acquisition, R&R, law & Order, delay in Procurement of Equipment especially, HEMM, construction of CHP, railway siding or evacuation network problems etc.
- CIL had identified 145 projects with an ultimate production capacity of 391.22 Mty in the XI plan period. Of these, 80 projects having ultimate sanctioned capacity of 195.78

Mty have been approved till July 2011 for a capital investment of ₹11293.27 Cr. and are in various stages of implementation. Out of these, 37 projects contributed 80.11 Mt in 2010–11. In 2011–12, 42 projects are expected to contribute 88.71 Mt. 65 identified projects of XI Plan period having a total estimated capacity of 195.44 Mty are under formulation/approval.

- In the XII Plan period production from Existing and Completed projects of CIL is expected to decline from 218.37 Mt in 2011–12, Terminal Year of XII Plan, to 192.42 Mt in 2016–17. Production from Ongoing Projects is programmed to increase from 227.63 Mt in 2011–12, to 300.18 Mt in 2016–17. Another 63.8 Mt is envisaged to come from future new/expansion projects to be taken-up during XII plan. As many as 70 new/expansion projects and around 50 spillover projects of XI Plan are to be taken up in the XII Plan period.
- In SCCL, 33 projects were envisaged for implementation with a capacity of 56.674 Mty during XI Plan Period. Out of 33 Projects, 24 (36.72 Mty) Projects have been taken up during the XI plan period and production started. During XII Plan, nine new projects are proposed to be taken up.
- For better monitoring of project implementation projects need to be monitored on MS Projects software, web based monitoring is to be adopted, package based contract management eliminating delays to be devised and powers at various levels as per the enhanced empowerment of coal companies to be delegated down the line.

ENVIRONMENTAL MANAGEMENT AND LAND ACQUISITION AND R&R

- As per the Environmental Impact Assessment Notification of September 2006 of MoEF, prior Environmental Clearance (EC) is a must for all Mining Projects or activities including that involving Expansion and Modernisation/ Change in lease area / change in capacity / change in product mix.
- As per EIA notification 2006, the EMP clearance process should take maximum of 210 days but the general experience of coal companies is that it invariably involves some 1½ to 2 years time. Forestry clearance is granted in 2 stages, Stage– I (in principle clearance) and after observing conditions imposed in St–1 clearance and payments for NPV, compensatory afforestation, etc., Stage– II clearance is accorded.
- The process of EC requires Re-engineering with specific provisions for coal mining. Mines be grouped together on the basis of unique environmental concerns, geographical separations for the purpose of preparing cluster-wise EIA/EMP where mines of same owners are located in close proximity
- Over the years of implementation of coal mining projects it has been observed that mine reclamation and mine closure have not been paid proper attention leading to environmental concerns. Ministry of Coal has issued a set of guidelines mandating all the mine operators to undertake reclamation for which approval of Mine Closure Plans by the competent authority is mandatory.
- Coal companies should take possession of the entire area of land required for the life of the project at one go. Often, land records with State Authorities are inaccurate or incomplete. This leads to delays in processing acquisition of land and disputes over ownership and size of land plots. Updating and computerisation of land records

supported through survey of land is essential. Govt. should make suitable legislation to stop construction on coal bearing land.

CLEAN COAL TECHNOLOGIES

- The technologies employed and being developed to meet coal's environmental challenges collectively referred to as Clean Coal Technologies (CCTs). Broadly CCTs include washing of coal, Coal Gasification, Coal Bed Methane/Coal Mine Methane extraction, Underground Coal Gasification, Coal Liquefaction or Coal to Liquids (CTL), coal conversion technologies like Integrated Gas Combined Cycle (IGCC) for power generation, Carbon Capture and Storage (CCS), etc. Government has laid thrust on clean coal technologies to mitigate adverse impact of coal usage on environment.
- Ministry of Coal (MoC) and Ministry of Petroleum & Natural Gas (MoP&NG) are working together and government has offered 33 blocks in four rounds of bidding for CBM covering 17416 sq. km of area.
- The clean coal technologies related to combustion of coal are mainly being dealt with in the power sector. These technologies are envisaged to improve the overall efficiency levels of power plants and reduce emissions of CO₂. Specific coal consumption levels are also envisaged to reduce with adoption of these technologies.

AUTOMATION & APPLICATION OF INFORMATION TECHNOLOGY

- Automation is the key to high productivity, production and safety. The information revolution of the country is gradually getting into mining industry and has a significant impact on mine operations. The field of application is vast and almost unlimited. Top Down approach of is to be adopted for various business functions including IT infrastructure is to be laid at subsidiary Hqs. and to be extended to area and unit level to individual's desk.

RESEARCH & DEVELOPMENT

- Soon after Nationalization of the coal industry in mid 1970's, the three pronged approach for Research and Development in coal, viz. Coal S&T Programme under the Standing Scientific Research Committee (SSRC), in house Research and Development Programmes of coal companies and Inter-Sectoral Science Technology Advisory Committee (IS-STAC) has been adopted during different Five Year Plans. R&D in coal is carried out under four major areas namely production, productivity and safety; coal beneficiation; coal utilisation; and environment and ecology.
- Some of the emerging new areas of R&D are in-situ coal gasification, Liquefaction of coal, Coal Bed Methane(CBM), Shale gas estimation & its recovery, 3D seismic survey, Study of structure of coal seam and roof rocks in hydro-fracturing areas.
- Coal companies should consider investing at least 1% of their PBT in R&D every year. Private sector participation in R&D work should be encouraged, research scholars, academicians and reputed overseas institutions for R&D should be involved.

SAFETY

- Coal mining operations are governed by the Mines Act, 1952 and the rules and regulations framed thereunder in regard to safety and health. The Directorate General of Mines Safety (DGMS), under the Ministry of Labour & Employment is the regulatory authority to enforce the statutes relating to mine safety. There is a Standing Committee on Safety in Coal Mines, chaired by Minister in Charge of Coal, with representatives from Ministry of Coal, Ministry of Labour & Employment, DGMS, Trade Unions, Coal companies (All PSUs & Private), State Mines & Mineral Development Corporations. The Committee meets biannually to take stock of the safety situation in coal and lignite mines and suggests measures for bringing further improvement in the field of safety.
- In recent years, accidents in opencast mines due to transport equipment have shown a rising trend. Measures such as Simulator to impart training for all HEMM operators and virtual reality training facilities at Central Training Institute need to be established in all coal companies.

HR REQUIREMENT

- In order to keep pace with the stupendous growth of the coal sector, it is imperative that human resource planning is given paramount importance.
- Looking at CIL as a case study one can safely predict the requirements of human resources for the national coal sector and work out a stratagem for upgrading skills for new levels of productivity and performance.
- The coal industry needs an innovative framework to attract, select, deploy and develop the industry's human resources.
- A situational analysis reveals that CIL is emerging as a geriatric organization with average organizational age over 50, with vanishing skill set based on experience.
- CIL is faced with a shrinking base of experienced front-line supervisors. A host of training initiatives have been proposed to revamp the existing training infrastructure which includes:
 - Strengthen the miners' ability to act competently in emergencies;
 - Use of simulation to enhance the perceptual judgment.
 - Revamping of VTCs with state-of-the-art facilities.
 - Use of simulators and computer aided techniques in Training Institutes;
 - Transformation of IICM into an open university.
- Significant recommendations have been made which advocate CIL to surmount the daunting challenge of human resource development at all levels – from front line supervisors to senior level executives – for a new order of performance.

ACQUISITION OF COAL ASSETS ABROAD

- The gap between demand and indigenous availability of coal has been consistently widening. The projected gap is estimated to increase from a level of 137Mt in the TY of XI

Plan to 265Mt in the TY of XII Plan and to further increase at the level of 423 Mt in the TY of 2021–22.

- While identifying the countries for acquiring coal assets issues related to the international coal trade routes, the present import sources of India, port & logistics infrastructure facilities available in the source countries and the port facilities available in India need to be taken into consideration.
- Conservative attitude of the host countries in regards to allow entry to foreign players in controlling a strategic asset like coal, the aggressive Chinese model of Merger & Acquisition to control coal properties in different parts of the world, absence of any sovereign fund for developing infrastructure in the host countries and limited empowerment in respect of Indian PSUs to take strategic business decisions are identified as constraints in acquiring foreign asset by Indian entrepreneurs.
- Clear-cut Govt. guidelines allowing PSUs to be strategically aggressive for maiden foreign acquisitions, policy to appoint Investment Bankers on nomination basis to incentivize them for bringing exclusive deals which can be transacted on one-to-one basis, to do away with the distinction between listed and unlisted companies in respect of acquiring foreign assets, introduction of definite tools/Guidelines related to financial parameters for quick decision making and to fast track the entire Merger & Acquisition (M&A) transaction and inclusion of suitable clause for reviewing the proposed financial powers of the Board related to periodic foreign investment are some of the measures proposed for effective result.

INVESTMENT ENVISAGED

For the XI Plan period, the Planning Commission had approved a capital outlay of Rs.37,100.07 crores (cr.) for the Ministry of Coal. However, the overall outlay for the Ministry of Coal was revised downward in the Mid-Term Appraisal (MTA) in September, 2009 to Rs. 32,623.55 Cr. Against the original approved outlay for CIL of Rs 17390.07 cr. it is anticipated that utilization would be Rs.13,400 cr. Similarly, against an approved outlay of Rs. 3340 Cr for SCCL, utilization is anticipated to be Rs. 5070 Cr. The original approved outlay for NLC was Rs.15044 Cr, the anticipated utilisation is Rs. 7904.20 Cr. For Dept. Schemes against the approved outlay of Rs.1326 cr. the anticipated utilisation will come to Rs. 1500 cr.

- The proposed Public Sector investment for the XII Plan for supporting their production plan is Rs. 66,941.51 Cr. The outlay proposed for coal PSUs for the XII Plan is Rs. 34,316.96 Cr more than proposed XI Plan outlay (MTA) of Rs. 32,623.55 Crores (excluding Departmental Schemes). The proposed outlay for Departmental Schemes in XII Plan to be supported through domestic budgetary support is Rs. 7,882.51 Cr. Thus the total plan outlay proposed for MoC for the XII plan is Rs.74,824.02 Crores (Rs.66941.51 Cr for PSUs + Rs. 7,882.51 Cr for departmental schemes through domestic budgetary support). Besides this ad-hoc provision of Rs.25,000 Crores has been made for acquisition of coal assets abroad by CIL and Rs.10,000 Crores for development of coal blocks in Mozambique. Total plan outlay envisaged for Coal sector, excluding captive coal

block development, is Rs.1,09,824.02 Crores which includes investment abroad proposed by CIL.

- Against the estimated IEBR position of Rs. 1, 28,537.34 Cr. the proposed plan outlay of PSUs is Rs.66, 941.51 Cr. While the resource position of CIL is surplus, the resource position SCCL and NLC is not sufficient to meet the plan outlay, and the companies have to depend on EBR.
- Besides, the above investment position for public sector and departmental schemes of MOC, additional investment is required in coal sector for development of captive blocks and washery. Till 2010-11, production commenced in 28 blocks and yielded a production of 34.64 Mt. At the end of the XI Plan, it is anticipated that 34 blocks will be in operation and the likely production is expected to be 36.60 Mt. It is estimated that the production from Captive coal blocks would increase to 80.7 Mt (incremental production of 44.55 Mt) in the terminal year of XII plan. It is expected another Rs.20-25 thousand crores will be invested by the promoters of captive blocks during XII Plan period for achieving envisaged level of production.

POLICY INITIATIVES ON COAL SECTOR REFORMS

In the last few years, various committees under Government of India have made recommendations on reforms required in the coal-mining sector. The sub-committee reviewed the status of implementation of key areas of policy / reforms identified by each of these different committees. Reports / recommendations of the following committees were reviewed:

- Working Group report on Coal and Lignite for XI Plan – 2006
- Coal Vision 2025
- Integrated Energy policy – 2006
- Expert Committee on Road Map for Coal Sector Reforms – 2006
- Report of the Committee on National Mineral Policy – 2008

Further the sub-committee discussed the key areas of reforms / policy identified in the above reports, but not yet taken up for implementation. The sub-committee also discussed the additional areas of reforms that need to be taken up based on the issues and challenges being faced by the coal mining industry. Based on the deliberations, some of the key initiatives that the sub-committee identified for taking up in the XII Plan are discussed below:

Suggested policy reforms in XII Plan

- Exploration and Project Formulation
 - ✓ Coal exploration to be speeded up exponentially to ensure availability of more explored coal blocks for mining by private and public sector.
 - ✓ A comprehensive study to classify country's coal resources as per international standards such as JORC / UNFCC should be taken up

- ✓ Need to strengthen the institution of RQP through greater scrutiny of their capabilities.
- Clearances and Licenses – Environmental and Forest
 - ✓ To expedite clearances a co-ordination committee at the Centre and State level should be set up (Single window concept) with senior representation from the concerned departments.
 - ✓ To ensure a leaner, transparent and efficient approval process, there is a need to ensure Forest and environmental clearances in a time bound manner. Also the number of levels and stages should be reduced.
- Clearances and Licenses – Land Acquisition and R&R
 - ✓ Enactment of a central legislation to ensure uniform R&R policy and speedy land acquisition
 - ✓ Creation of a mechanism to prevent permanent industrial establishments and habitation over coal bearing areas
 - ✓ Coal companies should actively restore post mining land and return back to the local communities.
 - ✓ Captive Coal Mining
 - ✓ To take appropriate measures for increasing coal availability from captive coal mining blocks by amending Coal Mines Nationalization Act.
 - ✓ Future blocks should be allocated on the basis of a transparent bidding process, with bidders placed on a similar platform.
- Captive / MDC / Other Government Company block owners
 - ✓ One of the key challenges being faced by these block owners in development of their blocks is their inability to create / access infrastructure for evacuation of coal to their end use plants. The recommendations are:
 - ✓ Create an institutional mechanism for planning and development of common infrastructural facilities for use by all the block owners
 - ✓ A Local area Development authority should be created with participation of block allocates, coal mining companies and the respective state governments to develop comprehensive plans for infrastructural facilities and requirements in each identified coalfields areas.
- Regulation and Governance in Coal Sector – Industry structure
 - ✓ The coal sector regulator should be set up on a priority basis
 - ✓ National Coal Council to advice Ministry of Coal should be set up
 - ✓ Either CMPDI is made an independent organization or an independent organization be created to develop and maintain the repository of all geological information in the country on the lines of CEA or DGH

- ✓ Government should enable the acquisitions of coalmines abroad by setting up a Sovereign fund.
- Increasing Underground coal mining development in the country
 - ✓ Coal companies should develop a comprehensive plan for improving its performance in underground mines
 - ✓ Government should consider options such as cost plus pricing, cross subsidies, fiscal incentives etc to improve the potential returns currently available from underground mining activities

MARKETING STRATEGY & GRIEVANCE REDRESSAL MECHANISM

- Identification of consumers' need, segmenting the market and accordingly positioning different grades of coal and developing product features by way of beneficiation, reducing band-width of the existing grades, sizing, R&D for developing appropriate burning equipments have been identified as important strategy areas for optimum utilization of the fossil fuel.
- It has been felt necessary to open up pricing of indigenous coal to market force and also to link pricing with international benchmarks for bringing equilibrium in coal market and also to encourage economic use of the fuel.
- The need to review the existing coal distribution policy for providing level playing field to all coal consumers old or new, for dissuading diversion of coal to gray market has been highlighted. The existing system of supply of coal through FSA cannot be made effectively operational, till such time the system of FSTA, as envisaged by the NCDP, is implemented.
- The importance of optimization of available logistic infrastructure through source rationalization, investment in logistics infrastructure and development of end-to-end logistics solution companies in PPP model, and harnessing the potential of alternate modes of transport of coal have been identified as the important areas for building up the logistics strategy of XII Plan period.
- Computerization and networking of all road and railway weighbridges, capturing real time data on stock situation at despatch points and making it available to all stakeholders, integration of entire rail despatch system with FOIS network of IR, launching GPS enabled truck despatch system and developing teleconferencing facilities with all dispatch points have been identified as the thrust areas for introduction of IT-enabled sales management.
- Development of 24x7 on line grievance registration and response system, creating on-line retrievable database for monitoring purpose across the hierarchy of the management of coal companies, introduction of online suppliers' performance rating system, formation of a fixed tenure adjudicating/reviewing Board with adequate decision making power comprising of representatives from coal companies, Ministry of coal, Railways and ministries of important consuming sectors are some of the suggestions of the Sub-Group for developing an effective grievance redressal mechanism.

CHAPTER-1

Review of XI Plan Performance

1.0 Plan period-wise coal production trend and annualized growth rate (CAGR) are as under:

Plan Period	Terminal Year	Production (Mty)	CAGR (%)
I Plan	1955-56	38.40	
II Plan	1960-61	55.72	7.73
III Plan	1965-66	70.30	4.76
IV Plan	1973-74	78.18	1.24
V Plan	1978-79	102.02	5.47
VI Plan	1984-85	147.44	7.24
VII Plan	1989-90	203.36	6.64
VIII Plan	1996-97	289.32	4.76
IX Plan	2001-02	327.79	2.53
X Plan	2006-07	430.83	5.62
XI Plan (P)	2011-12	554.00	5.16

Source: Coal Controller's Organisation

Year-wise, sector-wise demand vis-à-vis supply of coal during X Plan period is given in Annexure 1.1

1.1 Demand-Supply scenario of XI Plan

Coal demand for the terminal year of XI Plan (2011-12) was revised from 731.10 Mt to 713.24 Mt during Mid-Term Appraisal (MTA) by Planning Commission. During the process of formulation of Annual Plan 2011-12, the demand was further reassessed at 696.03 Mt by Planning Commission/Ministry of Coal. Indigenous supply projection was revised from original level of 680.0 Mt to 629.91 Mt by MTA, which was subsequently revised to 559 in the Annual Plan of 2011-12, thereby finally leaving a gap of 137.03 Mt. This gap is envisaged to be met from projected import of coal (29.44 Mt coking & 107.59 Mt non-coking) as against initial projection of 51.10 Mt (40.85 Mt coking and 10.25 Mt non-coking) made by the Working Group on Coal & Lignite for formulation of Plan Document for XI Plan.

Projected Demand / Supply Scenario in XI Plan			
(in Mt)			
Particulars	Terminal year of XI Plan (2011-12)		
	XI Plan Working Group	Mid-Term Appraisal	Annual Plan 2011-12
Demand			
Steel	68.50	68.50	46.67
Power (Utilities)	483.00	473.00	460.00

Projected Demand / Supply Scenario in XI Plan			
(in Mt)			
Particulars	Terminal year of XI Plan (2011-12)		
	XI Plan Working Group	Mid-Term Appraisal	Annual Plan 2011-12
Power (Captive)	57.06	47.00	40.00
Cement	31.90	33.35	28.89
Sponge Iron	28.96	28.96	30.47
Others (Fertiliser, Paper, etc)	61.68	62.43	90.00
Total Demand	731.10	713.24	696.03
Supply/Offtake	680.00	629.91	559.00
CIL	520.50	486.50	452.00 *
SCCL	40.80	47.00	51.00
Others	118.70	96.41	56.00
Total Indigenous Supply	680.00	629.91	559.00
Demand-Supply Gap to be met through imports	51.10	83.33	137.03
Import-Coking	40.85	42.48	29.44
Import-Non-Coking	10.25	40.85	107.59
* Production projection is 447 Mt, Stock liquidation is 5 Mt			

Year-wise and sector-wise demand and supply of coal during XI Plan period is given in Annexure 1.2

1.2 Power Sector:

During Eleventh Plan, PLF performance of power stations though initially improved from 77.9% in 2006-07 (terminal year of X Plan) to 78.9% in 2007-08, shown a decreasing trend in subsequent years and had been 75.4% in 2010-11. Apparently, capacity addition during the first four years of XI Plan was at a higher pace in comparison to demand of power leading to running of plants in lower PLF. Actual capacity addition of coal based power plant by the end of August'2011 is 29740 MW. CEA anticipates that another 11401 MW capacity would be added during the period September'2011 to March'2012. Thus, total capacity addition anticipated by CEA during Eleventh Plan is 41151 MW. Thus, as per indication of CEA, 28% of the total capacity addition of the XI Plan will come during the last seven months (September'11 to March'12).

1.3 Steel Sector:

Production of hot metal in Mt and consumption of coking coal by steel sector during XI Plan period is summarized as under:

Figs. in Mt		
Year	Hot metal production	Coal consumption
X Plan (2006-07)	31.83	35.17
XI Plan		
2007-08	36.76	39.02
2008-09	36.78	37.66
2009-10	36.66	39.39
2010-11	36.68	40.00
2011-12 (BE)	45.14	46.67

(Source: Planning Commission)

Demand vis-à-vis indigenous coking coal off-take for the steel sector is given below:

Figs. in Mt			
Year	Demand of raw Coking Coal as assessed in Annual Plan	Demand of Indigenous raw Coking Coal as per Annual Plan	Indigenous raw Coking coal off-take
X Plan (2006-07)	43.70	18.51	17.30
XI Plan			
2007-08	38.00	18.00	16.99
2008-09	44.00	26.20	16.58
2009-10	44.52	17.26	16.45
2010-11	50.51	17.92	17.83
2011-12 (T) (Annual Plan)	46.67	17.23	17.23

Source : Annual Plan for Demand & Coal Controller's Organisation for actual offtake

Dwindling reserve of requisite quality of coking coal had been the main reason for less supply of coking coal to the steel plants.

The details of coking coal imports by steel manufacturers in the first four year of XI Plan are as under:

Year	Coking coal import (in Mt)
2007-08	22.03
2008-09	21.08
2009-10	24.69
2010-11	28.00 (provisional)

(Source: Coal Controller's Organisation)

1.4 Sectoral coal consumption pattern:

Sector-wise Year-wise and major sector-wise consumption pattern in Eleventh Plan period is shown as under:

Sectoral Consumption Pattern of Raw Coal in XI Plan (in Mt)									
Year	Coking	Non-Coking						Total	Annual Growth (%)
	Steel & Coke oven	Power (U)	Power (C)	Cement	Sponge Iron	Others	Total		
2006-07	35.17	307.92	28.13	19.67	17.47	55.51	428.70	463.87	
2007-08	39.02	332.40	29.31	21.27	20.92	61.37	465.27	504.29	8.7
2008-09	37.66	362.08	32.74	20.09	19.78	76.67	511.36	549.02	8.9
2009-10	41.14	364.60	51.33	21.61	23.10	86.03	546.66	587.80	7.1
2010-11*	45.83	383.98	28.99	27.58	18.76	110.98	570.29	616.12	4.8
2011-12 (Original)	68.50	483.00	57.06	31.90	28.96	61.58	662.50	731.00	18.6
2011-12 (MTA)	68.50	473.00	47.00	33.35	28.96	62.43	644.74	713.24	15.8
2011-12 (Annual Plan)	46.67	460.00	40.00	28.89	30.47	90.00	649.36	696.03	13.0
CAGR (%) in four years (06-07 to 10-11)	6.80	5.70	0.8	8.8	1.8	18.9	7.4	7.4	

Source : Coal Controller's Organisation (Figures for 2010-11 are provisional)

1.5 Coal Production:

The company-wise coal production performance during Eleventh Plan Period is as follows:

(Figures in Mt)	TY X Plan	Terminal Year of XI Plan (2011-12)		
Company	Actual	Working Group	MTA	AP 2011-12 Target
CIL	360.91	520.50	486.50	447.00
SCCL	37.71	40.80	47.00	51.00
Other Public Sector *	1.77	2.52	2.52	3.55
Other Private Sector **	12.83	12.10	12.10	14.20
Captive Mining	17.61	104.08	81.79	38.25
Total	430.83	680.00	629.91	554.00
* DVC/IISCO/JKML/JSMDCL/WBPDCL/SAIL/DVC-EMTA/APMDTCL, ** TISCO/Meghalaya				
Source : Coal Controller's Organisation & MOC/Planning Commission				

Company-wise production performance against target set during XI Plan Period is given below:

(Figures in Mt)					
Year	Particulars	CIL	SCCL	Others	Total
2006-07 (T.Y. X Plan)	Actual	360.91	37.71	32.21	430.83
2007-08	Target	384.51	38.04	37.95	460.50
	Actual	379.46	40.60	37.02	457.08
2008-09	Target	405.00	41.50	50.79	497.29
	Actual	403.73	44.55	44.48	492.76
2009-10	Target	435.00	44.50	52.83	532.33
	Actual	431.26	50.43	50.35	532.04
2010-11	Target	460.50	46.00	65.87	572.37
	Actual	431.32	51.33	50.42	533.08
2011-12 (T.Y.XI Plan)	Original Projection	520.50	40.80	118.70	680.00
	Target	447.00	51.00	56.00	554.00
	Anticipated	435.00	51.00	53.90	539.90

Source: Coal Controller's Organisation

The incremental coal production envisaged originally in the plan period under review was 249.83 Mt as against 103.04 Mt and 38.47 Mt achieved during Tenth Plan and Ninth Plan respectively. Expected achievement in 2011-12 is **539.90 Mt**. Therefore, incremental indigenous production during XI Plan is expected to be **109.07 Mt**.

Coal production of 118.70 Mt from TISCO, IISCO, DVC, Meghalaya field and other captive block production as envisaged in the original plan document, is now planned to be about 56 Mt in 2011-12. Out of this, production from captive blocks is expected to be 38.25 Mt. By the end of XI Plan 38 number of allocated captive blocks are expected to be in operation as against 11 such mining blocks in operation with production of 17.61 Mt in the terminal year of X Plan (2006-07). Company-wise, year-wise coal production performance during XI Plan period is given in Annexure 1.3.

1.6 Washed Coking Coal Production

The availability of adequate quality and quantity of washed coking coal from indigenous sources is declining and the import of coking coal is increasing. The production of raw coking coal, washed coking coal and import of coking coal and coke for steel sector during XI Plan period is given below:

Figs. in Million Tonnes

Year	Raw coking coal (metallurgical) production			Washed coking coal production			Import	
	CIL	Others*	Total	CIL	Otrs*	Total	Coking coal	Coke
2006-07 (TY X Plan)	9.81	7.42	17.23	3.81	3.22	7.03	17.88	4.69
XI Plan								
2007-08	10.16	7.90	18.07	3.83	3.34	7.17	22.03	4.25
2008-09	9.30	8.00	17.30	3.68	3.50	7.18	21.08	1.88
2009-10	9.58	8.15	17.73	2.97	3.58	6.55	24.69	2.36
2010-11#	9.99	7.85	17.84	3.19	3.18	6.37	28.00	2.00

Source: Coal Controller's Organization

* Others - TISCO/IISCO

The import figures for 2010-11 are provisional

The performance of coking coal washeries is adversely affected mainly due to non-availability of desired quality and quantity of raw coal feed from existing mines of CIL. There is an urgent need to review the situation and to take suitable steps to prepare road maps for improving the availability of washed coking coal from the domestic sources. Suitable technology needs to be firmed up for utilizing low volatile medium coking coal and for augmenting coking coal production.

1.7 Demand / Supply Management

Summarized information related to Demand / Supply management during Eleventh Plan period is given below:

(Figures in Mt)	X Plan	XI Plan				
Particulars	2006-07	2007-08	2008-09	2009-10	2010-11 *	2011-12
Demand (Annual Plan)	474.18	492.50	550.00	597.98	656.31	696.03
Coal Consumption	463.87	504.29	549.02	582.25	616.13	
Coal Production						
Target (Annual Plan)	430.10	460.50	497.29	532.33	572.37	554.00
Actual	430.83	457.08	492.76	532.04	533.08	
Indigenous Supply/Offtake	420.79	454.49	490.02	514.50	524.13	559.00
Import	43.08	49.80	59.00	67.75	92.00	137.03
Gap	10.31	-11.79	0.98	15.73	40.18	0.00
Pit-head stock of coal	44.35	46.78	47.32	64.86	71.47	

Source: Coal Controller Organisation & MOC/Planning Commission

* Figures for 2010-11 are provisional

CHAPTER – 2

COAL DEMAND

2.1 Methodology for demand assessment:

End-users' projections of coal requirement, wherever available, has been used for preparing the basic framework to assess sector-wise likely demand of coal. At the same time the macro-economic long-term goals set by the Planners, the trend of technological development in different coal consuming sectors, previous trend of consumption and projections given in the reports of various expert Committees have also been taken into perspective to arrive at different demand modules.

The sector-wise assessment of coal demand made by various expert groups from time to time for perspective planning of coal sector is given in Annexure 2.1.

2.2 Analysis of Demand Estimates

2.2.1 Power Sector (Utilities)

In the XII Plan, the massive capacity creation and the corresponding increase in thermal power generation is envisaged. CEA has indicated coal based capacity addition of 79,010 MW (14560 MW in Central Sector, 12081 MW in State Sector and 52370 MW in Private Sector). Thus major thrust (66%) in capacity addition programme in XII Plan is envisaged to come up through private sector.

The Central Electricity Authority (CEA) has given the following indicative assessment of coal based generation.

Particulars	Capacity Addition (MW)	
	Target	Actual /Ant
X Plan	18,308	8,575
XI Plan (up to Aug'11)		29,740
Sep'11-Mar'12 (Expected)		11,401
XI Plan	42,625	41,151
XII Plan	79,010	
2012-13	19,305	
2013-14	21,795	
2014-15	23,690	
2015-16	8,940	
2016-17	5,280	
XIII Plan (2021-22)	70,000	

CEA has indicated anticipated installed coal based power generation capacity of 1,11,058 MW in the beginning of the XII Plan. The envisaged coal based capacity creation during XII Plan is 79,010MW. Thus, the capacity augmentation during the XII Plan period is envisaged to be 71 % of the installed capacity at the beginning of the XII Plan. However,

actual coal-based capacity addition in X Plan was only 8,575 MW and for XI Plan, anticipated capacity addition is 41,150 MW (Actual addition in XI Plan till August'11 has been 29,740MW and 11401 MW is expected to come up in remaining months of 2011–12). It means that 28 % of the capacity addition of the XI Plan is expected to come up during the last seven months.

Further, it has been mentioned by CEA that over and above these 79,010 MW, another 38,905 MW coal based capacity is under various stages of execution.

The regional distribution of the above creation as indicated by CEA is as under:

Region	Projected end of XII Plan 31.03.2017 (MW)	Expected Capacity at the beginning of XII Plan 01.04.2012 (MW)	Capacity Addition (MW)	% increase
Northern	38,612	27,092	11,520	43
Western	82,651	39,176	43,475	111
Southern	32,972	22,832	10,140	44
Eastern+ NE	35,833	21,958	13,875	63
Total	1,90,068	1,11,058	79,010	71

From the above, it may be seen that maximum creation of capacity has been projected for Western Region followed by Eastern & NE Region.

Corresponding to the above capacity creation, the regional projection for generation and coal requirement at the end of XII Plan as given by CEA are as under:

Region	Projected Generation (BU)		Projected Coal Requirement(Mt) At the end of XII Plan (2016–17)
	At the end of XI Plan (2011–12)	At the end of XII Plan (2016–17)	
Northern	152.00	212.00	115
Western	203.00	582.00	424
Southern	135.00	188.00	137
Eastern	110.00	173.00	126
Total	600.00	1155.00	842

The above requirement of coal is given by CEA based for the coal based power projects in the XII Plan, wherein coal-based generation is assumed to be 1155 BU and coal requirement has been worked out assuming specific coal consumption of 0.73.

The list of power plants indicated by CEA to come up in XII Plan is given in Annexure-2.2. These projects have been grouped into different categories based on the status as (i) Projects under implementation (ii) Accorded Long-term Linkage/LoA or allocated coal block for captive mining or an identified imported coal based project, i.e. source tied-up projects and (iii) new projects.

The summary of Projects under implementation, source tied-up and new projects are as under:

Sector-wise Capacity Addition in XII Plan (Figures in MW)				
Status	Central	State	Private	Total
Projects under implementation	10600	11330	50390	72320
Source Tied-up Projects	3960	0	0	3960
New Projects	0	750	1980	2730
Total	14560	12080	52370	79010

Incremental Coal Requirement for Terminal Year of XII Plan 2016-17 (Figures in Mt)				
Status	Central Sector	State Sector	Private Sector	Total
Projects under implementation	49.00	54.24	228.83	332.07
Source Tied-up Projects	7.75	0.00	0.00	7.75
New Projects	0.00	3.68	9.30	12.98
Total	56.75	57.92	238.13	352.80

As per projection of TERI, coal requirement for Power Utilities at the end of XI Plan would be 462 MT for generation of 738 BU power. Specific coal consumption thus works out to 0.627 Kg/Unit. TERI had projected that all India Power demand would touch 1015BU and 1291BU in the terminal years of XII & XIII Plans with corresponding coal requirement of 592.5 & 738.28 Mt respectively.

It may be worth noting that so far, actual coal based generation had always been far less than what had been projected by TERI as demand as shown in the table below:

Year	Power Demand projected by TERI (BU)	Actual/Projection Generation (BU)	Coal Demand projected by TERI (Mt)	Coal Consumption /Requirement projected by CEA (Mt)	Specific Coal Consumption (Kg/unit)	
					TERI Projection	Actual/Projection
2006-07	544.03	431.13	356.82	300.561	0.656	0.697
2010-11	NA	535.27	NA	377.87	NA	0.705
2011-12	738.14	600.00	462.25	444.00	0.626	0.74
2016-17	1014.76	1155.00	592.50	804.88	0.584	0.697

Following points emerge from the above table:

1. While actual generation had been invariably less than the demand projected by TERI, CEA has been envisaging generation at XII Plan at a higher level than the demand projected by TERI.
2. CEA projects CAGR of 14% in generation during XII Plan period against actual CAGR of 6.8 expected to be achieved during XI Plan (the growth projected is subject to capacity addition of 11401MW during the last seven months of the current Fiscal)
3. Going against the forecast of TERI and actual trend, specific coal consumption is kept at a much higher level to arrive at coal requirement figure.

Out of the projected capacity addition of 79,010MW, about 17.7% projected to consume 17.1% coal are located at a distance of more than 1000 Kilometer distance and thus would be coming under the purview of MOEF stipulation. Besides another 5.1% capacity addition would be on the basis of imported coal, whose coal requirement would be 3.6% of the coal requirement for additional capacity. Thus Specific coal consumption of almost 23% of new capacity would be substantially less than the national average.

Scenarios that are emerging for coal demand of Power Utility sector on the basis of the projection of CEA and analysis of different expert agencies is given in the table below:

Scenario	Basis	Quantity (in Mt)
Scenario-I	CEA projection	842
Scenario-II	TERI Projection of demand for power and current trend of specific coal consumption of 0.705Kg/Unit	715
Scenario-III	17 th Electric Power Survey Report, Assuming 70% of total Electricity demand is coal based and sp. Coal consumption of 0.7Kg/Unit. (The requirement remains unaltered even if the contribution of coal based power generation is assumed at 67%, in line with the current trend of 66.9% in 2009, and specific coal consumption is kept at the same level of CEA at 0.73)	682

Out of these three options, Scenario-III appears to be the most realistic. Generation of electricity would be ultimately dependent on demand and not on capacity build-up. The projections given by CEA are essentially based on likely commissioning schedules of the plants and not on demand of electricity. It is of common experience that coal-based capacities remain unutilized or under-utilized during good monsoon for downfall of demand. Therefore, any assessment of coal demand for power generation should be on the basis of the demand for electricity. The mismatch between capacity addition and demand of power stated to be is the reason for drop in PLF in 2010-11 to 75.4% from a level of 78.9% in 2007-08. Electric Power Survey (EPS) makes detail demand analysis of power at the State level. Since 18th EPS is not yet finalized, the demand projection of 17th EPS, prepared in March 2007 can still be used for assessment of coal demand.

CEA has indicated year-wise capacity addition programme, the summation of which works out to 79010MW at the TY of XII Plan. CEA has also indicated that the incremental coal requirement of 352.8Mt for these 79010MW in 2016-17. CEA indicated total coal requirement of 842Mt in 2016-17. Based on these inputs of CEA, year-wise coal requirement for power (utilities) during the XII Plan period is estimated as under:

Year	Coal Requirement (Mt)
2012-13	466
2013-14	545
2014-15	631
2015-16	663
2016-17	682

1.2.2 Steel Sector

Demand of Coking coal in XII Plan

Various economic reports and projections of Chambers of Commerce have predicted healthy growth of steel sector in the coming years. The National Steel Policy (NSP), 2005 had envisaged that the steel production would go up from a level of 27 Mt in 2004-05 to 110 Mt in 2019-20. The annualized growth was therefore projected at 9.8%.

However, based on the assessment of current ongoing projects both in green-field and in brown-field, Ministry of Steel in 2009-10 estimated that by the end of XI Plan, the production capacity would be increased to 124.06Mt, which after taking into account the MOUs signed by private players with State Government is likely to reach 293Mt by the end of 2020. However, many of the brown-field projects are behind schedule and some of the major green-field projects through MOU route have been facing rough weather. While, capacity building continues to be a limiting issue on account of indigenous availability of steel, as per the projection of SAIL the demand of steel in 2020 would be within the range of 98Mt to 114Mt and the same is estimated at 137Mt by other industry experts.

During 2009-10 steel production had been 56.4Mt. The annualized growth in steel production, on the basis of most optimistic projection on demand of steel works out to 9.3% till 2019-20.

Ministry of Steel has indicated the following in respect of year-wise crude steel production vis-à-vis coking coal requirement for XII Plan period:

	Figs. in Mt					
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Projected Crude Steel Production	73.7	83.7	94	104.6	116.8	128.1
Coking Coal for Steel Sector	46.6	53.1	60.7	66.4	72.5	77.1

The projection of growth in steel production as indicated by MOS works out to 12.4% against optimistic projection of the industry at 9.3%. Coking coal consumption and crude steel production ratio has been projected by MOS at 0.60 against NSP's projection of 0.64.

NSP has projected a requirement of 70 Mt of coking coal in 2019–20 for production of 110 Mt of steel. Coking coal consumption ratio, as envisaged in the Policy, thus works out to 0.64. Coking coal consumption in 2004–05 being 32.07 Mt, the annualized growth in consumption of coking coal has been envisaged by the Policy at 5.3%. While making the forecast, they assumed that while 60% of the new capacity would be through blast furnace route, 33% would be from sponge iron unit and 7% would be using other available technology.

Coal Vision 2025 Document of MOC envisages requirement of 69Mt and 90Mt of coking coal respectively for 2016–17 & 2021–22 at 8% GDP. As per the consumption norms predicted by NSP, the projected coal requirement of Coal Vision Document would be sufficient to produce 107.8Mt and 140.6Mt of steel in 2016–17 and 2021–22 against the steel demand ranges of 90 to 105Mt in 2016–17 and 126 to 164 Mt in 2021–22 indicated by different expert agencies in steel sector. Since the coking coal consumption norm of NSP applied on the different steel demand projections are more or less corroborating also with the overall coking coal requirement projections of Coal Vision Document which is another independent study outside Steel Industry, it would be logical to apply the norms of NSP over the three steel demand scenarios for projection of coking coal requirement as under:

Scenario	Figs. in Mt	
	2016–17	2021–22
Scenario-I MOS Projection	77.1	--
Scenario-II- NSP Study	57.6	80.5
Scenario-III SAIL Study	59.1	84.0
Scenario-IV Optimal steel demand	67.2	104.7

In view of the capacity enhancement programme, both in Public Sector and in private sector through MOU with the State Governments, the projection of NSP appears to be too conservative. The projection of SAIL is also almost at par with the NSP. Past trend shows that steel plants normally utilize about 89% of the available capacity which means about 154Mt steel production capacity is required for producing 137 Mt of steel. The envisaged capacity, however in 2019–20, being 293 Mt, even if 60% capacity materialization programme fructifies, the steel production would reach at the optimal demand level. Moreover, considering the macro-economic perspective and the emphasis given by the Government for urbanization and providing shelters for all through various schemes, it is felt prudent to assess coal requirement on the basis of the optimal steel demand projection. Further, the requirement of coking coal worked out on the basis of the optimal steel demand is within the boundary of the projection of Ministry of Steel. Hence Scenario-IV appears to the most realistic demand of coking coal for the TY of XII Plan.

The year-wise requirement of coking coal, however, is being projected as under in line with the indication provided by MOS, since the steel demand projections by various expert groups were on the long-term basis while the projection of MOS is for year-on-year basis.

Figs. in Mt					
Year	2012-13	2013-14	2014-15	2015-16	2016-17
Requirement	46.3	52.9	57.9	63.2	67.2

1.2.3 Cement Sector

Cement sector has undergone substantial technological changes. With more emphasis now on dry process by cement plants, the specific coal consumption in cement plants has shown immense improvement over the years. As per the data available from the sources, coal consumption has reduced from a level of 154Kg for one tonne of clinker production in 2001-02 to 121Kg in 2008-09.

Important indicators in respect of trend in cement production and coal consumption is given in the table below:

Year	Capacity (Mty)	Cement Production (Mt)	Coal Consumption (Mt)	Actual/Projected Specific coal consumption Kg/Tonne
IX Plan (2001-02)	129.76	102.4	15.81	154
X Plan (2006-07)	163.88	155.99	19.67	126
XI Plan				
2007-08	198.10	168.31	21.19	126
2008-09	221.44	181.60	21.93	121

Similar figures have not been provided by DIPP from 2009-10 onwards.

Apart from the technological development in cement production, improvement in blending-mix with substantial use of imported coal and Pet-coke has also contributed in bringing down the specific coal consumption.

Trend of cement production, as indicated by Planning Commission, during the Annual Plan exercise of 2011-12, is given in the table below:

Year	Cement production (Mt)
2006-07	155.66
2007-08	168.31
2008-09	181.61
2009-10	201.06
2010-11(RE)	236.16
2011-12 (BE)	262.61
CAGR projected during XI Plan (%)	11

CMA has indicated likely cement production of 321.35Mt for its constituent members' units (excluding ACC & Ambuja Group) in the terminal year of XII Plan (2016-17). CMA has projected 12% growth in production of kiln in XII Plan for its constituent members against actual growth of 9% during the first three years of XI Plan. If the industry growth is applied over the production figures of 2008-09 of ACC & Ambuja Group Units furnished by DIPP, the total likely production for them works out to 72.86Mt in 2016-17. Thus the total cement production in the TY of XII Plan, as per the data furnished by DIPP works out to 394.21Mt. On the basis of this projection the year-wise likely production of cement would be as under:

Figs. in Mt

Year	CMA Members	ACC & Ambuja	Total
2012-13	205.68	46.30	251.98
2013-14	229.88	51.86	281.74
2014-15	256.99	58.09	315.08
2015-16	287.34	65.06	352.40
2016-17	321.35	72.86	394.21

Considering exclusive use of indigenous coal, CMA has indicated requirement of coal at 17% of the projected production. Thus the requirement works out to 67.01Mt.

CMA has indicated that the percentage contribution of different fuels used for production of cement clinker during first four years of XI Plan had been 66% of indigenous coal, 22% of imported coal, 11% of petcoke and 1% of lignite. As per industry information, there is substantial capacity addition in production of pet coke, which would make its use more popular in cement plants. Further, coastal cement plants were the pioneers in using imported coal at the Country. Taking advantage of location-specific competitive landed cost, even when import duty was substantially higher (35%) than present level (5%), they started using imported coal since late nineties even by forgoing indigenous coal allocated by Standing Linkage Committee (Short-term). The technical feasibility and supply chains for use of alternate fuels like lignite, pet-coke has already been established for more than a decade in Gujarat and Rajasthan based cement plants. As such, there is no reason for cement plants to change the pattern of use of different fuels in the mix in the foreseeable future. Therefore, assessment of coal requirement based on the current trend of consumption appears to be most realistic, which works out to 47.31Mt.

The year-wise coal requirement of cement sector during XII Plan period on the basis of current trend of coal consumption would be as under:

Year	Cement production (Mt)	Coal Requirement (Mt)
2012-13	251.98	30.24
2013-14	281.74	33.81
2014-15	315.08	37.81
2015-16	352.40	42.29
2016-17	394.21	47.31

1.2.4 Captive Power:

With the introduction of Electricity Bill 2003, captive power generation has become particularly, attractive for different industries. It has been emerging as the major coal-consuming sector over the years. Apart from traditional captive power generating industries like Aluminium, Cement or Steel Plants, even comparatively smaller endeavours have also come up with CPP units. However, authentic data pertaining to actual coal consumption for captive power generation is not available, reasons being non-availability of an Umbrella Organization monitoring activities of individual units and frequent transfer of energy between the power and process plants during actual operations. Currently fertilizer sector is using coal predominantly for power generation; therefore the entire requirement of coal for the Fertilizer sector has also to be considered under captive power category.

Two scenarios of coal demand for CPP units have been envisaged in Coal Vision 2025 document of MOC on the basis of targeted growth of GDP @ 7% and 8%. Another scenario of coal demand for CPP units has been indicated by the Expert Committee on coal sector reforms. Coal consumption for CPP units is poised to register an annualized growth of about 7.3 % during XI Plan (from 28.13Mt in 2006–07 to 40.00 Mt, as projected in the Annual Plan document in 2011–12).

Year-wise requirement of coal for CPP units based on the same growth rate of XI Plan, and the requirement indicated in Coal Vision Document 2025 as well as in Expert Committee on coal sector reforms is given in the table below:

Scenario	Figs. in Mt				
	12-13	13-14	14-15	15-16	16-17
Coal Vision 2025 @ 9% GDP (Extrapolated on the basis of the demand projected on 8%GDP Growth taking 0.7 as energy elasticity	51.71	55.47	59.51	63.82	68.47
Coal Vision document 2025 at 8% GDP	47.55	51.01	54.72	58.69	62.96
Growth rate of 7.2 achieved in XI Plan	42.84	45.88	49.14	52.63	56.36

While projection of Coal Vision Document modified at 9%GDP growth envisages a growth of 11.3% in coal demand during the XII Plan period over the demand projected at the Annual Plan document for 2011–12, the projection at 8% GDP growth envisages growth in requirement to the extent of 9.5%. In the scenario of emerging gap between overall demand of coal vis-à-vis indigenous coal availability, all future capacity addition in CPP sector will essentially have to depend on imported coal. This may not be an attractive proposition for CPP units.

Moreover, the capacity addition envisaged in Power (Utility) sector being higher than the projected power demand it is likely, that industry would be getting reliable supply of

power in a more competitive price than the power generated by the CPPs using imported coal exclusively. In view of this, it is unlikely that CPPs would be growing in higher than the current rate, which during XI Plan is not expected to be more than 7.2%. Therefore, scenario-3 with coal requirement of 56.36 Mt is likely to be most realistic demand.

2.2.5 Sponge Iron

Supply in raw coal terms for sponge iron sector in the country, rose from a level of 4.40 Mt in 2001-02 to 17.47 Mt in 2006-07 and further planned to be 30.47 Mt in terminal year of XI Plan (Annual Plan: 2011-12). Further, quite a number of sponge iron plants like Jindal Sponge Iron, Monnet Ispat, Prakash Industries etc. are also sourcing coal from their captive mining blocks.

Ministry of Steel has indicated year-wise non-coking coal requirement of sponge iron units as under:

	Figs. in Mt					
	11-12	12-13	13-14	14-15	15-16	16-17
Non-Coking Coal for Sponge Iron Sector*	39.1	49.6	51.5	57.1	63.0	67.5

Three demand scenarios for steel sectors are available as under:

	Figures in Mt					
Scenarios	09-10 (Act.)	11-12 (antc.)	16-17 (Proj.)	Incremental Demand XII Plan	2021-22 (Proj.)	Incremental demand XII Plan
National Steel Policy 2005	56.4	64.46	90.20	25.74	125.72	35.52
SAIL	56.4	64.92	92.30	27.38	131.23	38.93
Optimal steel demand	56.4	67.35	104.97	37.62	163.61	58.64

It is mentioned in National Steel Policy (NSP) that out of incremental capacity addition for steel making 33% would be through sponge-iron route. Assuming that 33% of the incremental demand of steel production of the Country will be coming through sponge iron route, as envisage by NSP, the coal requirement scenario for sponge iron sector would be as under:

Figs. in Mt

Scenarios	Antic. Demand 11–12	Incremental Demand of steel in XII Plan	Incremental Sp. iron demand— 33% of (3)	*Incremental Coal requirement in XII Plan 1.6x (4)	Coal requirement in 2016–17
	(2)	(3)	(4)	(5)	(6)=(2)+(5)
National Steel Policy 2005	30.47	25.74	8.49	13.58	44.05
SAIL	30.47	27.38	9.04	14.46	44.93
Optimal steel demand	30.47	37.62	12.41	19.86	50.33

Scenarios	Projected requirement 2016–17	Incremental Demand of steel in XIII Plan	Incremental sponge iron demand— 33% of (3)	*Incremental Coal requirement in XIII Plan 1.6x (4)	Coal requirement in 2021–22
	(2)	(3)	(4)	(5)	(6)=(2)+(5)
National Steel Policy 2005	44.05	35.52	11.72	18.75	62.80
SAIL	44.93	38.93	12.85	20.56	65.49
Optimal steel demand	50.33	58.64	19.35	30.96	81.29

* The extant normative coal requirement of 1.6 Tonne of coal for production of 1 Tonne of Sponge Iron applied for arriving at incremental coal requirement

In Point 2.2.4 above, the rationale for benchmarking optimal demand of steel projection for assessment coking coal demand has been explained. Since the assessment of coal demand for sponge iron plants have also been essentially derived out of steel demand, therefore the same logic holds good here as well. Moreover, on the basis of this projection, the demand in the TY of XII Plan works out to 50.33 Mt with an annualized growth of 10.6% against 11.7% achieved during XI Plan. Hence, 50.33 Mt appears to be the most realistic demand.

Since, the gestation period for setting up new sponge iron units is much shorter than that of integrated steel plants and as sponge iron units are essentially to cater to niche market, it is expected that the current growth rate will be maintained consistently in XII Plan also. Therefore, the year-wise requirement is projected with uniform growth of 10.6% during the plan period as under:

					Figs. in Mt
Year	2012-13	2013-14	2014-15	2015-16	2016-17
Requirement	33.69	37.24	41.18	45.52	50.33

2.2.6 Others

There are large numbers of units consuming comparatively small quantity of coal at present. These groups of consumers account for less than 10% of total coal demand and are placed under “other industries” category. The industries whose demand is aggregated under this category are mainly brick, aluminium, paper, textiles, glass & refractory, tiny and SSI units. An indicative figure is generally attributed to this group of industries / sector in the total demand scenario. The demand of various non-core industrial sectors is placed in this group. In this group, brick industry is a major coal consumer. 8Mt of coal from CIL sources that has been kept apart for distribution through State Governments nominated agencies to consumers having requirement of less than 4200 tonnes per annum, as per provisions of New Coal Distribution Policy of Government of India, is also included in this category. It is very difficult to assess demand of this sector due to non-availability of detail information. Therefore, demand assessment of this category of consumers could be made only on the basis of trend analysis of XI Plan period, and requirement projected in Coal Vision 2025 document.

The Annual Plan document has projected dispatch of 90Mt of coal to others category of consumers in 2011-12, which had been 55.51 Mt in 2006-07. These figures included projection of e-auction of 10% of production of CIL & SCCL for 2011-12 and dispatch through e-auction/e-booking in 2006-07. It is known that a substantial portion of the quantity offered through e-auction is also being consumed by Power, Cement, CPP and Sponge Iron sectors, whose requirements have already been dealt separately. It is also a fact that quantities offered in e-auction has substantially increased from November, 2007 after promulgation of NCDP on 18 October, 2007. Therefore, taking the despatch projection of the Annual Plan for 2011-12 for “Others” sector as such to assess the demand for 2016-17 is likely to lead to erroneous result.

Coal Vision 2025 document envisaged a demand of 82.11 Mt in 2016-17 with an incremental requirement of 17.6 Mt at 8% GDP growth for Brick & Other Consumers. Coal Vision document envisaged 5% growth in coal demand from the undefined category of consumers during XII Plan period. If the projection is modified at 9% GDP growth rate taking 0.7 as the energy elasticity, the demand is enhanced to 89.2 Mt. However, Coal Vision had included the demand of sponge iron in others category.

Therefore for an objective assessment, the projected dispatch to sponge iron sector in 2011-12 (30.47Mt) and the assessed demand for 2016-17 (50.33Mt) has to be taken out for necessary corrections. In the demand projection at 9% GDP, after necessary correction for sponge iron, annualized growth in requirement for XII Plan works out to 4.7%.

In the Working Group for Coal & Lignite document for XI Plan the demand for others was projected at 61.68 Mt in 2011–12. In the Mid-term Appraisal of Planning Commission for XI Plan the demand for others category including sponge iron and CPP sectors for 2011–12 was projected at 147.60Mt. If the demands projection of Working Group for Sponge Iron (28.96Mt) and CPP (57.06) sectors were taken out, requirement of others works out to 61.56 Mt, almost at the same level of projection of the Working Group.

In view of the above, the year-wise likely demand scenarios for other category in different scenarios can be projected as under:

Scenario	Figs. In Mt				
	12-13	13-14	14-15	15-16	16-17
Considering that 50% of the e-auction quantity being consumed by this category and taking the despatch projection 2011–12 Annual Plan as base line with the growth rate envisaged by Coal Vision Document	68.16	71.36	74.72	78.23	81.90
Considering demand projection of MTA for 2011–12 as base line and extrapolating the same growth rate envisaged by Coal Vision Document till 2016–17	64.44	67.45	70.60	73.90	77.22
Demand projection of Coal Vision Document at 9% GDP with 4.7% annual growth	35.63	37.29	39.04	40.86	42.77

*Coal Vision Document 2025 included Sponge Iron sector as part of others sector. Now, since Sponge Iron is separated out, demand for others category is reduced to that extent.

Coal Vision Document included sponge iron, which itself is a major consuming sector now, in 'others' category and therefore, this projection is now somewhat out of date. The Annual Plan document included e-auction in 'others' category and therefore, leading to erroneous result. In view of these, the projection on the basis of the demand assessed by MTA for the year 2011–12 appears to be most likely situation, wherein demand for the TY of XII Plan works out to 77.22 Mt. In absence of any input in respect of year-wise generation and or capacity augmentation programme, the requirement is projected with uniform growth rate throughout the Plan period.

2.3 Summary of coal demand for XII Plan

CEA has given a projection of capacity addition of 79010 MW during XII Plan period, as against envisaged capacity addition of 41150 MW during XI Plan. However, till Aug'11, actual addition of capacity had been only 29740 MW. Requirement of coal was given on a higher specific coal consumption rate than the present trend. Even if the projected capacity addition materializes, with the level of specific coal consumption of 0.70 Kg/Unit as had been in the TY of X Plan, which is likely to

improve to a great extent by use of imported coal, requirement would be reduced by about 32 Mt than what is projected.

The likely production of clinkers in 2016–17, as estimated on the basis of the information given by CMA/DIPP, would be 394.21 million tonnes, as against 223.41 million tonnes in 2011–12, with a growth rate of 12%. Moreover, coal requirement for per tonne cement production has been projected in excess to current level.

Ministry of Steel has indicated coking coal requirement as well as non-coking coal requirement for sponge iron. However, in both cases the demands are not based on the demand of steel projected by different expert agencies in steel industry, including the projection made by National Steel Policy.

Power (Utility), Steel (including sponge iron) and cement sectors so far indicated their coal requirement. These sectors account for more than 85 % of the total raw coal demand of the country.

From the analysis as given in Points 2.2.1 to 2.2.6 above, two demand scenarios are emerging out:

Scenario-I (on the basis of inputs received from the users' agencies) has been developed essentially on the basis of the likely generation/production projections and corresponding coal requirement as indicated by users' Ministry/Apex Agencies. Wherever such inputs were not available, the highest of the demand projections for the finished products of the users' industries along with coal consumption norms projected by various Expert Groups have been taken into consideration. In case of CPP, the Coal Vision document at 9% GDP was considered. For 'others' category of consumers, the growth rate envisaged on Coal Vision Document applied on the supply plan of 2011–12, assuming that 50% of the e-auction quantity is consumed by Power, Steel, Cement, sponge Iron, CPP sectors.

Scenario-II (Assessed by the Working Group): On the basis of the assessment of the concerned Ministry/Expert Groups in the relevant fields, the realistic demands and corresponding likely production figures of the end-products of the coal consuming sectors have been assessed. The requirement/demand of coal has subsequently been estimated on the basis of the current trend of specific coal consumption by the respective industry to produce each unit of the finished product.

The overall coal demand for the terminal year of XII Five Year Plan is accordingly summarized as under:

Sector	X Plan (2006-07)	XI Plan (2011-12)	XII Plan (2016-17) demand projection	
	Actual demand	Annual Plan demand projection	Scenario-I	Scenario-II
Coking Coal	35.17	46.67	77.10	67.20
Non-Coking Coal				
Power Utility	307.92	460.00	842.00	682.08
Power Captive	28.13	40.00	68.47	56.36
Cement	19.67	28.89	67.01	47.31
Sponge Iron	17.47	30.47	67.50	50.33
Others*	55.51	90.00	81.80	77.22
Total non-coking	428.70	649.36	1126.78	913.30
Grand Total	463.87	696.03	1203.88	980.50

* Figures in respect of 'Others' in 2006-07 and 2011-12 include e-auction, open to all consuming sectors including Power, CPP, Sponge Iron etc. The total likely e-auction quantity is 49.80 Mt (production of CIL & SCCL together being anticipated at 498Mt) in 2011-12. 50% of this e-auction quantity i.e. 24.90 Mt is assumed to be consumed by consumers in Power, Cement, CPP and sponge sector. Therefore, only the remaining quantity of 24.90Mt could be taken as the demand of 'Others' category. Thus, the actual demand of 'Others' category may be considered as 65.1Mt in 2011-12. The demand projected for 2016-17 accordingly envisages an annualized growth of 3.5%.

The demand for the terminal year of XII Plan, thus assessed by the Working Group, envisages an annualized growth of more than 8% over the actual demand of 2010-11. In comparison to the demand projected in the Annual Plan of 2011-12, the annualized growth works out to more than 7%. Sector-wise trend of demand and growth projection for 2016-17 is given in the table below:

(in Million Tonnes)					
Sector	2010-11 (Actual)	Demand of 2011-12 Annual Plan	2016-17 (Projection)	CAGR (%) (over Supply of 2010-11)	CAGR (%) (over Demand of 2011-12)
Coking Coal	45.83	46.67	67.20	6.6%	7.6%
Power (Utility)	383.98	460.00	682.08	10.0%	8.2%
Power (CPP)	28.99	40.00	56.36	11.7%	7.1%
Cement	27.58	28.89	47.31	9.4%	10.4%
Sponge Iron	18.76	30.47	50.33	17.9%	10.6%

(in Million Tonnes)					
Sector	2010-11 (Actual)	Demand of 2011-12 Annual Plan	2016-17 (Projection)	CAGR (%) (over Supply of 2010- 11)	CAGR (%) (over Demand of 2011-12)
Others*	110.99	90.00	77.22		
Total Non- Coking	570.30	649.36	913.30	8.2%	7.1%
Total	616.13	696.03	980.50	8.1%	7.1%

* The demand shown for 'Others' in 2010-11 & 2011-12 includes e-auction quantity. The actual demand for 'Others' category for 2011-12 considered as 65.1Mt.

2.4 Demand Projection for XIII Plan

Based on the realistic demand projection for Terminal Year of XII Plan, likely demand for Terminal Year of XIII Plan has been worked out as under:

Sector	T.Y.XI Plan (2011-12) (Demand as per Annual Plan)	T.Y. XII Plan (2016-17) (Realistic Demand)	CAGR (%)	T.Y. XIII Plan (2021-22) (Demand Projection)	CAGR (%)
Coking Steel	46.67	67.20	7.6%	105	9.3%
Power Utility	460.00	682.08	8.2%	938	6.6%
Cement	28.89	47.31	10.4%	78	10.4%
CPP	40.00	56.36	7.1%	79	7.1%
Sponge Iron	30.47	50.33	10.6%	81	10.1%
Others*	90.00	77.22		92	3.5%
Total Non-Coking	649.36	913.30	7.1%	1268	6.8%
Total	696.03	980.50	7.1%	1373	7.0%

- The demand shown for 'Others' in 2011-12 includes e-auction quantity.

Demand for Power Utility sector is based on power demand indicated in 17th EPS for 2021-22 at 1915BU, 70% of which, if comes through coal-based power station, the demand for coal-based power station works out to 1340BU requiring 938Mt of coal; Similarly demand indicated in National Steel Policy for 2021-22 in respect of steel production has been considered. Demand for other sectors in XIII Plan has been considered to grow at similar level as in XII Plan.

2.5 Observation:

The gap between demand and indigenous availability of coal has substantially widened during XI Plan from a level of 51.10Mt in the original plan document to 137.03Mt in the

Annual Plan of 2011–12. In this milieu, it is not unexpected that all manufacturing sectors would endeavour to register most optimistic requirement in order to ensure adequate availability of raw material. The requirement worked out on the basis of the inputs received from the major consuming sectors is the boundary limit for the demand. Notwithstanding the above, assessment of realistic demand is the fundamental activity for subsequent planning in production, infrastructure development and human resources. Moreover, projection of excess coal demand and increasing demand–supply gap may trigger in speculative pricing of coal in international market and therefore, ultimately may act as a self-defeating device. Working Group deliberated to estimate demand scenario and decided that wherever the demand of the finished products of the consuming sectors are available those would be used as the starting point for assess likely coal requirement. Accordingly, 17th Electric Power Survey report has been used to assess requirement of coal by power sector. Similarly demand of steel, as assessed by industry expert has been used to assess likely coking and non-coking coal demand of steel sector.

CHAPTER – 3

COAL PRODUCTION

3.0 Introduction

As per the Original XI Plan document, all India coal production was envisaged to be 680 million tonne (Mt) at 2011–12, TY of the XI plan. The envisaged annualised growth rate in XI Plan was 9.56 % against 5.62% achieved in the X Plan. At the Mid–Term–Appraisal (MTA) of the XI Plan, in Sept.2009, the production projections were revised downwards to 630 Mt for the year 2011–12 at an annualised growth rate of 7.89 %. As per the Annual Plan 2011–12 of MoC, all India coal production has been again revised to 554 Mt.

The company–wise trends of coal production, during the last three plan periods, are as under.

Table: Trend of Coal Production

(Figures in Mt)

	TY IX Plan (01–02)	TY X Plan (06–07)	TY XI Plan (11–12)	Growth in X Plan		Growth in XI Plan	
	Actual	Actual	Target	Absolute	CAGR %	Absolute	CAGR %
CIL	279.65	360.91	447.00	81.26	5.23	86.09	4.37
SCCL	30.81	37.71	51.00	6.90	4.12	13.29	6.22
Other s	17.33	32.21	56.00	14.88	13.20	23.79	11.70
Total	327.79	430.83	554.00	103.04	5.62	123.17	5.16

3.1 Coal Production Performance in XI Plan:

3.1.1 All India:

In the first three years of the XI Plan, the growth in all India coal production showed an increasing trend. Against the coal production of 430.83 Mt achieved in 2006–07, achievement in 2007–08, 2008–09 & 2009–10, was 457.08, 492.76 and 532.04 Mt respectively. The annual growth showed an increasing trend till 2009–10. It grew from 5.84% (AG) in 06–07 (TY X Plan), to 6.09% in 2007–08, 7.80 % in 2008–09 and 7.97 % in 2009–10. In 2010–11, 533.08 Mt was achieved against 532.04 Mt in 2009–10. The growth was arrested in 2010–11, mainly on account of issues related to delay in Forestry & Environmental clearance (FC & EC), besides land acquisition, R & R and coal evacuation. Coal production target, as per the AP 2011– 12, has been planned for 554 Mt

3.1.2 Coal India Ltd (CIL):

As per the original XI Plan document, CIL's coal production was envisaged to be 520.50 Mt, at a CAGR of 7.60 %, in the terminal year (TY) of XI plan i.e. 2011–12. This was revised to 486.50 Mt (CAGR – 6.15 %) at the MTA. However, in the Annual Plan 2011–12, CIL's coal production target has been further revised to 447 Mt. Coal production in 2007–08, 2008–09 & 2009–10, was 379.46, 403.73 and 431.26 Mt respectively against 360.91 Mt achieved in 2006–07 (TY X Plan). In the first three years of the XI Plan, CIL's coal production grew at an increasing trend with the annual growth rate of 5.10% in 2006–07 (TY X Plan), to 5.14 % in 2007–08, to 6.40 % in 2008–09, to 6.82 % in 2009–10. However, in 2010–11, CIL's coal production, 431.32 Mt, stagnated at the same level of the previous year on account of constraints of delays in obtaining forestry and environmental clearances of a large number of new/expansion projects, land acquisition and related R&R issues, and law and order problems. Additional environmental issues, in the form of imposition of restrictions on increasing coal production under the Comprehensive Environmental Pollution Index (CEPI) compounded the problem in the growing coalfields. Further, lack of evacuation facilities in some growing coalfields viz. North Karanpura, Talcher, IB Valley & Mand Raigarh caused build up of pithead stocks, which resulted in restriction of production in some subsidiaries.

In XI Plan, CIL had identified 145 new/expansion projects having a sanctioned capacity of around 390 Mty. So far only 80 projects having ultimate sanctioned capacity of 195.78 Mty has been approved and are in various stages of implementation. Out of these, 37 projects contributed 80.11 Mt in 2010–11. In 2011–12, 42 projects are expected to contribute 88.71 Mt. The remaining identified 65 XI Plan projects (estimated capacity of 195.44 Mty) are in various stages of formulation/approval.

Currently 149 On-going projects are under execution by CIL. Approved EC capacity available at present with CIL is 340.93 Mty. The projected production from these projects in 2011–12 is about 240 Mt. Out of this, only 81 projects have both EC and FC clearances with an approved EC of 190.48 Mty. The projected production of these projects in 2011–12 is about 125 Mt. For another 32 projects, EC, capacity of 142.67 Mt, has been approved. However, FC of these projects is pending. The projected production of these projects is about 100 Mt in 2011–12. In 14 projects (PR Capacity 16.62 Mty), FC has been obtained but EC is awaited. For the remaining 22 projects (PR capacity 88.12 Mty), both EC and FC is pending.

3.1.3 SCCL:

As per the original XI Plan document, SCCL was envisaged to produce 40.80 Mt (CAGR 1.59 %) in 2011–12 (TY of XI plan), against 37.71 Mt in 2006–07 (TY of X Plan). In the first two years of the XI plan, SCCL has exceeded the envisaged targets and achieved an annual growth of 2.89 Mt (7.7 %) in 2007–08 and 3.95 Mt (9.7 %) in 2008–09 over the previous year. At the MTA coal production targets for SCCL in 2011–12 was enhanced to 47.00 Mt (CAGR 4.50 %). In the Annual Plan 2011–12, SCCL's targets were further enhanced to 51.00 Mt (CAGR 6.22 %).

During XI plan period, 33 Nos. of projects were identified having PR capacity of 56.67 Mt. Their actual production during 2010–11 and anticipated production during 2011–12 are 36.72 & 36.48 Mt respectively.

Out of 33 Projects identified in the XI plan, 24 Projects have been implemented. Status of remaining projects is as follows:

- 2 projects were approved but could not be started due to land diversion/acquisition and Rehabilitation and Resettlement of displaced families.
- Feasibility Reports of another 2 project are under preparation.
- 2 projects are going to be implemented during 2011–12.
- FR approved for 2 projects and it is in initial stage of implementation.
- 1 project is proposed for dropping.

Out of 56.67 Mt of capacity planned to contribute during XI plan period, 36.72 Mt capacity was established by the end of 2010–11 & remaining projects of capacity 19.96 Mt could not be started due to –

- Problems related to land diversion/acquisition and R&R of displaced families.
- FR under preparation.

3.1.4 Captive Blocks:

As per the original XI Plan document, at the TY of XI Plan coal production from captive coal blocks was envisaged at 104.08 Mt (with a plan period growth of 86.46 Mt at a CAGR of 42.66 %). However, as per information received from the Coal Controller's Organisation (CCO), it is anticipated that at the end of the XI Plan, 2011–12, only 36.15 Mt is likely to come from captive blocks. The anticipated growth at the TY of XI Plan is likely to be 18.53 Mt (CAGR – 15.46 %). In the first two years there was a gradual increase in coal production. However, a declining trend is seen from 2009–10, growth in absolute terms reduced to 5.46 Mt in 09–10 compared to 8.75 Mt in 2008–09 over 2007–08. This is on account of constraints of FC&EC issues, land acquisition, etc. In 2010–11 a marginal negative growth (0.82 Mt) is seen.

The year-wise coal production from captive blocks in the XI Plan and the number of producing blocks is given below.

Table: Trend of Coal Production from Captive Blocks in XI Plan

Captive blocks	TY X Plan	XI Plan							
	06-07	07-08	08-09	09-10	10-11	11-12			
	Actual					Target	Ant	Original	MTA
No. of Blocks	11	15	25	26	28	38	34		
Production (Mt)	17.61	21.25	30.00	35.46	34.60	38.25	36.15	104.08	80.89
Absolute Growth (Mt)									
Annual	4.02	3.64	8.75	5.46	-0.86	3.65	1.55	69.48	46.29
Plan period	13.15					20.64	18.53	86.46	63.27
CAGR %	31.61					16.78	15.46	42.66	35.65

Till 2010-11, production commenced in 28 blocks & produced 34.64 Mt. At the end of the XI Plan, it is anticipated that 34 blocks will be in operation and the likely production is expected to be 36.15 Mt. Out of the total 34 blocks, 16 blocks of power utilities are expected to yield 26.30 Mt of coal, 12 sponge iron blocks will be producing 8.88 Mt and remaining production shall come from the 6 blocks of steel, cement, pig iron, etc.

3.1.5 Others:

Six PSE companies (JKML, JSMDCL, DVC, IISCO), Tata Steel and Meghalaya have been clubbed under the head 'Others'. In the original XI Plan document, at the TY of XI Plan coal production from other sources is envisaged at 14.62 Mt. Actual yearly coal production from this group in the XI Plan till 2010-11 is found to be ranging between 14.47 Mt to 15.83 Mt. The anticipated production for year 2011-12 is 17.75 Mt at an annualised growth of 12.41% and CAGR - 3.98%.

Year-wise achievement of all India coal production in the XI Plan Period is furnished in the table below.

Table: All India Coal Production Performance in XI plan

(Figures in Mt)

Source	TY X Plan	XI Plan						
	06-07	07-08	08-09	09-10	10-11	2011-12		
	Actual	Actual	Actual	Actual	Actual	AP Target	Original	MTA
CIL	360.91	379.46	403.73	431.26	431.32	447.00	520.50	486.50
SCCL	37.71	40.60	44.55	50.43	51.33	51.00	40.80	47.00
Captive	17.61	21.25	30.01	35.46	34.6	38.25	104.08	80.89
Others *	14.60	15.77	14.47	14.89	15.83	17.75	14.62	15.52
All India	430.83	457.08	492.76	532.04	533.08	554.00	680.00	629.91
AG %		6.09	7.80	7.97	0.20	4.12		
CAGR %	5.62					5.16	9.56	7.89

* JKML, JSMDCL, DVC, IISCO, Tata Steel and Meghalaya

3.2 XII Plan Projections.**3.2.1 Coal India Ltd**

Two scenarios of coal production programmes, viz. Business as Usual (Scenario-I) and Optimistic Scenario (Scenario-II) has been drawn up.

3.2.1.1 Business as Usual Scenario (SCN-I):

Under Scenario-I, CIL is envisaged to produce 556.40 Mt at the terminal year of the XII Plan, (2016-17) with a plan period growth of 109.40 Mt & a CAGR of 4.48%. This projection has been drawn up considering the current trends of delays in obtaining EC & FC, land acquisition and R&R issues, law & order problem and the development of coal evacuation facilities.

Coal Production Programme – CIL (SCN I – Business as Usual)

(In Mt)

Company	TY XI Plan	XII Plan Projection				
	11-12 Tar/BE	12-13	13-14	14-15	15-16	16-17
ECL	33.00	34.00	35.00	36.00	38.00	41.00
BCCL	30.00	31.00	32.50	33.50	35.00	36.00
CCL	51.00	55.00	62.00	70.00	76.00	83.00
NCL	68.50	69.00	71.00	74.00	77.00	80.00
WCL	45.50	45.00	45.00	45.00	45.00	45.00
SECL	112.00	117.00	119.00	123.00	126.00	130.00
MCL	106.00	112.00	120.00	125.00	132.00	140.00
NEC	1.00	1.10	1.15	1.25	1.30	1.40
Total	447.00	464.10	485.65	507.75	530.30	556.40
AG (Mt)	15.68	17.10	21.55	22.10	22.55	26.10
Plan Period Growth (Mt)	86.09					109.40
CAGR (%)	4.37					4.48

3.2.1.2 Group wise break-up

Group-wise break-up of production programme of CIL for the XII Plan under SCN-I is given below:

Group-wise coal production programme of CIL (SCN-I)

(Figures in Mt)

Group	XI Plan TY (RE)	XII Plan (Projection)				
	11-12	12 - 13	13 - 14	14 - 15	15 - 16	16 - 17
Existing +Completed	218.37	227.39	222.56	202.35	197.26	192.42
Ongoing Projects	227.63	233.76	254.31	272.69	288.26	300.18
Future Projects	1.00	2.95	8.78	32.71	44.78	63.80
TOTAL	447.00	464.10	485.65	507.75	530.30	556.40

In the XII Plan period production from Existing mines and Completed projects of CIL is expected to decline by 25.95 Mt from 218.37 Mt in 2011–12 to 192.42 Mt in 2016–17. Production from Ongoing Projects is envisaged to increase by 72.55 Mt i.e. from 227.63 Mt in 2011–12 to 300.18 in 2016–17. So far tentatively as many as 70 new/expansion projects identified to be taken up besides about 50 XI plan spill over projects during XII plan. It is expected that about 63.80 Mt will come from New/Future projects in the TY of XII plan.

3.2.2 SCCL

SCCL has planned for an incremental production of 6 Mt by the end of XII Plan in comparison to the end of XI Plan (51.00MT – anticipated) (CAGR 2.25%)

Year-wise production projections of SCCL during XII Plan period are given below:

Table: Coal Production Programme of SCCL (SCN-I)

(Fig in Mt)

	TY of XI Plan	XII Plan				
Year	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17
Production proposed	51.00	53.10	54.30	55.00	56.00	57.00

Table : Group-wise coal production programme of SCCL

(in Mt)

Group	TY of XI Plan Target	XII Plan Projection				
	11–12	12 – 13	13 – 14	14 – 15	15 – 16	16 – 17
Existing + Completed	41.04	33.32	31.78	31.53	30.90	30.91
Ongoing Projects	9.96	19.78	22.52	23.32	24.56	25.15
Future Projects				0.15	0.54	0.94
TOTAL	51.00	53.10	54.30	55.00	56.00	57.00

In the XII Plan period production from Existing and Completed projects of SCCL is expected to decline from 41.04 Mt in 2011–12 to 30.91 Mt in 2016–17 due to depletion of reserves. Production from Ongoing Projects is programmed to increase from 9.96 Mt in 2011–12, TY of XI Plan to 25.15 Mt in 2016–17 i.e. by 15.19 Mt. Another 0.94 Mt is expected to come from new/future projects in the TY of XII plan.

During XII plan, SCCL has envisaged 9 new projects. Increase in production will come mainly from 22 On-going projects and identified XII plan projects.

Out of the 9 new projects envisaged to be taken up in XII plan, Environmental Clearance (EC) for one project has been obtained. EC is yet to be obtained for the remaining projects. Forestry Clearance for JVR OC-II is in the initial stages. For all other new projects FC application has to be generated.

3.2.3 Captive Blocks

In the XII Plan period it is envisaged that production from Captive Blocks will increase from 36.15 Mt in 2011-12 to 79.60 Mt in 2016-17, i.e. an absolute growth of 43.45 Mt at a CAGR of 17.10%.

So far 194 blocks have been allotted for captive mining purpose. As per mine plan submitted by captive block owners to CCO it is envisaged that at the end of the XII Plan, as many as 111 blocks will be operative and will produce 79.60 Mt. Out of these 111 blocks, which fall in to GO Area, it is envisaged that about 42 blocks will cater power utilities. Sponge Iron will be provided coal from 42 blocks and remaining 27 blocks will provide to Steel, Cement, Pig Iron etc.

The details of coal production programme in the XII Plan period from Captive Blocks as made available by the Coal Controller's Organisation under Scenario I is given below.

Table: Coal production programme from captive blocks (SCN-I)

Captive Blocks	(TY XI Plan)	XII Plan Proj				
	11-12 Ant	12-13	13-14	14-15	15-16	16-17
No. of Blocks (Tentative)	34	39	50	70	80	>100
Production (Mt)	36.15	39.80	46.80	53.25	66.20	79.60
Plan Period Growth (Mt)	18.53					43.45
CAGR (%)	15.46					17.10

3.2.4 All India

In the business as usual scenario, it is envisaged that coal production would grow from 551.90 Mt in 2011-12 to 715.00 Mt in 2016-17. Incremental production envisaged is 163.10 Mt at a CAGR of 5.31 % as shown below.

Table: Coal Production Programme – All India (SCN – I)

(Figures in Mt)

Company	TY of XI Plan	TY of XI Plan	XII Plan				
	11-12	11-12	12 – 13	13 – 14	14 – 15	15 – 16	16 – 17
	Target	RE/Anticipated	Projection				
CIL	447.00	447.00	464.10	485.65	507.75	530.30	556.40
SCCL	51.00	51.00	53.10	54.30	55.00	56.00	57.00
Captive Mining	38.25	36.15	39.80	46.80	53.25	66.20	79.60
Others	17.75	17.75	18.00	18.25	19.00	20.50	22.00
Total – All India	554.00	551.90	575.00	605.00	635.00	673.00	715.00
Plan Period Growth (Mt)	123.17	121.07					163.10
CAGR %	5.16	5.08					5.31

Under this business-as-usual scenario, considering the present pace of FC&EC clearances, the difficulties in land acquisition and evacuation problems, it is envisaged that CIL would contribute an incremental production of 109.40 Mt at a CAGR of 4.48% and SCCL would add another 6 Mt, growing at a CAGR of 2.25%. Coal production from captive mining blocks is planned to yield an incremental production of 43.45 Mt at a CAGR of 17.10%.

3.2.5 Field-wise break-up

Significant growth in coal production is expected to come from the following coalfields:

Table: Projected growth from Captive Blocks & Major Coalfields (SCN – I)

(Figures in Mt)

Coalfield	Likely Growth in XI Plan	Projected growth in XII Plan (SCN I)	
	Abs (Mt)	Abs (Mt)	CAGR %
Captive blocks	18.99	43.45	17.10
Talcher	16.71	21.50	5.70
North Karanpura	3.42	18.11	11.67
IB Valley	9.29	12.50	5.76
Singrauli	16.34	11.50	3.15
CIC	0.69	8.37	6.16
West Bokaro	1.15	5.79	13.65

Coalfield	Likely Growth in XI Plan	Projected growth in XII Plan (SCN I)	
	Abs (Mt)	Abs (Mt)	CAGR %
Mand Raigarh	3.14	5.28	14.27
TOTAL	69.73	126.50	12.65
% of Total Growth	56.61	77.55	

It is envisaged that major growth will come from above seven coalfields and from captive blocks. In the XII plan the envisaged coal production growth from these seven coalfields & captive blocks is 126.50 Mt. Subsidiary-wise, field-wise production programme of CIL, SCCL and Others is given in Annexure 3.1

3.3 Optimistic Scenario (Scenario-II) :

3.3.1. Coal India Ltd

In the XI Plan period, coal production could not be achieved as planned primarily due to restrictions arising out of imposition of CEPI guidelines and non-availability of forestry clearances in time. Land acquisition in a large number of new/expansion projects is held up due to various issues of problems of inconsistent land records, R&R issues, etc. Also, coal production had to be restricted in certain growing coalfields for frequent stoppage of work by the local populace leading to deteriorated law and order situation, mainly in Orissa and Jharkhand States.

The production projected in this scenario is achievable only if the requisite clearances are processed in the fast-track route and delivered within the specified schedule and the issues affecting land acquisition, R&R and law and order are addressed appropriately by active involvement of all concerned Central and State Government agencies.

In spite of 29 Mt less production compared to AP target in the year 2010-11, about 6 Mt of coal production was added to coal stock and the overall pit-head coal stock increased from 63.54 Mt to 69.17 Mt. This was primarily due to non-availability of adequate railway wagons in different coalfields. Out of 185 rakes/day originally envisaged during formulation of the Annual Plan only 162 rakes/day could actually be supplied resulting in off-take lower than target.

Further, CIL's growth in production in the first four years of the XI Plan was 4.56 %. Against this growth in production, growth in rail off-take was only 2.61% resulting in increase in stock from 32.82 to 69.17 Mt in four years. At present rail despatch is around 47% of the total off-take and the rest of the off-take is through other modes. Growth in off-take in this period has been maintained through stretching the road despatch. Growth of this level through road will be difficult to sustain in future.

In this scenario it is also assumed that rail evacuation problems will be addressed to match with the growth in coal production expediting pending rail projects in the major growing coalfields with adequate availability of wagons.

CIL has worked out a second scenario of coal production projections in the XII Plan, with the above assumptions, in keeping with the growing energy requirements of the nation. Under this scenario, CIL, stretching all its resources, has worked out a projection of the maximum possible coal production during the XII Plan provided the issues mentioned above are duly addressed in a time bound manner and enabling conditions are created for CIL to both produce and despatch the produced coal. The company-wise break-up of coal production by CIL under this scenario is given below:

Table: Company wise coal production programme – CIL (Scenario II)

(Figures in Mt)

Company	TY XI Plan	XII Plan Projection				
	11-12 (BE)	12-13	13-14	14-15	15-16	16-17
ECL	33.00	34.00	36.00	39.00	42.00	45.00
BCCL	30.00	31.00	32.50	34.00	36.00	37.00
CCL	51.00	55.00	63.00	75.00	85.00	92.00
NCL	68.50	69.00	71.00	76.50	80.00	82.00
WCL	45.50	45.00	45.00	45.00	45.00	45.00
SECL	112.00	117.00	119.00	125.00	135.00	145.00
MCL	106.00	112.00	120.00	135.00	150.00	167.00
NEC	1.00	1.10	1.15	1.25	1.50	2.00
Total CIL	447.00	464.10	487.65	530.75	574.50	615.00
AG (Mt)	15.68	17.10	23.55	43.10	43.75	40.50
Abs Growth (Mt) in Plan period	86.09					168.00
CAGR (%)	4.37					6.59

Table: Group-wise coal production programme of CIL (SCN-II)

(Figures in Mt)

Group	TY XI Plan	XII Plan (Projection)				
	11-12 Target	12 - 13	13 - 14	14 - 15	15 - 16	16 - 17
Existing + Completed	218.37	227.39	222.56	202.35	197.26	192.42
Ongoing Projects	227.63	232.18	255.31	286.49	306.86	325.78
Future Projects	1.00	4.53	9.78	41.91	70.38	96.80
TOTAL	447.00	464.10	487.65	530.75	574.50	615.00

In the XII Plan period production from Existing and Completed projects of CIL is expected to decline from 218.37 Mt in 2011-12 to 192.42 Mt in 2016-17. Production from Ongoing Projects is programmed to increase from 227.63 Mt in 2011-12, TY of XI Plan to 325.78 Mt in 2016-17) i.e. by 98.15 Mt. Another 96.80 Mt is expected to come from new/future projects to be taken up during XII plan.

3.3.2 Captive Blocks

It is envisaged that at the end of the XII Plan around 133 blocks (as per mine plan submitted by captive block owners to CCO) are likely to be in operation, considering blocks both in GO & NO GO Areas. Out of these 133 blocks it is envisaged that about 56 blocks will supply to power utilities, 47 blocks to Sponge Iron and remaining 30 blocks to Steel, Cement, Pig Iron etc.

Assuming that the problem of captive blocks falling in NO GO areas would be addressed expeditiously it is expected that some of the blocks out of 22 blocks of No Go Area may get necessary clearances to be operational. Taking all these into consideration it is envisaged that as many as 115 blocks will be in operation and will contribute 100 Mt with an absolute plan period growth of 63.85 Mt (CAGR 22.57%)

The details of coal production programme from Captive Blocks as made available by the Coal Controller's Organisation under Scenario II are given below.

Table: Coal production programme from captive blocks (SCN-II)

Captive Blocks	(TY XI Plan)	XII Plan Proj				
	11-12 Ant	12-13	13-14	14-15	15-16	16-17
No. of Blocks (Approx)	34	40	52	74	85	115
Production (Mt)	36.15	39.80	46.80	53.75	68.50	100
Plan Period Growth (Mt)	18.53					63.85
CAGR (%)	15.46					22.57

3.3.3 All India

With the above stated assumptions it is envisaged that the total coal production shall grow from 551.90 Mt in 2011-12 to 795.00 Mt at 2016-17 (TY of XIII Plan), resulting in an incremental production of 243.10 Mt at a CAGR of 7.57%. Under this scenario CIL is envisaged to produce 630 Mt (2016-17) at a CAGR of 7.1%.

Table: Coal Production Programme – All India (SCN – II)

(Figures in Mt)

Company	TE of XI Plan (2011-12)		XII Plan (Projection)				
	(Tar)	Antic	12 - 13	13 - 14	14 - 15	15 - 16	16 - 17
CIL	447.00	447.00	464.10	487.65	530.75	574.50	615.00
SCCL	51.00	51.00	53.10	54.30	55.00	56.00	57.00
Captive Mining	38.25	36.15	39.80	46.80	53.75	68.50	100.00
Others	17.75	17.75	18.00	18.25	19.00	21.00	23.00
Total – All India	554.00	551.90	575.00	607.00	658.50	720.00	795.00
Abs Growth	123.17	121.07					243.10
CAGR %	5.16	5.08					7.57

However, the above scenario envisages an ideal situation where FC&EC clearances are received in the stipulated time frames, land acquisition and R&R issues are smoothened out with the co-operation of the State governments and coal evacuation issues sorted out.

3.4 Under Ground Production:

(Figs in Mt)

Company	TY of X Plan	TY of XI Plan(T)	XII Plan Projection				
	06-07	2011-12	12-13	13-14	14-15	15-16	16-17
CIL	43.32	45.00	45.00	46.00	47.35	51.00	54.50
Abs. Growth (PP)	-5.90	1.68					9.50
CAGR %	-2.52	0.76					3.92
SCCL	11.88	12.50	15.00	15.50	15.70	15.70	16.00
Abs. Growth(PP)	-1.87	0.62					3.5
CAGR %	-2.88	1.02					5.06
Captive	0.67	1.20	1.22	1.58	2.25	3.60	5.30
Abs. Growth(PP)		0.53					4.10
CAGR %		12.36					34.59
Others	1.83	6.92	7.37	9.09	9.20	9.61	8.67
All India	57.70	65.62	68.60	72.20	74.50	79.90	84.50
Abs.Growth(PP)		7.92					18.88
CAGR %		2.61					5.19

3.4.1 CIL

Following initiatives are being taken to enhance coal production from underground mines:

- Introduction of Mass Production and Long-wall technology at suitable locales. A few high capacity green-field underground mines have been identified for developing by Mass Production and Long-wall technology with Private –Public partnership on risk-gain sharing basis.
- High wall mining technology is also planned in the mines where geo-mining conditions permits.
- Driving additional shaft and incline/drift for enhancing evacuation capacity.
- Additional coal winning equipment is being deployed for enhancing capacity where ever feasible.

Further, 18 abandoned mines with estimated reserves of over 1600 Mt of high quality coking coal and thermal coal have been identified for developing under a Joint venture Arrangement with association of global underground mining companies.

3.4.2 SCCL

In SCCL, the share of production from UG mines in total production during XI plan (including

12.50MT anticipated for 2011–12) is 25.6 % against the target of 28.6 %. But in growth in UG production was negative (CAGR %) in TY of X plan and in TY of XI plan it is expected to be negligible.

During the initial four years of XI plan, the coal production in SCCL has increased by around 10.70 Mt but reduced by 1.0 Mt from UG mines.

SCCL has planned for an incremental production of 6.00 Mt by the end of XII Plan in comparison to the end of XI Plan (51.00 Mt – anticipated). Out of 6 Mt incremental productions, 3.5 Mt is proposed from UG mines.

- The phasing out of Conventional mining (Hand section mining) by semi-mechanization will continue in the XII plan also. By the end of XII Plan (2016–17), hand section units will get reduced to 9 units (in 3 mines) in comparison to that of 41 units (in 15 mines) during the terminal year of XI Plan (2011–12). Efforts will be continued to make this figure Zero.
- Two high capacity Long Wall projects – ALP & KLP (with ultimate capacity of 5.55 Mt which are under construction, are expected to start production during XII Plan period.
- During XII FYP, the no. of SDL will peak to 174. Presently 146 SDLs are working in SCCL.
- 3 More numbers of Continuous Miners are programmed for XII plan.

3.5 XIII Plan Projections (TY 2021–22)

For projections of XIII coal production two scenarios have been worked out, one is business as usual (Scn-1) and another is optimistic (Scn-2). It is envisaged that all India coal production for these two scenarios will be 950 Mt & 1102 Mt respectively with a CAGR of 5.85% & 6.16% and that for Coal India Ltd will be 650 Mt & 700 Mt with a CAGR of 3.16% and 2.62% respectively.

Table: All India Projections for XIII Plan

(In Mt)

Company	TY XI Plan	TY XII Plan		TY XIII Plan	
	2011-12	2016-17		2021-22	
	Antic.	SCN-I	SCN-II	SCN-I	SCN-II
CIL	435.00	556.40	615.00	650.00	700.00
SCCL	51.00	57.00	57.00	63.00	63.00
Captive Mining	36.15	79.60	100.00	215.00	315.00
Others	17.75	22.00	23.00	22.00	24.00
All India	539.90	715.00	795.00	950.00	1102.00
Absolute Growth	109.07	175.10	255.10	235.00	307.00
CAGR %	4.62	5.78	8.05	5.85	6.75

Table: Coal India Ltd : Company-wise break-up:

(In Mt)

Company	TY of XII Plan (2021-22)	
	SCN-I	SCN-II
ECL	45.00	47.00
BCCL	38.00	38.00
CCL	95.00	110.00
NCL	85.00	85.00
WCL	44.50	44.50
SECL	160.00	180.00
MCL	180.00	193.00
NEC	2.50	2.50
Total	650.00	700.00
Absolute Growth	93.60	85.00
CAGR %	3.16	2.62

3.6 AVAILABILITY OF COKING COAL

3.6.1 Coking Coal Reserves

As per the Geological Resources of Indian Coal (as on 1.4.2011), out of the total resources of 285.9 billion tonnes (Bt) proven resources are only 114 Bt. (39.9%). The remaining resources fall under the indicated (48.1 %) and inferred (12%) categories. Of the proved reserves 89.3 Bt lies within a depth of 300 m and the remaining 24.7 Bt lies at depths between 300 to 1200 m.

The total resources of coking coal in the country as on 1.4.2011 stands at 33.47 Bt. Of this, 5.31 Bt is prime coking coal, 26.45 Bt is medium coking coal and 1.71 Bt is semi-coking coal.

The type-wise and category-wise break-up of coking resources is given below:

Table : Type-wise & Category-wise Coking Coal Resources of India
(As on 1.4.2011)

(In Mt)

Type of coking coal	Proved	Indicated	Inferred	Total	% Share
Prime coking	4614.35	698.71	0.00	5313.06	15.8
Medium coking	12572.52	12001.32	1880.23	26454.07	79
Semi-coking	482.16	1003.29	221.68	1707.01	5.2
Total	17669.03	13703.32	2101.91	33474.26	100

As may be seen from the above table, only 15.8% of the total coking coal reserves are of Prime coking coal, the major portion being Medium coking coal (79 %). Prime coking coal resources are restricted to Jharia coalfield only. Medium and semi-coking coal is available in Jharia, Ranigunj, Bokaro, Ramgarh, Karanpura, Pench-Kanhan, Sohagpur and Sonhat coalfields.

3.6.2 Availability of coking coal

Though the production of total coking coal has increased from 32.1 Mt at the end of the X Plan to 49.53 Mt, the production of metallurgical coking coal has remained stagnant at 17 to 18 Mt. The remaining coking coal was not found suitable for metallurgical use on quality considerations.

3.6.3 Performance of XI Plan

The total production of indigenous coking coal and distribution in metallurgical and non-metallurgical industries is given below (Source: Provisional Coal Statistics for 2010-11, CCO)

Table: Production of metallurgical coking coal in XI Plan

(In Mt)

	YEAR	Total Coking	Metallurgical	Non-metallurgical	% Metallurgical
TY X Plan	2006-07	32.1	17.23	14.87	53.7
XI Plan	2007-08	34.45	18.06	16.39	52.4
	2008-09	33.81	17.3	16.51	51.2
	2009-10	44.41	17.73	26.68	39.9
	2010-11	49.53	17.84	31.69	36.0

As may be seen from the above table, in the XI Plan, production of metallurgical coking coal ranged between 17 and 18 Mt. Production from CIL sources is seen to be reducing in the first three years of the XI Plan – production from BCCL remained at the level of 3.5 Mt, while that from CCL reduced from 5.76 Mt in 2007-08 to 5.23 Mt in 09-10. Production from TSL hovered between 7.16 to 7.25 Mt.

Table : Year-wise, company-wise metallurgical coking coal production in XI Plan Period

(Source : Coal Directory, 07-08, 08-09 & 09-10)

(In Mt)

COMPANY	07-08	08-09	09-10	10-11
ECL	0.02	0.03	0.02	0.04
BCCL	3.54	3.50	3.64	4.95
CCL	5.76	4.92	5.23	3.02
WCL	0.68	0.73	0.55	0.38
SECL	0.16	0.15	0.15	0.16
CIL	10.16	9.30	9.59	8.55
Tata Steel (TSL)	7.19	7.25	7.16	9.29
IISCO	0.72	0.74	0.93	
ESCL (Pvt)	–	0.01	0.06	
ALL INDIA	18.07	17.30	17.73	17.84

3.6.4 Projections for coking coal production during XII Plan

In the XII Plan period CIL has projected an increase in metallurgical coking coal production, to 15.74 Mt by 2016-17. However, the increase will have to come mainly

from BCCL and CCL, from the old coalfields of Jharia, Bokaro and Karanpura, which are beset with problems of surface habitation, areas under fire and waterlogging, along with problems of land acquisition and environmental and forestry clearances.

(In Mt)

Company	XII Plan projection				
	12-13	13-14	14-15	15-16	16-17
ECL	0.007	0.007	0.007	0.007	0.007
BCCL	5.5	5.7	6.2	6.7	7.4
CCL	4.8	7.09	7.31	7.52	7.74
WCL	0.38	0.40	0.40	0.43	0.46
SECL	0.13	0.13	0.13	0.13	0.13
CIL	10.82	13.33	14.05	14.78	15.74
TATA STEEL	8.74	10.43	10.34	10.37	9.42
IISCO	0.93	0.93	0.93	1.20	1.20
Others *	0.80	2.17	4.29	4.34	5.34
ALL INDIA	21.29	26.86	29.61	30.69	31.70

*Electro Steel etc.

3.6.5 Programme for enhancing coking coal production

BCCL

In India Prime coking coal is confined to the Jharia coalfield operated mainly by BCCL.

The following measures are being taken for enhancing coking coal production at BCCL:

- Small patches having coking coal have been identified and operated by deploying Hired HEMM.
- At Moonidih UG mine, it had been planned to augment production through a new PSLW package on risk/gain sharing basis with M/s ZMJ, China. However, this package could not be finalised. A fresh tender is being floated to work XVI Seam on turnkey basis.

Meanwhile, an NIT was floated for working XV Seam of Moonidih (1.5 Mtpa) on a turnkey basis. Work order is likely to be issued shortly.

- Kapuria Project (2 Mtpa): Tendering is at a final stage and work order will be issued shortly.

- A number of new projects are in the pipeline, e.g. PB Project (1 Mtpa), Simlabahal (2 Mtpa), Madhuband (1 Mtpa), Amlabad (0.5 Mtpa), Bhowrah (South) (0.6 Mtpa), Sudamdih Shaft (0.5 Mtpa).
- The long standing land acquisition problem of Block II OCP has been sorted out and this will enable enhancement of coking coal production.
- Implementation of the Jharia Master Plan has commenced. Full implementation will release considerable coking coal resources for exploitation.

CCL

During the XII Plan, production of coking coal is expected to increase from the On-going projects, viz. Karo OC, Rajrappa RCE, Tapin OC, Tarmi OC, Parej East UG.

The production of coking coal would also increase with commencement of production from Future projects, viz., Chano-Rikba OC, Gose OC, Pichri OC, Ramgarh II West OC.

The increase in production from On-going and Future projects would be offset by the closure of Kalyani OC and Jarangdih OC due to reserve depletion. These two mines produced 2.98 Mt coking coal in 2010-11. Another mine Selected Dhori Quarry No 3, which produced 1.87 Mt of coking coal in 2010-11, would cease production in 2017-18 and is projected to produce 0.25 Mt in 2016-17 due to reserve depletion.

Production would again pick up in the XII Plan as a result of the coming up of Future projects. The following measures are being taken for enhancing coking coal production by CCL:

- The production of coking coal would increase from the following **ongoing projects** during the XII plan.

Rajrappa OC (3 MTY); Tapin OC (2.50 MTY); Karo OC (3.50 MTY); Topa OC RO (1.20 MTY)

- Parej East UG mine, which is an approved project, (0.51 MTY) would commence production during the XII plan
- The production of coking coal would increase as a result of the commencement of production from the following **future / new projects**:

Pichri Extn. OC (2 MTY); Tapin Integrated OC(2 MTY); Kuju OC (1 MTY); Gose OC (2 MTY); Chano - Rikba OC(3 MTY)

- To further increase coking coal production, establishment of joint venture is being explored for the exploitation of coking coal reserves of Ara and Laiyo mines.

Tata Steel

- Total coking coal production at Tata Steel's mines in India at present is over 7 Mill Tons from 2 locations—open cast operations at Ghato, West Bokaro which produces medium coking coal and underground operations at Jharia which produce prime coking coal.

- In addition to expanding capacity at its West Bokaro mines from 6 mill tons to 9 mill tons by 2016, Tata Steel is also planning to open another mine, called Kotre Basantpur–Pachmo with a planned capacity to go upto 8 Mill tons p.a. However, It will first be opened to produce 5 Mill Tons by 2016–17 in Phase–1 and then expanded to 8 Mill Tons in Phase–2.
- Tata Steel expects to reach a total production of coking coal of around 15 Mill Tons by end of XII five year plan from its domestic operations of its own/ captive mines.

CHAPTER-4

DEMAND VIS-A-VIS AVAILABILITY

4.1 Demand projections for XII Plan are furnished in detail in Chapter-2. Indigenous availability projections are furnished in Chapter-3. After examining different projections the Working Group assessed the total demand of coal in the terminal year of XII Plan (2016-17) at 980.50 Mt, out of which the demand for non-coking and coking coal are assessed at 913.30Mt and 67.20Mt respectively. Against these demands the productions of non-coking and coking coal are projected at 683.30Mt and 31.70Mt respectively in the TY of XII Plan. This leaves a gap of 265.50Mt between demand and indigenous availability comprising of 35.50Mt of coking coal and 230.00Mt of non-coking coal. The assessed demand vis-a-vis projected production and the resultant gap between demand and indigenous availability in the TY of XII Plan period is shown in the table below:

	Figs. In Mt		
	Demand	Production	Gap(-)/Surplus (+)
Coking	67.20	31.70	(-) 35.50
Non-Coking	913.30	683.30	(-) 230.00
Total	980.50	715.00	(-) 265.50

4.2 STEEL

Demand and indigenous supply source for Steel Sector are mostly concentrated in Eastern Region. Demand supply scenario for steel sector is as under:

	2016-17(Mt)
Demand	67.20
Indigenous Availability	
CIL	15.74
TATA STEEL	9.42
OTHERS	6.54
Total	31.70
Gap (-)/Surplus(+)	(-) 35.50

4.3 Power (Utilities):

As per the demand projections, Power Utilities would continue to be the most important consuming segment. The share of power sector (682.08 MT) in the total assessed coal demand (total non-coking coal demand of 913.30 MT) works out to 74.7%. Demand vis-à-vis availability position for TY of XII Plan is as under:

	2016-17(Mt)
Demand	682.08
Availability	
CIL	396.71
SCCL	26.69

Captive Blocks/OTHERS	68.78
Indigenous availability	492.18
Gap (-)/Surplus(+)	(-) 189.90

4.4 Power Captive:

Total coal requirement of captive power sector has been projected in the terminal year of XII Plan (2016–017) at 56.36 million tonnes. Demand vis-à-vis availability position for TY of XII Plan is as under:

	2016–17(Mt)
Demand	56.36
Indigenous availability	
CIL	43.01
SCCL	3.44
Captive Blocks/OTHERS	2.12
Indigenous availability	48.57
Gap (-)/Surplus(+)	(-) 7.79

4.5 Cement Sector:

Cement Sector accounts for about 5 % of total coal demand of the country. The coal demand at the end of XII Plan has been estimated at 47.31 million tonne. Demand vis-à-vis availability position for TY of XII Plan is as under:

	2016–17(Mt)
Demand	47.31
Indigenous availability	
CIL	22.70
SCCL	17.09
Captive Blocks/OTHERS	0.51
Indigenous availability	40.30
Gap (-)/Surplus(+)	(-) 7.01

4.6 Sponge Iron: Demand vis-à-vis availability position for TY of XII Plan is as under:

	2016–17(Mt)
Demand	50.33
Indigenous availability	
CIL	24.34
SCCL	2.78
Captive Blocks/OTHERS	9.93
Indigenous availability	37.05
Gap (-)/Surplus(+)	(-) 13.28

4.7 Others: Demand vis-à-vis availability position for TY of XII Plan is as under:

	2016-17(Mt)
Demand	77.22
Indigenous availability	
CIL	53.91
SCCL	7.00
Captive Blocks/OTHERS	4.30
Indigenous availability	65.21
Gap (-)/Surplus(+)	(-) 12.01

4.8 Overall Demand and coal availability position for the TY of XII Plan is as under:

Source	Coking	Non-Coking						Total
	Steel	Power (U)	Power (C)	Cement	Sp. Iron	Others	Total	
Demand	67.20	682.08	56.36	47.31	50.33	77.22	913.30	980.50
Availability								
CIL	15.74	396.71	43.01	22.70	24.34	53.90	540.66	556.40
SCCL	0.00	26.69	3.44	17.09	2.78	7.00	57.00	57.00
Others	15.96	68.78	2.12	0.51	9.93	4.30	85.64	101.60
Indigenous	31.70	492.18	48.57	40.30	37.05	65.20	683.30	715.00
Gap(-)	35.50	189.90	7.79	7.01	13.28	12.02	230.00	265.50

4.9 Observation:

- The gap between demand and indigenous availability of coking coal to the extent of 35.50Mt is to be met through import
- Similarly the gap between demand and availability for Power (Utility) sector to the extent of 189.90 Mt is to be bridged through import. This includes requirement of about 23Mt of coal by imported coal based power plants.
- Non-coking coal import requirement for other sectors works out to 40.10Mt.
- Total import requirement of the Country in the TY of 2016-17, including those of import-based TPS, would be 265.50Mt, out of which 35.50Mt coking and 230.00Mt of non-coking coal.

4.10 Source-wise projected demand vis-à-vis availability for terminal year of XII & XIII Plan is given in the table below:

(in Million Tonnes)	TY of XII Plan		TY of XIII Plan	
Demand	980.50		1373.00	
Indigenous Availability				
	SCN-I	SCN-II	SCN-I	SCN-II

CIL	556.40	615.00	650.00	700.00
SCCL	57.00	57.00	63.00	63.00
Captive Blocks & Others	101.60	123.00	237.00	337.00
Total	715.00	795.00	950.00	1100.00
Gap	265.50	185.50	423.00	273.00

4.11 The gap between demand and indigenous availability is projected at 265.50 Mt in the TY of XII Plan. Out of this 265.50 Mt, the gaps in coking coal and non-coking coal is assessed at 35.50 Mt and 230.0 Mt respectively. Institutional efforts at the level of Central & State Government may however, bring additional production of 80Mt at the maximum resulting in reduction of the gap to 185.50Mt. However, such additional production is envisaged for non-coking coal only. Therefore, the gap between demand and availability of only non-coking coal could be reduced to 150.0 Mt.

CHAPTER-5

COAL MOVEMENT AND INFRASTRUCTURE DEVELOPMENT

- 5.0 In the XI Plan emphasis was given for building requisite rail infrastructure for evacuation of coal from major potential coalfields of North Karanpura, Mand-Raigarh, Ib-Valley fields. Increased availability of rolling stock, improving turn round of rakes and harnessing the potential of alternative modes of transportation for coal evacuation, particularly use of inland waterways were some of the issues identified as the thrust areas for XI Plan. Evacuation capacity building in XI Plan has not been to the level of expectation for various reasons like forestry and environmental clearance, land acquisition, lukewarm response from the prospective service providers and users of inland waterway transportation facilities etc. These issues need to be addressed on top priority during XII Plan to avoid accumulation of coal stock at the pitheads.
- 5.1 The usual modes for coal movement are rail, rail-cum-sea (coastal movement), road, merry-go-round, belt and ropeways. Since import of coal would be an important feature for bridging the demand-supply gap during XII plan, planning for creating port facilities and capacity building for hinterland movement of imported coal from ports to consuming centers would also be of immense importance.
- 5.2 The realistic demand in the TY of XII Plan is estimated at 980.50Mt. The incremental demand during XII plan (696Mt being the demand of terminal year of XI plan) is projected to be 284.50 million tonnes.
- 5.3 The supply of domestic coal is projected at 715Mt in the TY of XII Plan (2016-17). It is likely that demand-supply gap will be in the range of 265.50Mt. This gap is essentially to be made by importing coal. Therefore, the logistics infrastructure should be developed in such a fashion that apart from handling about 750 Mt indigenous coal, it would also be capable to handle at least 200 Mt of imported coal.
- 5.4 The critical issues in respect of movement logistics are:
- a) Railway capacity
 - b) Port Capacity
 - c) Capacity for transportation of coal at the railway sidings
 - d) In case of pithead consumption centres, synchronization of development of mining project and captive mode of transportation
- 5.5 The likely movement matrix for terminal year of XII plan (2016-17) for indigenous coal is being drawn for 715 Mt and is annexed at Annexure-5.1
- 5.6 It may be seen that requirement of rail movement for raw coal and coal products during 2016-17 would be 389.50 million tonnes for which wagon requirement

would be 281 rakes per day at the level of movement of 715Mt, assuming that 1 rake is equal to 3800 tonne. This, of course, includes coastal movement of 19.95 Mt but excludes movement of coal from private washeries to the extent of about 40 rakes/day. The movement of raw coal by rail constitutes about 42% of indigenous production.

The reduction in projected percentage share in movement of raw coal is arising out of envisaged augmentation in washing capacity in CIL from the existing level of 39Mt to 150Mt by the end of XII Plan, for which internal movement of raw coal to washeries would be essentially through road or captive mode.

However, the movement of washed coal would again depend on Railway system and therefore, it will continue to be the mainstay of coal movement in XII Plan as well.

5.7 The movement matrix for imported coal for 2016–17 is given in Annexure 5.2.

5.8 Requirement of rail movement for imported coal works out to 229.68 million tonnes equivalent to 165.6 rakes per day.

5.9 The total rail movement requirement in 2016–17 for assessed demand of coal works out to 619.18 million tonnes which is equivalent to 446.4 rakes per day.

5.10 The other modes of transport involved for movement of domestic coal are as under:–

Road: 267.23 million tonnes (38% of indigenous coal production)

MGR: 114.50 million tonnes (16% of indigenous coal production)

Belt/Rope: 28.85 million tonnes (4% of indigenous coal movement)

The substantial increase in movement through road is arising out of proposed increase in movement of raw coal to washeries in CIL, as the capacity is proposed to increase from a level of 39Mt in TY of XI Plan to 150Mt in the TY of XII Plan. While the movement of raw coal to washery is proposed to be through road, the processed product would ultimately move through rail to the consumption points.

5.11 About 12% of indigenous supply, i.e. about 85 Mt, has been projected for movement from captive mining blocks. Movement plan of these blocks was arrived at on the basis of the location of end-use plants and the position of the mining blocks. Wherever end-use plants are located far away from mining blocks, movement is considered to be made by rail.

5.12 Rail Capacity:

The exponential growth projected in rail movement would be dependent on speedy execution of pending infrastructure projects by railways both in respect of augmentation of line capacity and capacity addition of rolling stock. Indian Railways envisages handling about 700 million tonnes of coal, both indigenous as well as imported by 2020, roughly accounting for 33% of the total estimated freight traffic. On the basis of the projections given above for 2016–17, Indian Railways may have to relook on their estimates.

5.12.1 As per Railways Vision 2020 document, by 2020, the estimated originating freight traffic proposed to be handled would be 2165 Mt. In order to achieve the targeted growth, IR has set up following goals for capacity building:

Broad category	Vision 2020 Targets
Doubling including DFC	12,000 Kms.
Gauge Conversion	12,000 Kms.
New Lines	25,000 kms.
Electrification	14,000 kms.
Procurement of Wagons	289,136
Procurement of Diesel locomotives	5334
Procurement of Electric locomotives	4281

5.12.2 A list of some of the important on-going Railway projects for augmentation of coal routes, as indicated by Railway Board, is given in Annexure–5.3.

5.12.3 **Dedicated Freight Corridor:** To sustain the kind of growth of envisaged, IR has also planned for construction of Dedicated Freight Corridor projects. These corridors will be a Multi-Modal High Axle Load Freight Corridors with Computerized Train Control System. Presently, Ministry of Railways has sanctioned two DFC projects. A special purpose vehicle named Dedicated Freight Corridor Corporation of India Ltd., has been formed for execution DFC project. DFC projects are aimed at segregation of freight movement. The eastern DFC will primarily cater to the principal coalfields and will handle a major portion of the coal traffic. The salient features of the eastern corridor are as below –

Features	Eastern Corridor
Route Description	Dankuni–Gomoh–Sonnagar–Mughalsarai–Kanpur–Khurja–Ludhiana
Route Kilometre	1839
No. of lines	Double (Single – Khurja–Ludhiana)
Signalling	Automatic signalling with 2 kms. spacing

	on double line. Absolute block system on single line.
Traction	Electrified (2x25 KV AC)
Axle loads	25 Tonne (sub-structure of bridges fit for 32.5 tonne axle load)
Speeds	100 kmph
Traffic projections (2021–22)	144 million tonnes (160 trains)
Feeder Routes	3071 Km
Total Cost [current excluding cost escalation, Taxes, Insurance, IDC, Private Investment and Cost of Land (Rs.4200 Cr.)]	Rs. 23,605 crore

The Project as indicated by Railway Board is likely to be completed by 2016–17.

5.12.4 Since major incremental indigenous availability of coal would be from Karanpura, Korba & Ib Valley fields special efforts need to be given for development of railway siding/ tracks in Ib Valley, Korba and Karanpura fields both in CIL mines and coal blocks given for captive use. Following development projects would be of utmost importance for incremental movement of coal in XII Plan:

- Karanpura:- Construction of Tori–Shivpur–Hazaribagh (TSH) BG line was taken up during X plan period. However, the project is continuously getting delayed due to various problems related to land acquisition and law & order. Of late, Ministry of Environment & Forest (MOEF) has denied forestry clearance necessitating realignment of tracks. A concerted effort from all corners is required to ensure that the project is completed at the earliest so that movement of coal to power stations can start from Karanpura field during XII plan.
- Mand–Raigarh Coalfield:- This coalfield is expected to contribute 100MTPA coal. A single line 63KM railway project connecting Bhupdeopur– Kharasia – Baroud – Korichhaper was already under consideration. However, considering the projected traffic movement, it is now proposed that the route should have double line.
- Korba Coalfield:- This coalfield is expected to contribute about 125MTPA of coal production. In order to augment the existing railway infrastructure, a double line from Baroud – Korichhaper to Anuppur via Durgapur–Gevra Road of Korba coalfield will be required for smooth evacuation of coal.
- Ib Valley:- This coalfield has an ultimate production potential of 192MTPA including 45MTPA mainly from CIL projects. In addition to the on-going Barpali–Dhootra–Jharsuguda–Sardegga rail line in Gopalpur track covering 52.4KMs line, a few more lines to cater to the requirement of captive block holders has already been identified by CMPDIL. Simultaneously, the up gradation of single line to double line is required to be taken up to ensure requisite movement of coal.

5.13 Port Capacity:

5.13.1 Coastal Shipment: From a level of about 26 million tones in 2010–11, coastal movement of coal through Ports (both loading and unloading taken together) is envisaged to increase to a level of about 40 million tonnes in the TY of XII Plan. The entire coastal movement presently is limited to east coast only. This essentially involves three load ports (Haldia, Paradeep & Vizag) and three unload ports (Chennai, Ennore & Tuticorin) for the present. This projection is excluding the transshipment already taking place between Paradeep–Haldia & Vizag–Haldia for indigenous non-coking and imported coking & non-coking coal. Considering the capacity constraints in rail movement, coastal shipment of coal to some of the consumers in power sector in Gujarat is envisaged during XII Plan. In view of the capacity constraints of Indian Railways, the possibility of further expansion of coastal movement of coal from Orissa to the states of Maharashtra needs to be explored during XII plan period.

5.13.2 Imported coal: The gap between demand and indigenous availability is projected to be more than 265 Mt. However, considering the higher calorific value of imported coal, the import requirement may ultimately reduce to some extent. The Planning Commission in its approach paper for XII Plan has projected likely import requirement of 200 Mt in the TY of XII Plan. If 1Mt of imported coal is considered equivalent to 1.5 Mt of indigenous coal, the projection of Planning Commission would be taking care of the gap of around 300Mt of indigenous coal, more or less matching with the estimate made in Chapter–4 of this report.

5.13.3 Coast-wise location of requirement of imported coal: The indicative requirement of imported coal in East & West Coast ports, as given in Annexure 5.2, is assessed to be 173.5 Mt & 92 Mt respectively. This assessment is made on the basis of the location of consumption centres, essentially power stations.

5.13.4 Coal handling capacity of Indian Ports: The Maritime Agenda 2010–2020 indicates that coal handling capacity of the major ports is likely to be 196.59Mt in 2016–17 from a level of 81.65Mt in 2011–12. Port-wise envisaged capacity is as under:

Port-wise coal handling capacity for Major Ports Mt)			
Ports	11–12	16–17	CAGR
Kolkata/Haldia	15	52.5	28.5%
Paradip	22.5	32.5	7.6%
Vizag		26.44	
Ennore	24	34	7.2%
Chennai			
Tuticorin	14.75	28.75	14.3%
East Coast	76.25	174.19	18.0%

New Mangalore	5.4	11.4	16.1%
Mormagao	0	11	
Kandla			
West Coast	5.4	22.4	32.9%
Total	81.65	196.59	19.2%

The capacities indicated above are dedicated coal capacity. Many of the major ports, viz. Vizag & Kandla, though do not have dedicated coal berths, have been handling coal in the general cargo berths. Therefore, the effective coal handling capacity would be more than what is projected.

As reported in the Maritime Agenda, major ports have consistently been utilizing 90% of the capacity for last three years. Going by the trend, the effective capacity for coal handling at major ports in the TY of XII Plan could be assumed at 177Mt, 157Mt in east & 20Mt in west coast.

Capacities for non major ports have not been indicated in the Maritime Agenda. However, it is projected that coal traffic would grow from a level of 89.34Mt in 2011–12 to 284.80Mt in 2016–17.

The major incremental traffic has been projected in the following states:

States having major share of incremental coal traffic from non-major ports (Mt)			
State	2011–12	2016–17	CAGR
Andhra Pradesh	34.21	69.18	15.1%
Tamilnadu	0.80	21.00	92.2%
Odisha	19.13	75.95	31.8%
East Coast	54.14	166.13	25.1%
Gujarat	25.00	66.00	21.4%
Maharashtra	10.08	50.14	37.8%
West Coast	35.08	116.14	27.1%
All States	89.34	284.8	26.1%

If the traffic forecast for the non major ports is considered as capacity, the total coal handling capacity of Indian Ports works out to 481Mt, with minimum capacities at east & west coast of 340Mt and 138Mt respectively. Even if 80% of the capacities are available the total capacity would be 336.7Mt.

Against these capacities, the projected requirement is 305.5 Mt, i.e., 40Mt coastal movement and 265.5 Mt imported coal. Therefore, port capacity is not likely to be a constraint for movement of coal. However, three major constraints in port operations may come in the way for planned import of coal:

a) Hinterland connectivity:

The hinterland connectivity for coal movement is essentially dependent on Indian Railway system. Out of the projected 265Mt import only about 36Mt is likely to be consumed in the vicinity of port and remaining 236Mt would be dependent on railway system for reaching the consumption points. Again out of this 236Mt, movement from east coast ports to hinterland in the states of Eastern India, a part of central India including eastern UP and Madhya Pradesh and southern states to the tune of 165Mt, i.e., about 119 rakes/day would be dependent on Indian Railway system. Similarly, movement of about 71Mt coal from west coast ports, i.e., 51 rakes/day, to destinations in Northern and Western India would also be dependent on Railway system. While the major ports of the Country are more or less linked with the Railway system, albeit with insufficient capacity, most of the non-major ports do not have proper railway connectivity. As reported by the Maritime Agenda, the poor connectivity has been coming in the way of augmenting share of rail movement, which is presently only 24% of the total cargo movement out of which share of major ports is 30% and non major ports is insignificant 8%. Since movement of coal is absolutely dependent on Railway system, unless significant augmentation of railway capacity matching with the projected growth of 19% in major ports and 26% in non-major ports is achieved the bottleneck in hinterland movement may ultimately affect capacity utilization. The current status of some of the projects for strengthening port-connectivity, as indicated by Railway Board, is given in Annexure-5.4

b) Draft availability at ports:

Due to various reasons, the drafts at Indian Ports (both in the channel and at berths) have historically been very low and not commensurate with the developments taking place in the world in terms of change of ship sizes, higher parcel sizes, changes in cargo trends. In some of the Indian ports the available drafts is as low as 7 Mtrs. The maximum draft that is available throughout the year is 16 Mtrs that too limited to a few newer ports.

In the existing major ports, the available draft is hardly sufficient to handle panamex vessels on regular basis. Haldia port is not even capable for handling 30000 ton DWT vessels. Wherever, maintenance of adequate draft is not possible mid-sea transshipping arrangement has to be considered for handling bigger vessels.

With the increasing demand of imported coal, the Country will likely to be compelled to import coal from as far as South America. Unless the capability is developed for handling cape size vessels in Indian ports, the option will be limited only to South East Asia.

c) Mechanization of ports and available stacking space:

The turn round of vessels in a port has a direct impact on the ocean freight and thereby on cost of imported coal. The turn round of vessels largely depends on loading/discharge rate

at port. From a level of 2500 tons/day at the lowest, average discharge rate at Indian ports hovers around 12,500 tons/day. Only one of the mechanized ports in private sector in the Country could so far attain internationally comparable discharge rate of around 50,000 tons/day. Unless large scale mechanization programme is undertaken for installation of high capacity versatile cranes, conveyor belt system, silos, harbour mobile cranes, grab unloaders and Gantry cranes in ports, delay in unloading could be a major constraint.

The unloading capacity is required to be backed up by sufficient stacking space with reclaiming and water sprinkling facilities. Going by the current status of hinterland movement constraint, the in-transit time of the consignment at ports is expected to increase significantly. The quick transfer of the consignment from the wharf to the stacking space and maintenance of the stock would be a prerequisite for efficient port activities. Almost all the major ports have space constraint for stacking coal, excepting Gangavaram in East & Mundra in West, as reported by Maritime Agenda report.

5.14 Capacity for transportation of coal at Railway Sidings:

Improvement in the availability of a given number of railway rolling stock is directly related to the turn-round time. Therefore, improvement in turn-round time is of vital importance for movement of planned quantity of coal. While yard management, maintenance of rolling stock and other issues pertaining to running of the trains are to be dealt by Indian Railways, the efficiency in terminal management is largely dependent on coal companies and also to some extent on the consumers at the destinations. Improvement in turn-round of rakes can be ensured through faster loading and unloading of rakes. Taking these objectives in view, the following issues need to be identified as the thrust areas for XII Plan:

5.14.1 Transportation of coal to sidings:

Transportation of coal to sidings involves two major issues – (1) mobilization of requisite number of tripping trucks for transportation and (2) availability of requisite infrastructure, particularly roads for continuous movement of heavy duty trucks. Building up road infrastructure takes a long gestation period. Therefore, advance planning is of utmost importance for developing matching infrastructure for movement of coal from mines to railheads.

Company-wise envisaged rail dispatch quantity in the TY of XII Plan vis-à-vis transportation requirement and corresponding number of trips per day is given in the table below, assuming that each transport trip carries 10 tons of coal.

Company	Annual Rail despatch Qty (Mt)	Transportation required	
		Tons/day	Trips/day
ECL	20.63	56521	5652

Company	Annual Rail despatch Qty	Transportation required	
BCCL	29.94	82027	8203
CCL	63.74	174630	17463
NCL	26.79	73397	7340
WCL	25.18	68986	6899
SECL	58.79	161068	16107
MCL	85.84	235178	23518
NEC	1.11	3041	304
CIL	312.02	854849	854850
SCCL	35.88	98301	9830
Captive Blocks	41.60	113973	11397
Total	389.50	1067123	106712

It may be seen from the above, that in order to achieve planned level of rail dispatch, coal transportation to the tune of 1.07Mt/day involving 1.07lakhs trips/day from mines to railway sidings has to be ensured.

5.14.2 The enormity of the operations has to be visualized keeping in the perspective the entire transportation of coal in the traditional coalfields has to be made through thickly populated villages, which is exposed to blockage and other disturbances arising out of socio-political reasons.

In view of the above, following are suggested in respect of capacity building for transportation of coal to Railway Sidings:

- Keeping the environmental impact of transportation by road, thrust should be given in developing long-distance conveyor system, wherever possible, for movement of coal from the mines to the sidings.
- Siding rationalization plans need to be adopted taking into account the impact of insurmountable problems, viz. air pollution, en-route pilferage of coal, seasonal hardship and associated social issues leading to frequent obstruction in movement before embarking on long distance road transportation plan.
- Coal Companies, for the existing mines, wherever feasible, may also develop plan for having a few centralized coal handling hubs for catering multiple sidings through conveyor to shortening the transportation distance and or avoiding transportation through villages. Coal handling plants would also help them supply of sized coal.
- Existing fair weather roads, in high growth coalfields, particularly where captive coal blocks would also be operative, needs to be identified for converting into all weather express coal corridors in PPP model.
- A specific plan is required to reduce at least 30% dependence on road transport for movement of coal to railway sidings. In order to fructify the plan the new mining projects of XII Plan and the capacity addition programme of in non-coking

coal washery may be brought under transportation of coal to through conveyor belt system. 30% reduction of surface transport by road will result in to reduction of by more than 32,000 trips/day.

5.14.3 Sizing of coal:

Despatch of sized coal would not only ensure faster unloading of rakes at the destinations, but would also improve the carrying capacity of wagons for better compaction. It is, therefore, proposed that by the end of XII Plan, excepting customized product dispatch like export or defence consignments, all the sidings should be capable of handling both bottom discharge and tippler discharge types of wagons.

5.14.4 Coal handling arrangements at destinations:

Delay in unloading and handicap to accept all types of wagons come in the way of improving turn-round of rakes, particularly at power stations where daily requirement is in terms of multiple rakes. All up-coming power stations as well as existing power stations, therefore, should develop facilities for handling all types of wagons.

5.14.5 Scheduling wagon placement at loading and unloading ends:

Optimum utilization of coal transport, loading and unloading capacity will not only bring down the operational costs of the coal companies and power stations, but also will bring overall improvement in system efficiency thereby improving turn round of the rakes. On line real time scheduling of placement of rakes at sidings and at power stations is required to be introduced in the XII Plan. To start with, a few power stations essentially getting supplies from single coal company, a few multiple rake loading sidings and the concerned Zonal Railways may be integrated for on line scheduling of rakes and placement forecast, which may further be expanded to integrate the entire rail loading system.

5.15 Synchronization of mining and captive transport projects:

In many instances due to mismatch between mining and captive transportation projects, stop gap arrangements are being introduced for supply of coal either from alternative sources in case of delay in mining project or through railway and other system in case of delay in development in captive transport project. In both the cases the equilibrium gets disturbed. Often the socio-political situation prevents the system to come out from the stop gap arrangement creating a vicious cycle in the entire coal movement operations. A special cell needs to be created to ensure synchronization of the mining and transport projects during XII Plan for all major pithead power stations.

5.15 Inland waterways:

In order to ease out pressure from the available railway infrastructure for movement of coal to hinterland consuming centers, utilization of inland waterways, particularly NW-I for movement of imported coal as well as coal from Ib Valley and Talcher fields to power stations in West Bengal & Bihar from Haldia Port requires to be taken up in right earnest during XII Plan. Similarly, development of NW-5 including the project for connecting NW-5 and NW-I should be considered as a thrust area of XII plan for coal movement. A task force involving Ministries of Coal, Surface Transport, Power and Railways with budgetary support needs to be developed. The task force should decide the targets in respect of requisite navigability of the waterways, arrangement for 24hours navigations, creating coal handling infrastructures at ports and at power stations and availability of requisite types of rolling stock so to ensure that this alternative mode of transportation is in place by the end of XII Plan.

CHAPTER – 6

LIGNITE

6.1 Importance of Lignite in energy security

Availability of lignite in India is confined in the States of Tamilnadu, Gujarat, Rajasthan, Pondicherry, Jammu & Kashmir and Kerala where the coal is almost completely absent. In view of rapidly increasing demand for energy, non availability of coal deposits for exploitation in the states of Tamil Nadu, Gujarat and Rajasthan, problems faced in the transportation of coal from far off coal fields and high transportation cost involved in transporting coal over a long distance, the scope of using Lignite as an alternative source of energy is immense. It is, therefore, considered advantageous to develop lignite mines in these states and utilize them for generation of power as well as for meeting the energy of other industries such as cement, textiles, chemical etc.

6.2 Lignite resources in the country

The total Geological reserves of lignite in the country stands at 40905.86 MT as on 1.4.2011 against 38756.16 MT estimated as on 1.4.2007. State wise Lignite resource in the country as on 1.4.2011 is given below:

Fig in Mt

State	Proved	Indicated	Inferred	Total
Tamilnadu	3735.23	22900.05	6257.64	32892.92
Rajasthan	1166.96	2148.72	1519.61	4835.29
Gujarat	1243.65	318.70	1159.70	2722.05
Pondicherry	0.00	405.61	11.00	416.61
Kerala	0.00	0.00	9.65	9.65
Jammu & Kashmir	0.00	20.25	7.30	27.55
West Bengal	0.00	0.93	0.86	1.79
Total	6145.84	25794.26	8965.76	40905.86

There is an increase of about 2149.70 Mt of reserves during the last five years by active and intense exploration taken by several agencies. Similarly the reserve brought under proved category has increased from 4177.18 Mt as on 1.4.2007 to 6145.84 Mt as on 1.4.2011 thus making available more deposits for immediate exploitation. State-wise distributions of Indian lignite shows that major part of the resources are located in Tamilnadu (32892.92 Mt) followed by Rajasthan (4835.29 Mt), Gujarat (2722.05 Mt), Pondicherry (416.61 Mt), J&K (27.55 Mt), Kerala (9.65 Mt) and West Bengal (1.79 Mt).

6.3 Development of lignite sector in different Plan Period

Lignite production, increased to 31.129 Mt at the end of X Plan from a level of 2.563 Mt in III Plan. The incremental Lignite production over the previous Plan period up to XI Plan and the projected incremental production up to XIII Plan period are furnished below.

Plan Period	Terminal Year	Production in Mt	Incremental production over previous Plan period Mt	CAGR %
VI Plan	1984-85	7.84	4.54	15.51
VII Plan	1989-90	12.36	4.52	9.53
VIII Plan	1996-97	22.64	10.28	9.03
IX Plan	2001-02	24.81	2.17	1.85
X Plan	2006-07	31.13	6.32	4.64
XI Plan	2011-12	41.64 (Projected)	10.51	5.99

6.4 Performance during XI Five Year Plan

6.4.1 Lignite Production:

At the end of XI Plan (2011-12), the original XI Plan envisaged a total production of 54.96 Mt (Tamil Nadu -24.23 Mt, Gujarat - 22.26 Mt, Rajasthan - 8.47 Mt). It is now anticipated that lignite production would be 41.64 Mt (Tamil Nadu - 22.85, Gujarat - 15.14 Mt, Rajasthan - 3.65 Mt) in 2011-12. The Projected Lignite production for the whole period of XI Plan in the country has been 223.99 Mt. Against this, the actual Production would be about 179.85 Mt (including the projected production figure for 2011-12) leaving a shortfall of about 44.14 Mt. This shortfall is mainly due to non-starting of several mines under Private & State Sector and due to delay in commissioning of certain mines under the Central Sector. As far as NLC is concerned, thinning of Lignite seam thickness and the wash out zone encountered in Mine -I is the main reason for the shortfall of 3.26 MT against the Projected Target of 113.93 in Tamilnadu. Similarly, in Barsingsar Mine under NLC at Rajasthan, though the Mine is ready in all aspects to give full production, it was warranted to limit its production to cope up with the demand of its linked TPS which has certain teething problems. Year-wise & State-wise trend of Lignite production during XI Plan is given in the table below:

Year/Plan	Tamilnadu	Gujarat	Rajasthan	Total
Projected target (Mt)				
Total XI Plan	113.93	83.38	26.68	223.99
Actual Production (Mt)				
2007-08	21.55	11.79	0.62	33.96
2008-09	21.21	10.06	1.12	32.39
2009-10	22.31	10.54	1.26	34.11
2010-11	22.75	13.07	1.93	37.75
2011-12 (Anticipated)	22.85	15.14	3.65	41.64
Total XI Plan	110.67	60.60	8.58	179.85
Excess / Shortfall (Mt)				
Total XI Plan	(-) 3.26	(-) 22.78	(-) 18.10	(-) 44.14

6.4.2 Lignite demand

Against the projected installed capacity of 5819 MW at the end of XI Plan, the capacity available at the end of XI Plan is only 5211 MW. Lignite based capacity addition in power sector as per XI Plan document has been 2225 MW (TN – 500 MW, Gujarat – 825 MW, Rajasthan –900 MW). Against this, the actual addition would be 1617 MW (TN – 500 MW, Gujarat –337 MW, Rajasthan –780 MW).The shortfall in projected capacity addition is 608 MW (TN – 0 MW, Gujarat –488 MW, Rajasthan –120 MW). The lignite demand as projected at the end of XI Five year Plan (2011–12) period is 55.926 MT (Power Sector – 42.456 MT and Other sectors – 13.470 MT) against which the actual demand has been only 49.35 MT. The shortfall in demand is mainly from power sector due to non-starting of the lignite based power stations in Gujarat & Rajasthan.

6.5 Lignite Demand Perspective for XII & XIII Plans:

6.5.1 Lignite demand for power sector:

Demand of lignite mainly comes from power sector. A small demand is also there from Cement, Textiles, Chemical, Paper and other industries. After reviewing the performance of lignite sector during the XI plan and considering the need to increase the share of lignite based power generation capacity in the country, it has critically examined the possibility of adding additional power generation capacity, increasing the Lignite productivity and increasing the Lignite production by developing new mines in the states of Tamilnadu, Gujarat & Rajasthan under Central, State and Private sectors during the XII

plan & XIII plan. The installed capacity of the Lignite based power stations has been projected as 7491 MW at the end of XII plan and 11091 MW at the end of XIII plan against the installed capacity of 5211 MW at the end of XI Plan. The state wise projected lignite based power generation capacity during the XII plan and at the terminal year of XIII Plan is given in **Annexure 6.1**. Available capacity at the end of XI plan is 5211 MW. Projected Capacity addition during XII Plan is 2280 MW and XIII Plan is 3600 MW. The state-wise anticipated capacity addition during XII & XIII Plans are as under:

State	Installed Lignite based power capacity in MW				
	At the end of XI Plan	Projected Addition XII Plan	At the end of XII Plan	Projected Addition XIII Plan	At the end of XIII Plan
Tamil Nadu	3240 *	400 #	3640	2600 **	6240
Gujarat	1066	500	1566	1000	2566
Rajasthan	905	1380	2280	--	2280
Total	5211	2280	7491	3600	11091

* On the assumption that the TPS II Expansion will be synchronized during XI Plan end.

** The following Projects will be implemented during XIII Plan if a positive response in favour of NLC is received from MOP for exemption of lignite projects from tariff based competitive bidding route.

- a. 1600 MW Thermal Power Plant with 13.5 MTPA capacity lignite Mine at Jayamkondam.
- b. 1000 MW TPS-III at Neyveli and linked 8.0 MTPA Mine-III at Neyveli.

New Neyveli TPS of capacity 1000 MW will be commissioned and the existing TPS I of capacity 600 MW will be closed during XII Plan leaving a capacity addition of 400 MW.

6.5.2 Sector-wise Lignite demand:

With the above projected installed capacity and anticipated increased demand for lignite from other sectors, it has projected the total lignite demand at 300.30 MT for XII plan. The demand projected at the terminal year of XII Plan and XIII plan are 71.96 MT and 108.62 MT respectively. Sector wise, state-wise projected Lignite demand details are given in **Annexure 6.2**

6.6 Projected Lignite Production for XII and XIII Plan

Having estimated the Lignite demand and also the possible resources, it has been estimated that the total Lignite production at 290.16 MT for the entire XII plan and the availability at the terminal years of XII plan and XIII plan are projected at 68.60 MT and

104.55 MT respectively. Details in respect of State-wise, mine-wise, year-wise production plan for XII Plan period and for the TY of XIII Plan are given in **Annexure 6.3**

**State-wise projected lignite production during XII Plan
and at terminal year of XIII Plan**

(Figs. in Mt)

	XII PLAN						XIII PLAN
State	2012-13	2013-14	2014-15	2015-16	2016-17	Total XII Plan	2021-22
Tamil Nadu	24.23	24.23	24.23	25.08	27.20	124.97	45.75
Gujarat	16.24	17.48	18.53	20.00	21.60	93.85	39.00
Rajasthan	8.89	9.89	15.09	17.67	19.80	71.34	19.80
Total	49.36	51.60	57.85	62.75	68.60	290.16	104.55

6.7 Projected demand–supply scenario for Lignite:

The incremental Lignite production projection in the Terminal year of XII Plan is 26.96 MT and in the Terminal year of XIII Plan is 35.95 MT. The projected production is not sufficient to meet the anticipated demand in the terminal year of XII Plan. As per the projections received from various agencies of Tamil Nadu, Gujarat and Rajasthan, it is observed that the state of Gujarat will face a deficit in lignite availability during the XII Plan by 9.0 MT, which calls for additional production from the existing mines and / or advancing of the implementation of new mines in the state of Gujarat. Tamilnadu will face 1.64 MT deficit which can be managed by advancing Devangudi project or by improving the production of other three mines. The demand vis-à-vis production during XII & XIII Plan is given in the table below:

	XII Plan (Total plan period) Mt			XIII Plan (Terminal year–Mt)		
State	Demand	Production	Excess/shortfall	Demand	Production	Excess/shortfall
Tamilnadu	126.61	124.97	(–) 1.64	45.48	45.75	(+) 0.76
Gujarat	102.85	93.85	(–) 9.00	43.60	39.00	(–) 4.60
Rajasthan	70.84	71.34	(+) 0.50	19.54	19.80	(+) 0.26
Total	300.30	290.16	(–) 10.14	108.62	104.55	(–) 3.58

As far as Neyveli Lignite Corporation, by putting together the Mines and Power Plants in Tamilnadu and Rajasthan, is concerned, the total Projected Lignite demand for Power and

other sectors is 137.35 MT for XII Plan whereas the total Projected Lignite Production is 136.21 leaving a meagre shortfall of 1.14 MT. But during the Terminal year of XIII Plan (2021–22), the projected Production (49.22 MT) for NLC exceeds the Projected demand (49.75 MT) by 0.53 MT.

	XII PLAN Fig in MT					XIII PLAN
Year	12–13	13–14	14–15	15–16	16–17	21–22
Projected Demand	26.18	26.68	26.41	27.12	30.96	49.22
Projected Production	26.02	26.02	26.02	26.95	31.20	49.75
Excess / Shortfall	(–) 0.16	(–) 0.66	(–) 0.39	(–) 0.17	(+) 0.24	(+) 0.53

6.8 Capital Investment in Lignite Sector

On the basis of the assessed demand and projected production, the investment required in the XII Plan period in Lignite Sector has been estimated. As per the assessment made, a total of about Rs. 46,640 Crores is required to implement the planned projects during XII Plan. Out of this Rs. 46,640 Crores, the requirement of NLC works out to Rs.31,192 Crores including Rs.19326 Crores for development of coal based power projects and Rs.1,047 Crores for renewable energy sector. The shares of PSUs of Gujarat & Rajasthan in the total investment proposal are Rs. 5,536Crores and Rs.9,913 crores respectively. Further, only 12% of the proposed investment, i.e. Rs. 5,590 Crores is planned for development of mines and remaining 88%, i.e. Rs. 41,050 Crores is planned for development of power generation capacity, out of which Rs.19326 Crores for development of coal based power projects. The state-wise and sector-wise investment proposal is given in Annexure 6.4.

CHAPTER-7

COAL QUALITY & BENEFICIATION

7. COAL QUALITY ISSUES

Consistency in size and quality of coal supplied to consumers is important. In addition to the constraints of inherent quality of coal being mined in the country, considerable share of coal production from opencast mines has added to the quality issues due to contamination of mined coal with extraneous materials.

To overcome quality problems, a number of measures have been undertaken by the coal industry over a period of time. These are as mentioned below:

- i. Selective mining of bands of > 1 meter thickness.
- ii. Appropriate positioning of OB and coal benches to avoid contamination.
- iii. Scrapping/cleaning of coal benches before blasting.
- iv. Installation of metal detectors / Magnet for 'tramp-iron-removal' over running conveyors before loading coal.
- v. Having high capacity coal handling plants to dispatch sized and uniform quality of coal at all major projects to suit the requirement of the consumers.
- vi. Establishment of well equipped laboratories at all the projects for regular quality assessment.
- vii. Shale-picking, at mine face, stocks & loading points/sidings to address the issue of consistent quality.

In order to overcome the problems of oversized coal, the coal companies are establishing Coal Handling Plants (CHPs) and feeder breakers. Coal India Ltd. is supplying almost 99% of crushed coal to the power sector. Further, deployment of surface miners in different projects is also helping in producing sized coal for supply to the consumers.

A total of 212 CHPs (74 major CHPs and 138 mini CHPs/ Feeder Breakers) with a total capacity of about 277 million tonnes per annum are operating in different subsidiary companies of CIL. Further, 50 Surface Miners deployed at CCL, SECL & MCL produced about 103 million tonnes of sized coal in 2010-11, which has helped augmenting supply of sized coal.

Installing Auto Mechanical Samplers (AMS) at all silo loading points is under implementation in different subsidiaries of CIL. For quality assurance, joint sampling facility is extended to large consumers with an annual requirement of 0.4 million tonnes and above. Payment of coal value in such cases is based on quality determined through joint sampling and analysis.

7.1 Coal Beneficiation

Currently, around 36% of total coking coal produced indigenously is used for metallurgical purpose and balance are used for non metallurgical purpose due to absence of desired quality parameters and also higher cost of washing for improving its quality for use in steel making. There is an impressive growth in production of indigenous coking coal over last five years to 49.5 Mt in 2010-11 from 32.1 Mt in 2006-07 but the production of metallurgical coking coal remained standstill at about 18 Mt. The production of good quality coking coal did not grow due to depleting reserve of good quality coking coal in the upper seams of existing mines. This has resulted in unsatisfactory performance of coking coal washeries particularly in terms of Yield (ratio of total clean coal produced to total raw coal feed) and Capacity Utilisation. However, the production of non metallurgical (low volatile coking / non linked washery) coal over the last five years has grown more than double. The production of coking coal and use of metallurgical and non-metallurgical coking coal during previous five years is as below:

Year	Total coking coal Prod. (Mt)	Metallurgical use (Mt)	Non metallurgical use (Mt)	% of metallurgical coal	Growth (%)
2010-11	49.533	17.844	31.689	36.0	11.53
2009-10	44.413	17.731	26.682	39.9	27.6
2008-09	34.809	17.301	17.508	49.7	1.03
2007-08	34.455	18.065	16.39	52.4	7.3
2006-07	32.097	17.231	14.866	53.7	1.86

Coal washing is one of the practices being promoted as a measure to encourage implementation of clean coal technologies. Coal washing is an important area both from economic and environment points of view. A number of studies carried out earlier have clearly highlighted benefits of using washed coal in improving the economics of power generation and also reduction of emissions. The directive of Ministry of Environment and Forests restricts the use of coal containing more than 34% ash in power stations located beyond 1000 km from the pit head and in urban area or sensitive area or critically polluted area irrespective of their distance from the pit head except any pit head power plant which is now being considered to be reduced to 500 km. With this as a driver, a number of power utilities have shown their inclination in using washed coal for power generation.

While coking coal washing has been in practice for quite some time in the country on technical compulsions, washing of non-coking coal particularly for power generation has come under focus due to implied environmental and economic benefits. Use of washed non-coking coal has increased many folds over the last ten years.

As mentioned earlier, all coking coal produced is not being washed since a major portion of this is low volatile medium coking (LVMC) coal which is difficult to wash. However, efforts are being made to build commercial washeries for washing LVMC coals which have now been proved to be technically feasible.

7.1.1 Performance of washeries

Coking coal– Presently CIL operates 17 coal washeries, out of which 12 coking coal washeries with 22.18 Mtpa capacity and 5 are non-coking coal washeries with 17.22 Mtpa capacity totaling to 39.40 Mtpa. SAIL & TISCO operate 5 coking coal washeries with a total capacity of 7.70 Mty. The performance of CIL's coking coal washeries is not satisfactory as these are quite old. Further, due to a significant change in the quality of feed coal over the years due to depletion of reserves, the yield and performance of these washeries has been adversely affected. A brief of the performance of the coking coal washeries in operation in the XI plan period is shown below:

Company / washery	Capacity (Mty)	Washed coking coal production (Mt.)				
		2007-08	2008-09	2009-10	2010-11	2011-12 (Target)
CIL	22.18	3.841	3.671	2.960	3.194	3.89
SAIL	2.04	0.514	0.577	0.526	0.537	0.54
TISCO	5.66	2.82	2.925	3.048	2.642	2.60
TOTAL	29.88	7.175	7.173	6.534	6.373	7.03

The targeted washed coking coal of 7.03 Mt by the turn of XI plan will be available with an approximate 15.5 Mt raw coking coal feed to the washeries. The details of performance of the coking coal washeries in operation in the XI plan period have been shown in Annexure – 7.1.

Non coking coal – At present 32 non coking coal washeries with a total throughput capacity of 95.96 Mty are in operation in the country. CIL operates 5 non – coking coal washery with a total throughput capacity of 17.22 Mty and others operate 27 non coking coal washeries with a total throughput capacity of 78.74 Mty. A brief of the performance of the non coking coal washeries in operation in XI plan period is shown below:

Washery/Company	Capacity (Mty)	Washed non-coking coal production (Mt.)				
		2007-08	2008-09	2009-10	2010-11	2011-12 (Target)
CIL	17.22	10.317	10.677	11.24	11.716	11.30
Others	78.74	2.232	30.442	27.71	20.93	25.00
Total	95.96	12.58	41.119	38.952	32.64	36.3

The targeted washed non coking coal of 36.3 Mt by the turn of XI plan will be available with an approximate 52 Mt raw non coking coal feed to the washeries. The details of performance of non-coking coal washeries in operation in the XI plan period have been shown in Annexure – 7.2.

7.2 Approach of Coal India Ltd. for coal washing

As a long term strategy, CIL is planning supplying washed coal to consumers located away from pit heads and also develop mines of 2.5 Mtpa capacity and above with integrated washeries. Accordingly, CIL has proposed to develop 18 new washeries on a modified Build Operate and Maintain (BOM) basis and 2 (two) new washeries on Turn-Key basis for existing coal mines with a total capacity of about 111 Mtpa at various subsidiary companies at an estimated cost of approximately Rs. 2320 crore. These include 6 coking coal washeries for an ultimate raw coal throughput capacity of 19.1 Mtpa and 14 non-coking coal washeries for an ultimate raw coal throughput capacity of 92.0 Mtpa. The details are furnished in the table below:

Details of Proposed New Washeries of CIL

Sl No	Name	Capacity (Mty)	Scheme	Type
1	Kusmunda	10.0	BOM	Non coking
2	Baroud	5.0	BOM	Non coking
3	Madhuband	5.0	BOM	Coking
4	Patherdih	5.0	BOM	Coking.
5	Patherdih	2.5	BOM	Coking.
6	Dahibari	1.6	BOM	Coking
7	Dugda	2.5	BOM	Coking.
8	Bhojudih	2.0	BOM	Non coking
9	Ashoka	10.0	BOM	Non coking
10	Konar	3.5	BOM	Non coking
11	Karo	2.5	BOM	Non coking
12	New Piparwar	3.5	Turn-key	Non coking
13	Dhori	2.5	Turn-key	Coking.
14	Chitra	2.5	BOM	Non coking
15	Sonepur-Bazari	8.0	BOM	Non coking
16	Basundhara	10.0	BOM	Non coking
17	Jagannath	10.0	BOM	Non coking
18	Hingula	10.0	BOM	Non coking
19	Ib-Valley	10.0	BOM	Non coking
20	Kolarpimpri	5.0	BOM	Non coking
TOTAL		111.1		

On completion of the proposed new washeries, the capacity coal washeries in CIL will increase from existing 22.18 Mtpa to about 41 Mtpa for coking coal and 17.22 Mtpa to about 110 Mtpa for non coking coal. CIL envisages washing of about 90% of the additional coal produced during XII Plan from new mines.

7.3 Coal Washing Technologies

The different technologies in vogue for washing coking and non-coking coal are as under:

Coking Coal Washing

- Heavy media (HM) Cyclones and Froth Floatation
- Deshaling Jig, HM Bath, Batac Jig and Froth Floatation
- Deshaling Jig, HM Cyclone and Froth Floatation
- HM Cyclone, Jig and Froth Floatation
- HM Washer, Cyclone and Froth Floatation
- Jig (Coarse Coal), Jig (Small Coal) and Froth Floatation
- Jig and Heavy Media

Non-coking Coal Washing

- HM Washer, Baum Jig and Froth Floatation
- Batac Jig
- HM Washer, Batac Jig
- ROM Jig
- HM Cyclone
- HM Cyclone, Hydro Cyclone and Spiral
- Rotary Breaker and Barrel Washer

7.3.1 Technologies in vogue in existing washeries of CIL are as follows:

Sl. No	Name of Washery	Technology
Coking Coal		
1	Dugda -II	HM Cyclones, Froth Floatation/Water only Cyclone
2	Bhojudih	BATAC Jig for small coal, HM Bath, Froth flotation, Drum filter
3	Patherdih	Baum Jig for Deshaling, Barvoys HM Bath, HM Cyclone
4	Sudamdih	HM Cyclones, Froth Floatation
5	Moonidih	HM Cyclones , Water only Cyclone
6	Madhuband	BATAC Jig for small coal, HM Cyclone, Froth flotation, Disc filters
7	Mohuda	HM Cyclone
8	Kathara	Drewboy HM Bath, HM cyclone, Froth flotation, Screen Bowl centrifuges
9	Sawang	Deshaling Jig, HM Cyclone
10	Rajrappa	BATAC Jigs for coarse coal and small coal, Froth flotation, Disc filters
11	Kedia	BATAC Jigs for coarse coal, Jigs for small coal, Froth flotation, Disc filters
12	Nandan	KOMAG Jigs for coarse coal and small coal, Froth flotation, Disc

Sl. No	Name of Washery	Technology
		filters
Non-coking coal		
1	Dugda-1	KOMAG Jig for deshaling
2	Piparwar	BATAC Jig
3	Kargali	ROM Jig
4	Gidi	Deshaling Disa Bath, KOMAG Jig
5	Bina	ROM Jig

7.3.2 New Technology for Coal Beneficiation

The conventional methods for coal beneficiation in vogue are based on wet technology. Moisture is invariably and inadvertently added to the products. Addition of moisture to the clean products offset the benefit of beneficiation to some extent as ash-forming mineral matters and moistures both have no fuel value and cause wastage of heat when coal is burnt and overall GCV of the solid fuel is affected adversely. Moreover, wet processes invariably generate slurry and require whole lot of circuit for pumping solid-liquid mixture to the washing equipment, rinsing & dewatering of products, recovery of fine solid as well as water, effluent control circuit and so on.

Availability of water is an issue for setting up new washeries and is a resource deterrent. One partial washing plant of 5 Mtpa may need water to the tune of 0.2 Mgp/d depending upon technology and extent of washing. Beneficiation of ROM coal to improve its quality without use of water is an issue recently discussed at various level and drawn attention of all concerns. Dry coal beneficiation technologies are being encouraged for conserving water. The commercially adopted dry beneficiation methods for coal are:

Manual picking of shale and stone from conveyor belts.

- i. Rotary breakers – to take advantage of differences in friability between coal, stone and shale.

Dry beneficiation technologies are usually suitable for medium-to-high specific gravity of cut which is a case with non-coking coal. There are a number of techniques available in the realm of dry beneficiation.

Two technologies identified for demonstration under CIL R&D schemes are:

- i. Dry Beneficiation system using Radiometric Techniques (Ardee Sort) at Bharat Coking Coal Ltd.
- ii. Dry Beneficiation of coal by All-air Jig at Mahanadi Coalfields Limited.

Other wet technology patented by JCOAL is the Variable Wave Jig Technology, which is said to provide better yield, better separation accuracy and increase in the processing capacity compared to conventional jigs. This technology can be applied in the existing washeries with small modifications.

7.4 Measures for Improving the Performance of Coal Washeries

Many existing washeries have outlived their lives long back and need technological upgradation for improvement in its performances. In this connection, following modification schemes have been identified by CMPDI/subsidiary companies to enhance/improve the performance of coking coal washeries which are under various stages of implementation:

- a) Deshaling plant at Madhuband washery (BCCL)
- b) BOBR wagon unloading system at Dugda washery (BCCL)
- c) Replacement of worn-out Jig at Bhojudih washery (BCCL)
- d) Switching over from manual control to automatic control system for specific gravity control in Patherdih, Moonidih, Sudhamdih and Bhojudih washery (BCCL)
- e) Modification of Gidi washery (CCL)
- f) Modification of Rajarappa washery (CCL)
- g) Introduction of primary crushing unit at Kedla washery (CCL)
- h) Introduction of fine coal beneficiation plant at Swang washery (CCL)
- i) Replacement of Jig and introduction of Spiral Concentrator for fine coal beneficiation at Nandan washery (WCL)

7.5 Environmental Aspects

The washeries of CIL are designed for closed circuit system and no effluents are discharged to outside washery premises as per environmental stipulations. Fine coal is recovered from the effluent through various processes like Froth Floatation, use of cyclones, filters etc.

A common problem of coal washeries is handling of rejects or tailings and recovery of fines. The rejects in general are being disposed off for consumption in fluidized bed combustion (FBC) boilers for power generation or for filling the mined-out areas or for filling of low land/construction of road etc. Fines recovery is being addressed through some R&D efforts.

7.6 Details of Existing Washeries of SCCL

Two coal washeries with capacities of 1.5 Mtpa each were established at Manguru and Ramagundam on BOO basis. Two more washeries at RKP CHP and Khairagura area of Belampalli region are proposed and are expected to come up by 2014-15. Some more washeries have been conceptualized and prospects are under study.

7.7 Washery capacity addition in XII Plan

7.7.1 Coking coal – Though coking coal production has increased from 32.097 Mt in 2006-07 to 49.533 Mt in 2010-11; the metallurgical coking coal production has remained almost stagnant at 17 to 18 Mt. The non metallurgical coking coal production has increased considerably during XI Plan period. In XII Plan period, the metallurgical coking coal production is projected to increase to 31.7 Mt during 2016-17. The anticipated washed coking coal

production in XII plan from existing and proposed washeries is furnished below and washery wise details are furnished in Annexure-7.3.

Company	Washery Capacity Mty	2012-13		2013-14		2014-15		2015-16		2016-17	
		CC	Mid	CC	Mid	CC	Mid	CC	Mid	CC	Mid
Coking coal (Existing washery):											
CIL	22.18	3.98	3.36	4.22	3.55	4.45	3.65	4.61	3.78	4.86	3.91
SAIL, TISCO	7.70	3.20	–	3.40	–	3.60	–	3.80	–	4.00	–
Total Existing	29.88	7.18	3.36	7.62	3.55	8.05	3.65	8.41	3.78	8.86	3.91
Coking coal (Proposed washery):											
CIL	19.1	–	–	2.76	3.30	4.83	6.83	5.06	7.17	5.06	7.17
Total Coking (Existing+ proposed)	48.98	7.18	3.36	10.38	6.85	12.88	10.48	13.47	10.95	13.92	11.08

7.7.2 Non coking coal – The projected washed non coking coal production during XII plan from existing and proposed washeries is furnished below and washery-wise details are furnished in Annexure-7.4.

Washery / Company	Capacity (Mty)	Washed non-coking coal production (Mt.)				
		12-13	13-14	14-15	15-16	16-17
Non coking coal (Existing washery):						
CIL	17.22	11.18	10.33	10.339	10.445	10.46
Others	78.74	27.00	30.00	33.00	36.00	39.00
Total Non coking (Existing)	95.96	38.18	40.33	43.339	46.445	49.46
Non coking coal (Proposed washery):						
CIL	79.00	–	3.73	14.20	42.26	65.00
Total Non coking (Existing & Proposed)	174.96	38.18	44.06	57.54	88.70	114.46

Note: The anticipated washed coal production from proposed washeries is subject to MoEF clearance for construction of the washeries as per schedule.

Since the anticipated total capacity of beneficiation of non-coking coal in India, by the end of XII plan, is 199 Mty and projected low grade coal production, other than pithead linked coal, is 360 Mt, there will be a huge gap of 161Mt as given below for capacity addition requirement of washing the entire low grade coal to be produced.

Type of coal	Projected production(Mty)	Anticipated washing capacity (Mty)	Capacity addition required (Mty)
Superior grade coal	159	–	Need based
Pithead TPS linked low grade coal	115	–	Need based

Type of coal	Projected production(Mty)	Anticipated washing capacity (Mty)	Capacity addition required (Mty)
(approx.)			
Remaining low grade coal	360	199	161

However, this capacity addition gap of 161 Mt will reduce further in the event of building up some capacity in the private sector. Further, CIL is also formulating plan to set up more no. of washeries (non coking and coking) in the 2nd phase with approximate total capacity of 129 Mty, for which action will be initiated in the later part of XII plan. In this way the washing capacity addition gap will come down considerably.

Finally, the anticipated scenario of coal beneficiation by the turn of XII th plan as well as XI th plan is furnished below :

At present, CIL operates 17 washeries (coking-12; Non-coking-05) with a total capacity of 39.40 Mty. Against this, likely washed coal production in TY XI plan- 15.19 Mt (coking-3.89 Mt & Non-coking 11.30 Mt)

Capacity vis-a-vis washed coal production projection -

Details	Present capacity (Mty)		TY XI Plan (11–12)		TY XII Plan (16–17)	
			Washed coal production (Mt)			
	Coking	Non–coking	Coking	Non–coking	Coking	Non–coking
CIL	22.18*	17.22	3.89	11.39	9.92	75.46
Others	7.70	78.74	3.14	25.00	4.00	39.00
Total	29.88	95.96	7.03	36.30	13.92	114.46

* > 30 yrs. old, Operation capacity much lower.

During XI plan, CIL targeted to take-up 20 new washeries (capacity 111.10 Mtpa) at estimated cost of approx. Rs. 2320 crs. (6 coking , capacity 19.10Mtpa & 14 Non-coking, capacity 92.00Mtpa)

Besides these, in 2ND phase CIL has envisaged to construct 17 coal washeries with a total capacity of about 129 Mty.

With this, Coal washing capacity of CIL will enhance to the extent of 279 Mty.

Environmental Issues:

Environment clearance is one of the main issues causing inordinate delay in commencing construction of the washeries. The main impediment in obtaining the clearance is utilization of washery rejects in an environmentally friendly manner i.e. using the rejects as fuel for generation of power in FBC power plants.

Setting up new FBC plants using these washery rejects as fuel need to be encouraged, supported by Tax Holidays. The requirement of developing reject based FBC power plant should not be so rigid that washery as well as power plant should be constructed simultaneously, rather a breathing period of 3/ 4 years after commissioning the washery may also be considered for construction of such power plant if no other alternative for disposal / utilization of the washery reject is conceived and approved.

7.8 Changing over to GCV based coal pricing for non coking coal

Internationally trading of non-coking coal is based on the Gross Calorific Value (GCV) system of coal which is the total heat content of coal as measured in the laboratory. However, in India grading and pricing of non-coking coal is based on Useful Heat Value (UHV) system which is based on an empirical formula suggested in 1960s having a component of ash and moisture penalty taking into account the efficiency of burning coal in the boilers in use at that time. As per this formula, the UHV of a coal having about 2000 K cal of GCV works out to be zero.

Moreover, the existing band widths of various grades calculated on the basis of UHV are very wide and provide a little incentive to coal producers for improving quality of coal.

A number of High Level Committees including the Integrated Energy Policy Committee have recommended adopting GCV based system in place of UHV based system for grading and pricing of non-coking coals in line with the international best practice. It is high time that coal sector should switch over to GCV based system for trading of non-coking coals before commencement of the XII Plan.

To monitor the quality of coal being dispatched from coal mines provision of auto-mechanical samplers and analysis system needs to be established at each mine or point of dispatch on priority. Provision of mobile labs should be made for taking samples and analyzing from coal stocks and other places.

7.9 Coal Conservation and Development

The issue of conservation of coal and development of transport infrastructure in coalfield areas has been addressed through the promulgation of Coal Mines (Conservation and Development) Act, 1974, (CM (C & D) Act, 1974) and the Coal Mines (Conservation and Development) Rules, 1975 soon after the nationalisation of coal sector in the early 1970s.

The provisions of the CM (C & D) Act, 1974 mandate the need for extending assistance to the coal companies for encouraging coal production from depillaring panels of underground mines in conjunction with sand stowing for filling the voids created and for taking up various protective measures for extraction and conservation of coal. The Act also mandates the offer of assistance towards Research and Development activities and encouraging Transport Infrastructure Development in coalfield areas.

In each financial year, a sum not exceeding the net proceeds of the SED levied and collected during the preceding financial year or years is disbursed by the Central Government to the owners, agents or managers of coal mines or to any other person for one or more of the following purposes:

- (a) Conservation of coal and development of coal mines;
- (b) Grant of stowing materials and other assistance for stowing operations;
- (c) Execution of stowing and other operations for the safety in coal mines or conservation of coal;
- (d) Research work connected with conservation and utilisation of coal; and
- (e) Any other purpose connected with the conservation of coal or development of coal mines, or transportation, distribution of coal.

An Advisory Committee called “ Coal Conservation and Development Advisory Committee” (CCDAC).constituted under the provisions of the CM(C&D) Act, 1974 and CM (C & D) Rules, 1974 under the Chairmanship of Additional Secretary (Coal) with Members from Ministry of Coal, Ministry of Labour, Planning Commission, Coal Companies, Central Institute of Mining and Fuel Research, etc. advises the Government regarding the formulation and implementation of National policy in relation to “Coal Conservation & Development Activity” and scientific utilisation of coal seams of the country, rates of SED, disbursement of SED proceeds to different coal companies etc. The CCDAC has the power to regulate its own procedure and thus is a statutory body with powers conferred on it for implementing related activities under the CM(C&D) Act, 1974.

Two Plan Schemes of CCDA namely, Conservation and Safety in Coal Mines and Development of Transport Infrastructure are under implementation under the provisions of the CCD Act. Coal Controller’s Organization is vested with the responsibility of implementation of the schemes.

Presently only partial reimbursement to coal companies i.e. 90% for protective work, 70% for sand stowing and 70 % for rail/roads infrastructure is taking place and the amount available is not adequate. Moreover, a number of new coal projects are coming up as a result of new coal block allotment for captive purposes which need to be provided with road and rail infrastructure connecting to the main lines for coal evacuation. Further, a part pf the Stowing excise Duty being collected is also required to be used for funding implementation of Master Plan for Jharia and Raniganj. The current rate of SED of Rs.10 per tonne was last revised in June 2003 and this needs to be suitably enhanced for addressing the proposed funding of the Master Plan.

7.9 Action for XII Plan

- i. Coal India to quicken the process of implementing all the identified new washeries.
- ii. Supplying washed coal to TPS located away from pithead.
- iii. Augmenting washery capacities to supply of washed coal to TPS located more than 500 km away within next 3 years.
- iv. 100% crushing and sizing of coal before dispatch must be ensured by coal companies within next two years.
- v. Auto mechanical samplers to be installed at all dispatch points/mines before commencement of XII Plan.

- vi. Deployment of mobile labs for coal sampling and analysis.
- vii. Deshaling of ROM coal if not complete beneficiation needs consideration wherever feasible.
- viii. Strengthening/ Renovation and modernization of existing coking coal washeries for improved yield and to match the raw coal feed quality needs immediate consideration.
- ix. Augmenting coking coal and LVMC coal production to feed the washeries is critical.
- x. New washing technologies including dry coal beneficiation needs consideration.
- xi. Facilitating setting up new washeries in the private sector.
- xii. Disposal of washery rejects in an environmentally acceptable manner.
- xiii. Provision of Rail evacuation facilities to new washeries.
- xiv. Coal sector should switch over to GCV based system in place of UHV based system for trading of non-coking coals before commencement of the XII Plan.
- xv. The current rate of SED of Rs.10 per tonne was last revised in June 2003 and this needs to be suitably enhanced for addressing the proposed funding of the Master Plan.

CHAPTER-8

EXPLORATION FOR COAL & LIGNITE

8.1 STAGES OF EXPLORATION

Exploration for coal and lignite in the country is taken up in stages. In Preliminary Exploration, geological surveys are undertaken to identify potential coal / lignite areas. During Regional / Promotional Exploration wide spread drilling is undertaken to establish broad frame-work of the deposits. The potential blocks are selected for Detailed Exploration to provide data for mine projectisation. After start of mining, Developmental exploration is undertaken to aid mining.

It is desirable that the results of Detailed Exploration are available about 10 years in advance of the production needs to allow projectisation and mine development. Regional (and Promotional) Exploration, accordingly, is needed to be taken up by 4-5 years in advance to allow planning for detailed exploration.

8.2 REVIEW OF COAL AND LIGNITE EXPLORATION IN 11th PLAN

COAL

Regional / Promotional Exploration: Against a target of 1.94 lakh meters (revised to 1.47 lakhm during mid-term review of core group, CGPB-Com-V in 2009) for Regional Exploration during 11th Plan, 1.14 lakh meters (78%) of drilling will be achieved and 7.07 Bt of coal resources to be established..

In Promotional Exploration, against a target of 4 lakh meters of exploratory drilling, 2.95 lakh meters (74%) is expected to be achieved, establishing 20.05 Bt of coal resources.

2D HRSS Surveys were not a part the exploration programme of 11th Plan. However, in view of the trends world over, these surveys were considered as part of regional (promotional) exploration by Sub Committee on Energy Minerals. **National Geophysical Research Institute (NGRI)**, a premier organization for geophysical Studies in the country, was therefore, inducted to carry out these surveys in coal areas. It is expected that a total of 31 Line Kilometer (L.km) in coal areas HRSS survey will be carried out during 11th Plan.

Detailed Exploration for Coal: Against a target of 5.00 lakh meters in CIL areas, 11.28 lakh meters (226%) of exploratory drilling will be achieved by CMPDI and its contractual agencies including MECL and 8.52 Bt of reserves are projected to be proved during 11th Plan. In SCCL area, 2.34 lakh meters of drilling (47%) will be achieved against a target of 5.0 lakh meters, establishing 0.50 Bt of reserves.

2D HRSS involving 120 line km (Lkm) of survey covering 5 blocks is likely to be completed as part of detailed exploration efforts in CIL areas. The results are encouraging as far as

delineation of faults is concerned. These surveys, once established, are **likely to result in reduction in quantum of exploratory drilling required for delineation of structure.**

In Non-CIL areas, 8.15 lakh meters (60%) of drilling against a target of 13.5 is envisaged to be carried out establishing 5.20Bt of reserves by the end of 11th Plan.

Geophysical logging, as part of detailed exploration, spread over almost all the CIL and Non CIL Blocks, was carried out and a total of 4.5 lakh m of borehole length (both coring & non coring Bhs) is expected to be geophysically logged during 11th Plan.

LIGNITE

Regional / Promotional Exploration: Against a target of 1.48 lakh meters in lignite areas, 1.32lakh meters achieved during 11th Plan mainly by NLC and by other agencies viz. GMDC and RSMML. The governments of Gujarat and Rajasthan have undertaken Regional Exploration in their respective states by drilling 1.04 lakh m of drilling and established 1.85 Bt of lignite resources.

In Promotional Exploration, against a target of 3.50 lakh meters of exploratory drilling, 2.74 lakh meters (78%) is expected to be achieved, establishing 3.22Bt of lignite resources.

2D HRSS Surveys were not a part the exploration programme of 11th Plan. However, in view of the trends world over, these surveys were considered as part of regional (promotional) exploration by Sub Committee on Energy Minerals. **National Geophysical Research Institute (NGRI)**, a premier organization for geophysical Studies in the country, was therefore, inducted to carry out these surveys in lignite areas. It expected that a total of 94 Lkm in lignite areas HRSS survey will be carried out during 11th Plan

Detailed Exploration for Lignite: Against a target of 0.61lakh metres in NLC areas, 0.54 lakh metres achieved and 1.98 Bt of reserves are projected to be proved during 11th Plan. In other areas, 0.77 lakh meters of drilling against a target of 0.77 lakh metres is envisaged to be carried out by GMDC, GHCL, RSMML establishing 0.47Bt of reserves by the end of 11th Plan.

As part of Detailed Exploration in lignite **around 0.51 lakh m of geophysical logging** is likely to be completed during 11th Plan in NLC areas. **100 Lkm Resistivity surveys** alongwith **300 Vertical Electrical Soundings (VES)** are expected to be carried out in lignite areas under NLC

Developmental Exploration: Against a target of 1.48 lakh metres in lignite areas, 1.32 lakh metres achieved during 11th Plan. In other areas, 0.87 lakh meters of drilling against a target of 0.975 lakh metres is envisaged to be carried out by GMDC, GHCL, RSMML by the end of 11th Plan.

A summary of the Programme and Progress of work during 11th Plan is given in **Annexure 8.1**

8.3 REVIEW OF INTEGRATED COAL AND LIGNITE RESOURCE INFORMATION SYSTEM (ICRIS & ILRIS).

ICRIS

The Net-accessible coal resource database structured on the UNFC pattern approved in Oct'2004 are under progress at different data centers in CMPDI/ Singareni. The projects need to be continued into 12th Plan with enhanced outlays for successful completion, maintenance and regular up dating.

The following jobs have so far been completed for ICRIS project:

1. Nine data centers were developed
2. The data acquisition from all the available old reports and maps has been completed, including existing mine maps, topographical maps etc.
3. All the maps have been georeferenced by using a vendor.
4. A consultant has been appointed to design a RDBMS database using GIS as a front end, with integration of RDBMS, GIS and web tools.
5. The modeling data, as being generated from different RIs are also being migrated. The database design is expected to be completed by October 2011, and the database will be available for use, with data from eight zones initially.

ILRIS

The Net-accessible lignite resource database structured on the UNFC pattern approved in Oct'2004 is under progress at data center in NLC. The following jobs have so far are nearing completion or have already been completed for ILRIS project.

1. Establishment of Data Centre
2. Procurement of H/W & S/W
3. Borehole & Descriptive Data Capture
4. Map Data Capture
5. Database Design & Data storage

8.4 REVIEW OF CBM EXPLORATION

47 boreholes spread over different coalfield and 3 boreholes in lignite fields are likely to be tested for CBM during 11th Plan under Promotional Scheme.

8.5 ALLOCATION OF FUNDS DURING 11th PLAN

COAL

Regional Exploration: The fund provision for Regional Exploration for coal and lignite was not covered in the 11th Plan by the MoC as these activities are funded by Ministry of Mines (MoM). The same is not being reviewed here.

Promotional Exploration: The financial outlay of 264.02cr. was approved by MoC against the the original proposal of Rs 383.50cr. including the expenditure on ICRIS, ILRIS and CBM Studies for 11th Plan. The cost of Integrated Coal Resource Information System (ICRIS) was revised (lowered) due to free supply of data by GSI. During Mid Term Review (Feb'2011) the approved outlay has been enhanced to 305.82cr. Against this only Rs 185.38cr. has been released by MoC till August' 2011.

Detailed Exploration in CIL/SCCL: The funding towards Detailed Exploration in 11th Plan was done by CIL and SCCL from their own resources, CIL expenditure on detailed expenditure is to be projected around 714 crores and SCCL is likely to spend around 88 crores for detailed exploration during 11th Plan. The details of expenditure in respect of blocks available for Captive mining are not available.

Detailed Exploration in Non-CIL Blocks: MoC approved the expenditure of 472.94 crores against the proposed expenditure of 893.89 crores for undertaking 13.50 lakh metre of Detailed Drilling in Non-CIL blocks. During Mid Term Review (Feb'2011) the approved outlay has been enhanced to 523.08 crores. Against this a sum of Rs 324.22 has been released by MoC till August'2011.

LIGNITE

Detailed Exploration in NLC The funding towards Detailed Exploration of lignite in 11th Plan was done by NLC from their own fund. The expenditure is likely to be around 16.5 crores for detailed exploration in lignite during 11th Plan.

8.6 STATUS OF COAL RESOURCES & NEEDS OF 12th AND SUBSEQUENT PLANS.

The Coal Resource Status: The summary of the inventory of coal reserves as on 1.4.2011(Annexure 8.2) incorporating exploration results of 4 years of 11th Plan and estimated area of coverage out the total basinal area of around 35000sq km is given below:

Plan	Prognosticated Potential Coal Bearing area (sq km)	Area (Sq km)					Proved (Mt)	Indicated (Mt)	Inferred (Mt)	Total (Mt)
		Covered by Regional Exploration	%	Remaining to be covered by Regional Exploration	Covered by Detailed Exploration	%				
End of 8 th Plan	15079	8526	56	6553	4824	56	70.443	89.750	41.761	201.954
End of 9 th Plan	17303	10535	60	6768	5048	48	87.319	109.378	37.417	234.114
End of 10 th Plan	17303*	11992	69	5311	5568	46	95.866	119.769	37.666	253.301
End of 11 th Plan	17619* (17303 + 316**)	14013	79	3606 (770+2836***)	7188 ⁺	51	114.00	137.47	34.39	285.86****
Beginning of 12 th Plan	18279			4226 (1430+2836***)						

*Tentative Estimate,

**Addl. Area identified during 10th Plan,

*** Includes 2836sq km area under CBM Blocks,

****Around 10.87Bt of coal has been extracted from 1950 to 2010-11 from these resources, +Does not include area covered by detailed exploration by captive block allocattees.

The type wise distribution of the coal resources is as below:

Type of Coal	Category			Total (in Bt)	Resource %
	Proved (in Bt)	Indicated (in Bt)	Inferred (in Bt)		
Prime Coking	4.62	0.70	0.00	5.31	1.86
Med. Coking	12.57	12.00	1.88	26.45	9.25
Semi Coking	0.48	1.00	0.22	1.71	0.60
Non- Coking	95.74	123.67	31.49	250.90	87.77
Tertiary Coal	0.59	0.10	0.80	1.49	0.52
Total	114.00	137.47	34.39	285.86	100.00

The Lignite Resource Status: As on 1.04.2011 the inventory of lignite resources stands at 40.91 Bt with 6.15 Bt in 'Proved' category. (Annexure 8.3)

8.7 STATUS OF COAL BLOCKS UNDER DIFFERENT DISPENSATIONS:

Apart from 401 mines **Coal India Limited has 236 coal blocks under its command.** There is a requirement of detailed exploration in 78 partially/regionally explored CIL blocks. 328 Coal Blocks have been identified for Captive allocation. Out of 191 allocated coal blocks, Mining Plans for 105 Blocks (with around 483 Mty production capacities) have already been approved. Out of remaining 223 blocks (328-105), 187 blocks need to be explored by the allocatees/Prospective allocatees. The information on detailed exploration undertaken by block allocatees in these blocks is largely unknown. In addition 116 (146 minus 30) Blocks proposed to be retained by CIL. There is a need of detailed exploration in 76 of these blocks.

8.8 THE DEMAND FOR COAL AND LIGNITE AND THEIR SUPPLY

The Expert Committee on Integrated Energy Policy has projected coal requirement at the end of different plan periods which is as follows:

Terminal Year of	Demand for Power Coal (Mt)	Demand for Non-Power Coal* (Mt)	Total (Mt)	Remarks
11th Plan (011-012)	493	164	657	*Includes coking coal
12th Plan (016-017)	656	221	877	
13th Plan (021-022)	814	299	1113	
14th Plan (026-027)	1133	408	1541	
15th Plan (031-032)	1478	562	2040	

The Regional and Promotional Exploration will require to be continued in the 12th Plan to provide identification of potential coal & lignite bearing areas for Detailed Exploration in the subsequent plan periods to meet the requirement to sustain the desired level of production.

8.9 EMERGING REQUIREMENTS

Coal Exploration: Out of the total 'Prognosticated Potential Coal Bearing Area' of 17619sq km, around 770sq km area will remain to be covered by Regional exploration by the end of 11th Plan. In addition around 660sq km additional 'Prognosticated Potential Coal

Bearing Area' has been identified based on the investigations during 11th Plan. As such 1430 sq km of 'Prognosticated Potential Coal Bearing Area' needs to be covered by Regional Exploration. A total of 58 new coal blocks have been identified over the newly demarcated 'Prognosticated Potential Coal Bearing Area'. All these blocks along with the spillover blocks from 11th Plan need to be taken up for Regional Exploration.

Out of 285.86 Bt of coal resources established by 1.04.2011, 171.86Bt of resources remain in 'Indicated/ Inferred' category. All these resources need to be 'Proved' to facilitate their projectisation. On the basis of the results of Regional and Detailed Exploration undertaken during 11th Plan a total of 37 Blocks have been identified for undertaking Detailed Exploration during 12th Plan.

With more and more importance being attached to coal for meeting the energy needs of the country, and the demand projections of 1133 Mt, 1478 Mt of non coking coal by the terminal years of 14th and 15th Plans respectively, **the pace of exploration to explore non coking coals needs to be speeded up to meet the demand on sustainable basis.**

Coal Exploration efforts should not only aim at enlarging the resource base through regional exploration but also to upgrade the known resources remaining under 'Indicated and 'Inferred' categories through detailed exploration to facilitate their projectisation for mining.

Considerable part of the coal basinal areas left for exploration activity being concealed and under younger cover, **substantial accretion of resource in coming years is envisaged in the intermediate and deeper levels (beyond 300m depth).** As such there is also the emerging need to fully bring out the potential of coal resources, which are at greater depths, for other exploitation like CBM, underground gasification (UCG) etc. to augment the coal resources.

With ever increasing demand of steel in the country the requirement of coking coal is projected to increase from 69.47Mt to 85.06Mt at the end of 12th and 13th Plans **There is a need to focus exploration efforts on the prime coking coal resources available beyond 300m depth to bring them to 'Proved' category.**

Lignite Exploration: The possible target areas for lignite exploration may be:

- i) **Extension areas of already proved blocks** viz Neyveli, Mannargudi in Tamil Nadu, Barmer Basin, Jaisalmer Basin, Bikaner Basin and Nagaur Basin in Rajasthan and Eastern part of Kutch Basin and Sanchor basin in Gujarat.
- ii) **Areas identified from gravity and magnetic survey work** in Barmer district in Rajasthan state.

- iii) **Lignite occurrences reported by other agencies** in respect of certain areas viz. Kerala–Konkan basin in Kerala and Gudivada, Buntumilli and Mundapeta in Andhra Pradesh and Tertiary sediments in Raniganj Coal field in West Bengal.
- iv) **Occurrence of Tertiary formation identified based on Remote sensing studies** in Rajasthan and Gujarat states .

Coal Bed Methane Investigations & Assessment of Potential Shale Gas in Coal Formation: There is strong need to generate CBM related data from thick/inferior coal/lignite seams, as even if the gas content is less, the overall CBM resource is compensated by thickness of seams and also by shallow occurrences, which would entail less cost of recovery of CBM.

Although **shale gas** has been produced for more than 100 years in the coal bearing Appalachian Basin and the Illinois Basin of the United States, studies in this direction has not been carried out in India so far in coal bearing organic carbon rich shale of Gondwana basin. Development of this resource will be in the national interest and if found suitable, will bridge the gap between demand and supply of energy resource existing in the country on account of accelerated GDP growth.

8.10 PROGRAMME FOR 12th PLAN FOR COAL AND LIGNITE

COAL

Regional Exploration: The programme for Regional Exploration with 1.05 lakh meters of drilling in coal has been drawn up. GSI will be able to establish resource base of about 5.789Bt in coal.

Promotional Exploration: A programme for 4.80 lakh meters of drilling in coal has been drawn up. About 1204 sq. km. area will be covered in coal and a resource of about 16.64Bt will be established.

Detailed Exploration: Keeping the production requirement beyond the 12th Plan in view, programme has been drawn up with 54.46 lakh meters of drilling in CIL and SCCL and Non CIL areas. It is expected that 76.80 Bt of coal reserves will be 'Proved' through Detailed Exploration. Similarly, a programme for Detailed Exploration for lignite involving 0.85 lakh meters of drilling has been drawn up. However, major part of the exploration activity will need to be outsourced in view of the limited capacity available with CMPDI & other agencies involved in detailed exploration.

Developmental Exploration: Programme for 1.61 lakh meters of Developmental Exploration has been drawn up in CIL and SCCL.

Coal Bed Methane Investigations & Assessment of Potential Shale Gas in Coal Formation: CBM Studies in 60BHs and Shale Gas Studies in 25 boreholes have been proposed during 12th Plan.

LIGNITE

Regional Exploration: The programme for Regional Exploration with 0.74 lakh meters of drilling in lignite has been drawn up, to establish resource base of about 0.30Bt in lignite.

Promotional Exploration: A programme for 3.34 lakh meters in lignite has been drawn up. In lignite, 5.30Bt of resources will be established covering an area of 6047sq km.

Detailed Exploration: A programme for 0.85 lakh meters has been drawn up for detailed Exploration in lignite by NLC, RSMML and GMDC to establish 0.51 Bt of resources.

Developmental Exploration: Programme for 2.059 lakh meters of Developmental Exploration has been drawn up in, NLC and Non NLC areas.

A table giving the details of the proposed Exploration Programme during 12th Plan is given below:

Exploration stage	Agency		Area Coverage (Sq km)	Projected Drilling in 12 th Plan (Lakh m)	Resources Likely to be established in 12 th Plan (Bt)
Preliminary	GSI	No requirement of Drilling & no resource to be established as per nature of work			
Regional	GSI	Coal	225	1.05	5.78
	DMGR	Lignite	451	0.08	0.10
	CGMG		100	0.66	0.20
Promotional	GSI, MEC & CMPDI	Coal	1204	4.80	16.64
	GSI, MEC & DMGR	Lignite	6047	3.34	5.30
Total Regional + Promotional		Coal	1429	5.85	22.42
		Lignite	6598	4.10	5.6
Detailed (Coal)	CMPDI	CIL Areas	1609	30.52	58.61
	SCCL	SCCL Area	155.50	4.91	1.95
	NTPC, State Govts. & Pvt.	Own areas	NA	NA	NA
	CMPDI	Non-CIL	508	19.03	16.22
Total Detailed Coal			2272.5	54.46	76.80
Detailed (Lignite)	NLC	Own area	30	0.15	0.30
	RSMML	Own area	43	0.046	0.115
	GMDC	Non-NLC	104.18	0.65	0.10

Exploration stage	Agency		Area Coverage (Sq km)	Projected Drilling in 12 th Plan (Lakh m)	Resources Likely to be established in 12 th Plan (Bt)
Total Detailed Lignite			177.18	0.85	0.51
Developmental Coal	CIL Areas			0.10	
	SCCL Areas			1.51	
Total developmental Coal				1.61	
Developmental Lignite	NLC Areas		5.0	0.947	
	GMDC		5.0	1.005	
	GIPCL		10.0	0.055	
	RSMML		0.05	0.05	
	VS Lignite		0.001	0.002	
Total developmental Lignite			20.051	2.059	
UCG Lignite					
GMDC			10	0.045	
GIPL			12	0.020	
NLC			170	0.12	
Total UCG			192	0.185	
CBM Studies (Promotional Scheme)	CMPDI			40 borehole	
	GSI			20 borehole	
Shale Gas Studies (Promotional Scheme)	CMPDI			25 borehole	
2D HRRS (Promotional Scheme)		Coal		150 Lkm	
		Lignite			
3D HRSS (Promotional Scheme)		Coal		50sq km	
		Lignite			

Coal Resource Information System & Lignite resource Information System: Both these projects will be continued in XII Plan for their successful completion and maintenance thereafter.

8.11 NEED FOR CAPACITY ENHANCEMENT AND MODERNISATION

a) **Capacity Enhancement:** Considering the likely achievements in Regional and Detailed Exploration during 11th Plan vis a vis the programme for 12th Plan with envisaged increased requirement to the tune of 42% and 120% for Regional & Detailed Exploration respectively **there is an urgent need to enhance the capacities of exploration agencies to meet the targets set for 12th Plan.**

The existing exploration agencies viz. GSI, MEC, CMPDI etc., all in the Govt. and Public Sector, have the full range of geological, drilling, geophysical, coal petrographic, geochemical, remote sensing, computer modeling and other capabilities.

However, the capacities of coal exploration agencies both in Govt/PSUs and state governments presently available are almost fully utilized for the present level of exploration. The increase in exploration activities, therefore, entails **enhancement of drilling capacities as well as technical support system both in terms of drilling equipments and manpower.**

The available capacities in private sector are very limited. However due to the lack of adequate technical environment and facilities available with them, the outsourcing of exploration to these agencies will need close coordination and supervision by established exploration agencies.

The existing capacity of laboratories for undertaking chemical analysis of coal cores is not sufficient to meet the present level of exploration. In order to meet the requirement of additional coal core generation CIMFER, CMPDI, MECL and all other agencies need to enhanced the capacity of chemical, petrographic and related analysis on priority basis.

b) Modernisation: Drilling is the most important single input for mineral exploration work and there is a continuous need for its modernisation. For this purpose, hydrostatic and reverse circulation drills need to be selectively deployed. For future deeper resources/areas introduction of **oil-well drilling technology** may also be considered. For this adequate exposure at established agencies will be required.

Data acquisition and interpretation being the most important part of any exploration activity also need to be modernized by introducing state of the art techniques in i) data acquisition, transmission (**Information technology, Internet, GPS, Sattelite imageries, computers/laptops etc**), ii) Geological Mapping (Satellite Imageries, GPS, etc.), Core logging (**Core Scanners**), iii) Borehole Geophysical logging (all **latest probes for different parameters**), iv) Data Storing & Retrieval (Computers/laptops , **Data Base**), v) Data Processing (Computers, **data processing softwares**), vi) Deposit Modelling (**Modelling Softwares**), vii) Plans Preparation (**GIS, Autocad, Scanners, Plotters etc.**).

8.12 NEED FOR UNITED NATION FRAMEWORK CLASSIFICATION (UNFC) OF RESOURCES

The ISP addresses only the volume and tonnage. It is purely a geological resource classification system without assessment of mineability. The UNFC is a three digit code based on system where in first digit represent economic viability axis, second digit represent feasibility axis & third digit represent geologic axis. The UNFC type of classification system has the obvious advantage of providing a ready and well defined picture of coal occurrences for investments and exploitation. It is, therefore, necessary that all agencies involved in coal exploration switch over to UNFC System for reporting of

resources. Suitable mechanism also needs to be evolved for flow of information from mining companies for updation of resources on yearly basis.

8.13 FINANCIAL OUTLAYS OF EXPLORATION PROGRAMME FOR 12th PLAN

A total fund of Rs.1621.21crores is proposed to be provided by Govt. for Regional Exploration, Promotional Exploration and Detailed Exploration in Non-CIL Blocks in 12th Plan. Out of it, Rs.546.52cr is required for Promotional Exploration Scheme.

A fund of Rs. 974.69crore is proposed to be provided by the Govt. for Detailed Exploration in Non-CIL blocks during 12th Plan.

A fund of Rs. 1680.91cr. is required for Detailed Exploration in CIL blocks whereas SCCL will provide about Rs. 188.00 crores for similar exploration in SCCL blocks. NLC, RSMLL & GMDC will spent about Rs 43.07 crore for detailed exploration of own lignite blocks.

The total fund requirement assessed for all Exploration activities during 12th Plan is given below:

Total Fund Requirement Assessed for all Exploration activities during 12th Plan

Sl. No	Item	Scheme	Estimated Fund requirement (Rs.Cr)	Proposed Source of Funding
A. To be Funded by Govt.				
1.	Promotional Exploration	Promotional Expl.	409.69	MoC
	a) Coal Exploration	- do -	51.92	MoC
	b) Lignite Exploration	- do -	9.05	MoC
	c) Coal data base	- do -	21.21	MoC
	d) Lignite data base	- do -		
	e) CBM Studies/Shale Gas Studies	- do -	54.65	MoC
	f) 10% for NE region			
	Sub-Total		546.52	
2.	Regional Exploration	Regional Expl.	100.00 (Aprox)	MoM
	a) Coal & Lignite			
	Sub-Total		100.00	
3.	Detailed Exploraion of Coal in Non-CIL Blocks	Detailed Exploraion in Non-CIL Blocks	974.69	MoC

	Total of A: Funded by Govt.		
	a) MoC	1521.21	
	b) MoM	100.00	
	Total of A	1621.21	
	B. To be Funded by Coal/Lignite Companies		
1	Detailed Exploration in Coal		
	a) CIL	1680.91	CIL
	b) SCCL	188.00	SCCL
	Sub-Total	1868.91	
2	Detailed Exploraion in Lignite		
	a) NLC	21.23	NLC
	b) RSMML	1.84	RSMLL
	c)GSMDC	20.00	
	Sub Total	43.07	
	Total of B	1911.98	
	Total of Detailed Exploration	28886.67	
	Grand Total of A and B	4507.88	

A policy decision for continuous funding for detailed exploration in Non CIL blocks needs to be taken.

8.14 RECOMMENDATIONS

Promotional Exploration: Promotional Exploration for coal and lignite has been demonstrably effective in increasing the national Coal and Lignite Inventory at a faster rate and should, therefore, continue till the coverage of coal/lignite fields is broadly completed.

Detailed Exploration in the Non-CIL blocks and its outsourcing: For expeditious allocation of coal blocks to captive users, the Non-CIL blocks need to be explored in details on priority at faster pace. The increase in detailed exploration will require outsourcing of jobs.

Continuation of ICRIS and ILRIS Projects: The creation of a coal/ lignite resource data base to provide Net-accessible resource information needs to be continued for their successful completion and maintenance.

Developmental Exploration: It is recommended that **Developmental Exploration** in working mines should be given adequate attention and organization **to help reduce surprises** and, thereby, the cost of mining.

Clean Coal Technology: The **assessment of CBM resources** needs to be continued in 12th Plan. In addition **assessment of Shale Gas potential** in coal formations of different coalfields may be taken up.

Exploration in Forest Areas: The present guidelines more or less satisfy the requirement of regional exploration for coal as at least 1 borehole per sq km is required to categorize the resource under 'Indicated' category as per the ISP. However, 15 to 20 boreholes are needed to be drilled per sq km for open cast and underground prospects, respectively, to 'Prove' the resources to the desired level of confidence for mine planning. The above guidelines **do not address the requirement of detailed exploration and need to be revised to allow 15 to 20 boreholes per sq km immediately.**

Exemption from the need for 'Prospecting License: CMPDI, SCCL & NLC are premier organizations in Detailed Exploration of coal. Hence they may be included in the list of organisations exempted from seeking 'Prospecting License' as is the case with GSI/MEC.

Exploration for Coal in Identified CBM Blocks: A total of 21 blocks have so far been identified for CBM exploration and exploitation, covering an area of about 8800 sq.km. Majority of these blocks are available in the deeper part of different coalfields which have not been covered by Regional and Detailed exploration. In view of the fact that some of the CBM blocks have already been offered and the remaining are in the process of offering, a policy decision needs to be taken whether Regional Exploration and Detailed Exploration can be taken up in such identified CBM blocks to assess the national inventory of coal.

Capacity Enhancement & Modernisation: The increase in exploration activities entail enhancement of drilling capacities as well as technical support system both in terms of drilling equipments and manpower (both Geology & Drilling). Modernisation in 'Drilling Techniques', 'Data Acquisition & Transmission', 'Data Storage & Retrieval', 'Data Processing' & 'Deposit Modelling' 'Resource assessment' and 'Plan/Report Preparation' is considered necessary to achieve the targets set for 12th Plan.

Need for Flow Information from Block Allottees: With the allotment of a large number of regionally explored coal & lignite blocks to private entrepreneurs it has become necessary to evolve a mechanism of data flow from these entrepreneurs to the GSI through CMPDI (which is the nodal agency for detailed coal exploration in the country other than SCCL areas) and NLC for lignite block (which is the nodal agency for detailed lignite exploration in the country) in respect of exploration activities undertaken by these entrepreneurs to upgrade the resources for updating of the national inventory of coal & lignite. It may, therefore be made mandatory on the block allocates to provide data/GR on the resources explored by them before approval of Mining Plan.

Dual Mining Policy: It is necessary to formulate in association with concerned Ministries, Regulatory/legal framework and Policy guideline for concurrent Exploration/development of Coal/lignite blocks through Conventional mining, CBM/CMM Recovery, UCG etc.

CHAPTER- 9

MINING TECHNOLOGY

9 MINING TECHNOLOGY

Technology is the key to higher production, productivity and safety. Modernization in technology has an overwhelming effect on the development of mines. A combination of conventional and modern technology to suit the indigenous condition and environment would give the best results. In India, currently around 90% of the coal is being produced through opencast method and about 10% through underground methods.

9.1 Opencast Technology

Enhancement in production soon after Nationalisation of coal mines matching the rapidly increasing demand for coal, particularly from the Power Sector was possible due to taking up large opencast mines. The opencast mining has several advantages over underground mining from the points of higher percentage of extraction of resources, higher rate of production from the available resources, extraction of thick seams at shallow cover, higher productivity, shorter gestation period, lesser specific capital investment, lower cost of production, better economies of scale, higher safety etc., but for change in land use pattern and related environmental and R&R issues.

However, the limiting factors for the opencast technology are depth, stripping ratio, surface constraints including forest land, land for dumping etc.

Some of the opencast coal mines in the country have reached to a depth of around 220m. With other parameters being favorable, opencast mining can be planned upto a depth of 500m without any major constraints. Already mines like Bina-Kakri Amalgamation of NCL/CIL, RG OC-II in SCCL, Kerendhari OC in NTPC have been planned for a depth of about 400 m. Working at such depth, would require proper planning of transport network, dumping strategy, designing and monitoring of pit slopes and OB dump profile. The out-bye transport of coal and OB may have to be done by in-pit crusher conveyor system instead of conventional shovel-dumper system to overcome the constraints of road transport at the same time ensuring sizing of coal.

Extension of opencast for extracting dip side reserves beyond the economic stripping ratio should also be covered in the planning stage. Already lignite mines are being planned for an average stripping ratio of 1:20 and above. The higher ratio as compared to coal mining is feasible as the OB strata are generally softer and do not require any blasting. In coal also, projects like Ramagundam OC- II have been planned with a stripping ratio of about 1:10. With the changing economic scenario and price of coal it has become possible to strip open standing pillars in underground mines for augmenting production in a number of coalfields.

9.1.2 Present Opencast Technology

The prevailing mining technologies deployed in OC mines include:

- Shovel dumper combination

- Shovel dumper/ dragline combination
- Frontend Loader dumper combination
- Dragline dozer combination for Overburden
- Shovel dumper/in-pit crusher/ conveyor combination
- Shovel-dumper /surface miner/rock breaker-tipper combination
- Bucket wheel excavator/ conveyor combination (for lignite mining)

The OC mines in India were mostly designed with the combination of 5 cum and 10 cum electric rope shovels with 35T/50T and 85T/120T dumpers. Later on 20 cum shovel in combination with 170 T dumpers were adopted in some large mines. Recently, in two of the largest mines in SECL 42 cum rope shovels with 240 T dumpers were introduced. Globally, the trend of introduction of higher capacity HEMM like 120 cum Draglines, 56/42 cum Rope Shovels, 34 cum Hyd. Shovels, 400/320/240 T Rear Dumpers, 850 HP Dozers, 20 cum Frontend Loaders is increasing. Indian coal industry would need to examine the scope for adoption of higher size HEMM.

With increasing haul distances, depth of operations, increasing volumes of OB and coal and the growing need to conserve diesel, and improve environmental conditions in mines in-pit crushing and conveying technology using mobile/ semi-mobile crushers needs consideration in a big way as an alternative to dumper transport.

9.1.2.1 Application of Surface Miners

In 1990s, Surface Miners were introduced in Indian coal mines for the first time in MCL. Since then it has become a major equipment for soft to medium hard coal extraction providing scope for avoiding drilling and blasting operations and crushing arrangements. With surface miners it is possible to mine in selective manner to avoid dilution of quality of insitu coal. MCL, SECL and CCL are making extensive use of this technology.

Production contribution from surface miners in 2010–11 in CIL, from 46 (6 departmental + 40 outsourced) surface miners, was about 103 Mt which was 26 % of OC production and 24% total production. In SCCL one surface miner (outsourced) is operating which produced 3 Mt coal in 2010–11.

9.2 Next Generation Opencast Mines

For future resource use, environmental protection and land use, the next generation opencast mines have to be planned considering deep opencast mining of 500 m depth and beyond; extending and deepening existing opencast mines; planning of Super Pits/ mega mines of 25–30 Mt per annum capacity and more; deep seam mining beneath super pits; highwall mining to access exposed coal resources in final opencast batters/benches.

9.3 Underground (UG) Mining Technology

The techno economic feasibility of a deposit dictates its mineability either through OC or UG method. Coal reserves occurring at depth are better suited for mining by UG method. UG production in the country has been declining steadily over past many decades mainly due to the need for quicker augmentation of production in line with rapidly increasing

demand which was possible through taking up large size OC projects with economies of scale. The UG technology, in most of the cases requires higher investment, long gestation period and higher cost of production with greater exposure to safety risks involving strata control, fires, subsidence, gas problems etc. However, modern technologies infuse better confidence from safety, production and productivity angles with economies of scale.

9.3.1 The underground mining technologies presently in vogue in India are as follows:

i) Manual Bord & Pillar system

This had been the predominant technology till late 1990s and is being phased out through semi mechanization avoiding manual loading and exposure of miners in the coal face to the freshly exposed roof. All new mines are being planned with mechanized/semi mechanised operations.

ii) Semi-mechanized Bord & Pillar System With SDLs / LHDs

SDL (Side Discharge Loader)/ LHD (Load Haul Dumper) as loading machines were introduced in underground mines replacing manual basket loading since early eighties. UDMs (Universal Drill Machines) were also introduced in conjunction with SDLs/LH Ds for face blasting and roof bolting. The population of SDL/ LHD is envisaged to increase from the current level of 964 nos. to 1328 nos in the mines of CIL during the XII Plan.

iii) Mechanized Bord & Pillar System With Continuous Miners

The system was initially introduced in Charcha mine of SECL and subsequently in Tandsi, in WCL. Later on in NCPH, Jhanjra, Sarpi, Rani Atari and Kumbarkhani underground mines of CIL and VK-7 incline of SCCL. At present 6 nos. of CMs are operating in CIL, 12 CMs are in various stages of procurement and another 15 CMs are proposed during XII Plan. In SCCL presently two CMs are operating.

iv) Mechanized Longwall (PSLW) Mining System

Mechanized Powered Support Longwall (PSLW) technology was introduced in India in 1978. Lack of success in longwall mining in the country earlier could be attributed to the geo-mining conditions especially unique roof behavior in Indian mines resulting into non compatibility of the imported roof support system. Presently, 2 mines of CIL, viz. Balrampur, SECL (2 sets), and Jhanjra, ECL (1 set) are operating PSLW. In SCCL, one longwall unit is in operation at GDK-10A colliery. The roof support design have undergone a considerable change over the years and the technology has become very potential for deep seated coal seams. The proposal for new PSLW units in the XII Plan is summarised below:

Sl. No.	Company	Name of Mines	No. of sets	Status
1	ECL	(a) Jhanjra	1 no.	Jhanjra Phase II for R-VI seam is under procurement (1.7 Mty capacity)
2	BCCL	(a) Moonidih	2 nos.	PSLW package for XVI (Top) seam is under procurement , whereas that for XV seam is under planning/ tendering.
4	SECL	(a) Behrabandh North Extn. Block	2 nos.	High capacity longwall has been proposed at Behrabandh (Capacity- 2.5 Mty) in 2015-16 .
5.	SCCL	a) Adriyala	1 no.	High capacity set for 2.81 Mty with schedule of production by 2012-13
6.		b) Kakatiya	1 no.	High capacity set for 2.7 Mty with schedule of production by 2014-15

v) Shortwall Mining Technology

Shortwall mining is being currently practiced in the Balrampur colliery of SECL. It is basically a modified version of longwall technology with smaller length of face. Faster liquidation of pillars is possible with this method.

vi) Thick Seam Mining

Following methods of thick seam mining are at present in use in Indian mines.

- Mining in multiple lifts in ascending order with hydraulic sand stowing;
- Cable bolting method;
- Blasting gallery method using remote controlled LHDs etc.

Longwall top coal caving (popularly known as LTCC)/ sublevel caving has been developed and adopted successfully in China in some mines having amenable coal characteristics with compatible set of equipments. The same technology has also been practiced in the mines of Australia, Suitability of application needs to be assessed before introduction of these technologies in India.

vii) Steep Seam Mining

Jankowice method, Kazimierz Method (or Horizontal Slicing Method), and Kamora (Room) Method in conjunction with hydraulic sand stowing were tried in the mines of BCCL. Out of these methods, Jankowice method in conjunction with hydraulic sand stowing is still in vogue. In weak strata conditions as are prevailing in the north-eastern coalfields (NEC) of Assam, various types of sub-level caving methods like Bhaska Method, Tipong Method, Scraper-assisted Chamber Method, Flexible Roofing Method, Descending-Shield Method, Chamber Mining Method with cable bolting etc. were tried and discontinued due to lower production and percentage recovery.

Appropriate Mining Technology for NEC/CIL for extraction of thick, steep and gassy seams to achieve improved performance needs to be developed through R&D or foreign collaboration.

viii) Thin Seam Mining

In thin seams (thickness less than 1.5m), extra-low height Side Discharge Loaders (SDLs) are used in bord and pillar system of mining. This system can be further mechanized by using low height Continuous Miners. This system can be used even to mine ultra-thin seams i.e. seams having thickness less than 1.2m, but the quality of coal should be good to justify the investments involved.

Thin seams are also mined using longwall with plough as coal cutting machine in other countries. This being high capital intensive technology, is viable for better grades of coal only.

Another technology for extracting energy from thin seams is underground coal gasification, if it is techno-economically not feasible to mine by other methods.

ix) Technologies for deep Mining (>500 meters)

The technology proposed for mining coal at greater depth should focus on some critical issues like:

- Strata control problems like coal bumps/rock bursts & high vertical/horizontal stresses,
- Higher degree of gas emission,
- Higher strata temperature and humidity (which may require air-cooling), etc.

ECL/ CIL is aiming to float global NITs to exploit the coal reserves at a depth of 700m or more with very difficult geo-mining conditions through joint venture route in some of their old mines as a strategy to exploit available coal reserves.

9.4 Technology wise Coal Production

The technology wise trend in coal production during the XI five year plan is furnished below:

(Figures in Mt)

Company / Technology	06-07	07-08	08-09	09 - 10	10-11	11 - 12
	Actual	Actual	Actual	Actual	Actual	Tar/BE
COAL INDIA LIMITED						
Total Opencast	317.59	335.91	359.76	388.01	391.31	402.00
Total Underground	43.32	43.54	43.96	43.25	40.01	45.00
Conventional B&P	11.62	10.24	8.79	6.81	5.33	4.33
Conventional LW	0.07	0.07	0.05	0.05	0.05	0.05
Mechanised B&P (SDL/ LHD)	30.20	31.94	32.92	34.48	32.09	35.83
Mechanised LW	0.66	0.44	0.58	0.18	0.53	0.92
Continuous Miner	0.62	0.64	1.12	0.96	1.33	2.86
Special Methods	0.15	0.21	0.50	0.78	0.68	1.01

Company / Technology	06-07	07-08	08-09	09 – 10	10-11	11 – 12
	Actual	Actual	Actual	Actual	Actual	Tar/BE
COAL INDIA LIMITED						
CIL – TOTAL	360.91	379.46	403.73	431.26	431.32	447.00
SCCL						
Total Opencast	25.83	27.96	32.46	38.46	39.70	38.50
Total Underground	11.88	12.65	12.09	11.97	11.63	12.50
Conventional B&P	5.57	4.83	4.13	3.02	2.10	1.47
Mechanised B&P(SDL/ LHD)	4.13	5.23	5.95	6.38	7.03	7.73
Mechanised LW	0.92	1.13	0.89	1.02	0.68	1.00
Continuous Miner	–	–	0.03	0.43	0.85	0.80
Scraper	–	–	–	0.09	0.05	0.00
Special Methods	1.25	1.46	1.09	1.03	0.92	1.50
SCCL – TOTAL	37.71	40.60	44.54	50.43	51.33	51.00

The technology wise projection for coal production during XII Plan is given in the table below:

Company / Technology	XII plan, Coal Production, Mt				
	12-13	13-14	14-15	15-16	16-17
CIL					
Total Opencast	420.07	439.69	460.42	479.31	501.87
Total Underground	44.03	45.96	47.33	50.99	54.53
Conventional B&P	4.70	4.48	4.33	4.24	3.97
Mechanised B&P (SDL/ LHD)	34.71	35.83	35.82	36.38	37.30
Mechanised LW	0.60	1.02	1.20	1.85	2.60
Continuous Miner	3.27	3.83	5.19	7.73	9.87
Special Methods	0.75	0.80	0.80	0.80	0.80
CIL – TOTAL	464.10	485.65	507.75	530.30	556.40*
SCCL					
Total Opencast	38.15	38.75	39.40	40.39	41.08
Total Underground	14.95	15.52	15.68	15.68	15.98
Conventional B&P	0.62	0.62	0.62	0.42	0.42
Mechanised B&P (SDL/ LHD)	1.94	2.60	3.62	4.10	4.30
Mechanised LW	9.64	9.63	8.97	8.69	8.69
Continuous Miner	0.88	1.37	1.57	1.57	1.67
Special Methods	1.87	1.30	0.90	0.90	0.90
SCCL – TOTAL	53.10	54.27	55.08	56.07	57.06

* However in the optimistic scenario the projected coal production in 2016-17 is 615 Mt.

Mechanisation in Lignite Mines – NLC

The total lignite production from NLC is through mechanized opencast mining. The predominant technology is Bucket Wheel Excavator in mines in Tamilnadu (22.73 Mt in 2010-11), whereas in Barsingsar OC in Rajasthan, it is shovel dumper method without

blasting (0.41Mt in 2010–11). The Technology-wise production program for XII plan is given in the table:

NLC :Technology	XII plan, Lignite Production, Mt				
	12–13	2013–14	2014–15	2015–16	2016–17
Total Opencast	26.02	26.02	26.02	26.95	31.20
Specialised Mining Equipment (SME, Bucket Wheel Excavator)	24.23	24.23	24.23	24.23	25.50
Conventional Mining Equipment (CME, shovel dumper)	1.79	1.79	1.79	2.72	5.70

9.5 Technology for Underground Coal Gasification (UCG)

In India, a large amount of coal exists beyond present techno-economically viable mining depth. Such coals have immense potential to yield energy through UCG. Additionally, there is a huge occurrence of coal in India, which has not even brought into lignite resource inventory, but otherwise known in course of oil and gas exploration in the country. These lignite fields need proper exploration and may be taken up for UCG in addition to known lignite deposits.

UCG got impetus through notifying the activity as one of the end uses under the captive mining policy for coal. This has enabled to consider allotment of identified coal blocks to potential entrepreneurs for developing UCG. Further, coal companies have also taken initiative in developing UCG in the blocks under their command area. CIL, SCCL and NLC joined hands with ONGC for developing UCG and ONGC in turn has associated itself with Skochinsky Institute of Mining, Russia. NLC's R&D project for UCG did not take off due to non availability of technical consultants. Recently, CIL has taken initiative to develop two of its blocks namely Kaitha in Ramgarh coalfield of CCL and Tesghora–C block of WCL. Government has identified five lignite blocks and two coal blocks for UCG for offer under captive route. The development of UCG needs to be carried forward in the XII Plan in at least some four to five areas to establish the technology.

9.6 Technology for Extraction of CBM, CMM and AMM

Commercial exploitation of CBM has already been established in the country. Government has allotted 33 blocks to various companies in four rounds of bidding. However, exploitation of CMM from the working mines is yet to be developed on commercial lines. A demonstration project implemented with the assistance of UNDP/ GEF in BCCL area has developed confidence in this regard. CIL has initiated action for extraction of CMM from five of its areas/ blocks but some technical issues in regard to commercial exploitation of CMM by coal lease holders need to be sorted out between MoC and MoPNG.

Systematic assessment of AMM resources is yet to be done. Possibility of sizeable resource of AMM generally exists in abandoned UG mines, which has history of high gas emission and where sand stowing has not been practiced earlier. Occurrence of such unstowed UG mines having large spatial extent is limited in number. The scope for extraction of AMM from abandoned mines needs to be explored.

9.7 Action for XII Plan

Opencast Mining

- i. **Conservation of reserves:** designing of large size pits and amalgamation of adjacent mines for extracting locked up coal in batters and barriers;
- ii. Scientific approach for designing pit slopes and dump slopes with appropriate monitoring measures;
- iii. Large scale adoption of in-pit crushing and conveying of coal and OB;
- iv. Standardization of HEMM for various pit capacities;
- v. Integrating washeries with all new opencast mines;
- vi. Land reclamation and mine closure plans with monitoring mechanism;
- vii. Application of IT for fleet management, inventory, maintenance and safety
- viii. In each subsidiary producing coal through OC operation, at least two high capacity OC mines are to be designed with state of the art technology, facilities of electronic monitoring, control system and facilities comparable to the best available in the world.

Underground Mining

- ix. All new underground mines are to be planned with high degree of mechanization;
- x. Large scale introduction of mass production technologies like longwall mining technology, continuous mining technology etc.
- xi. Non mechanized existing mines to be quickly converted to mechanised mines through adoption of SDL/LHD/Continuous miners and mechanized drilling and roof bolting;
- xii. In each subsidiary producing coal through UG operation, at least two high capacity UG mines are to be designed with state of the art technology, facilities of electronic monitoring, control system and facilities comparable to the best available in the world.
- xiii. Scientific strata and environment monitoring;
- xiv. Risk assessment and mitigation plans;
- xv. Faster development of infrastructure for UG mines– Mechanised shaft and incline drivages; high speed skips, conveyors etc.
- xvi. Introduction of man riding systems in UG mines;
- xvii. Adoption of telecommunications in underground mines;

- xviii. Air-conditioning systems for mine ventilation, particularly the deep mines of more than 400m depth or where temperature cannot be brought down to 33 degree Celsius with conventional ventilation system;
- xix. Creation of machinery manufacturing facilities to support underground mechanization.

CHAPTER- 10

PRODUCTIVITY AND BENCH MARKING

10.0 INTRODUCTION

The increase in productivity aims at efficient and effective utilization of resources. Traditionally, the output per man shift measured in terms of tonnes in coal mines in India, Though the opencast mines have recorded a consistent increase in productivity over the years, the underground OMS is hovering around 0.7 t. Targets for the productivity are mainly based on mechanization of workings and the system capacity utilization. In view of varied conditions in different coalfields in the country there is a need for benchmarking productivity of mining operations.

Trend in productivity in coal mines during the last two years is furnished in the table below:

Output per Man shift (OMS)

OVERALL

(In Tonnes)

	ECL	BCCL	CCL	NCL	WCL	SECL	MCL	NEC	CIL	SCCL
2006 - 07	1.34	1.15	2.81	10.94	2.50	4.53	15.93	1.70	3.54	2.39
2007 - 08	1.07	1.18	3.22	13.81	2.52	4.83	16.19	1.88	3.79	2.63
2008 - 09	1.33	1.22	3.27	14.58	2.55	5.26	16.60	1.77	4.09	3.01
2009 - 10	1.46	1.85	3.66	13.19	2.64	5.96	14.66	2.00	4.47	3.36
2010 - 11	1.60	2.09	3.88	13.52	2.65	6.47	15.37	2.16	4.73	3.58
2011-12 (Targ)	1.78	2.19	4.46	17.43	2.15	6.19	15.68	2.07	4.92	3.80

OPENCAST

(In Tonnes)

	ECL	BCCL	CCL	NCL	WCL	SECL	MCL	NEC	CIL	SCCL
2006 - 07	7.03	3.07	4.03	10.94	4.07	13.38	23.48	7.42	8.00	9.50
2007 - 08	5.04	3.08	4.66	13.81	4.06	14.30	23.57	8.09	8.60	10.76
2008 - 09	6.42	2.91	4.65	14.58	3.99	15.76	23.06	7.83	8.95	10.60
2009 - 10	7.29	4.85	5.24	13.19	4.12	18.89	18.89	7.10	9.51	10.71
2010 - 11	8.14	5.64	5.45	13.52	4.13	20.22	20.50	7.15	10.06	12.08
2011-12 (Targ)	8.86	6.19	6.38	17.43	3.99	19.00	21.56	7.16	10.73	13.01

UNDERGROUND

(In Tonnes)

	ECL	BCCL	CCL	NCL	WCL	SECL	MCL	NEC	CIL	SCCL
2006 - 07	0.42	0.44	0.40	-	1.09	1.14	1.16	0.23	0.71	0.90
2007 - 08	0.43	0.42	0.39	-	1.11	1.19	1.18	0.20	0.73	1.02
2008 - 09	0.46	0.41	0.36	-	1.14	1.26	1.25	0.10	0.76	1.05
2009 - 10	0.47	0.39	0.35	No UG mine	1.12	1.33	1.29		0.78	1.08
2010 - 11	0.45	0.39	0.34		1.09	1.32	1.25	0.004	0.77	1.09
2011-12 (T)	0.57	0.47	0.45		1.05	1.38	1.28		0.84	1.20

The productivity projection for XII Plan period in mines of CIL & SCCL is given in the Table:

Output per Man shift (OMS)

OVERALL

(In Tonnes)

Year	ECL	BCCL	CCL	NCL	WCL	SECL	MCL	NEC	CIL	SCCL
2012 – 13	1.93	2.90	4.87	17.70	2.57	6.92	15.58	1.72	5.40	4.16
2013– 14	2.10	3.10	5.94	18.20	2.62	7.22	15.35	2.42	5.80	4.37
2014 – 15	2.27	3.50	7.13	18.70	2.61	7.53	15.39	2.56	6.20	4.63
2015 – 16	2.52	3.80	8.20	19.20	2.63	7.90	15.69	2.90	6.60	4.91
2016 – 17	2.84	4.20	9.56	19.50	2.61	8.33	16.06	3.25	7.00	4.93

OPENCAST

(In Tonnes)

Year	ECL	BCCL	CCL	NCL	WCL	SECL	MCL	NEC	CIL	SCCL
2012 – 13	10.26	7.00	6.95	17.70	4.03	23.23	20.80	1.72	11.20	14.97
2013– 14	11.41	7.20	8.60	18.20	4.09	24.07	20.26	2.42	11.90	14.83
2014 – 15	12.16	7.40	10.34	18.70	4.10	25.16	20.47	2.56	12.60	14.55
2015 – 16	12.98	7.60	11.95	19.20	4.10	26.37	20.83	2.90	13.30	14.82
2016 – 17	14.22	7.80	13.68	19.50	4.12	28.13	21.02	3.25	14.00	14.83

UNDERGROUND

(In Tonnes)

Year	ECL	BCCL	CCL	NCL	WCL	SECL	MCL	NEC	CIL	SCCL
2012 – 13	0.51	0.80	0.41	No UG Mine	1.06	1.48	1.27		0.90	1.47
2013– 14	0.55	0.85	0.49		1.06	1.60	1.24		0.95	1.59
2014 – 15	0.58	0.90	0.56		1.07	1.66	1.28		1.00	1.71
2015 – 16	0.73	0.95	0.67		1.07	1.75	1.62		1.05	1.81
2016 – 17	0.90	1.10	0.86		1.13	1.74	1.96		1.10	1.82

The trend and projection for lignite mines are given in the Table:

Output per Man shift (OMS) in tonnes

Company	X Plan	XI Plan				
	2006–07	2007–08	2008–09	2009–10	10–11	11 – 12 Target
NLC	10.16	10.18	10.16	10.77	11.00	9.36

Projections for XII Plan.

Company	XII Plan				
	12-13	13-14	14-15	15-16	2016-17
NLC	10.0	10.5	11.0	11.5	12.0

10.1 Analyses of reasons for low productivity in coal mines generally point out that:

- Lack of linking the various elements of coal production and transportation system into a *continuous process* at each mine and also across mines
- Lack of mechanization and automation in underground mines
- Lack of communication and coordination
- low productive time of men and machinery
- long shift change time
- high maintenance time
- high equipment repositioning time
- shortfall in materials logistics
- different equipments of different manufacturers creating problems of maintenance
- mismatch between excavating and transportation capacities
- lack of preparation and planning
- poor management practices and indiscipline
- lack of analytical approach to overcome the problems

10.2 Different steps taken for improving productivity

Over the years coal companies have addressed the issue of low productivity and implemented some feasible solutions like hot seat exchange for HEMM operators, MARC contracts and Depot agreements with OEM companies for reducing down time of machinery and timely arrangement of spare parts, overlapping shifts in underground mines with longwall workings etc. New equipment procurement contracts are being devised along with maintenance contracts for ensuring proper availability of the equipment by the OEMs.

10.3 Benchmarking of Operations and Equipment Productivity

One of the important areas is benchmarking of operations and equipment productivity. The earlier exercises carried out in this regard by a committee of MoC have lead to bench marking of both UG and OC equipments which are furnished below. However, these need to be reviewed periodically for improvement in view of the investments being made in new technologies.

10.4 Productivity of UG Machinery

Sl. No.	Type of machine/mining system	Machine Productivity benchmark		
		Machine		OMS (t)
		tpd/Mc	Mty	
SDL (Side Discharge Loader)/ LHD (Load Haul Dumper)				
1	SDL (Bucket capacity 1 m3)	120	0.036	1.30
2	LHD (Bucket capacity 1.5m3)	150	0.045	1.50
3	SDL (1m3 bucket) + UDM	135	0.040	1.60
4	LHD (1.5 m3 bucket) + UDM	170	0.050	2.00
PSLW (Power Support Longwall)				
5	PSLW system with 2 RHs	4800*	1.200	5.00
CM (Continuous Miner)				
6	CM (JOY 12CM 15 or equ.)	1650	0.500	5.00
7	CM in longwall development	825	0.250	5.00
BG (Blasting Gallery)				
8	BG with 5 LHDs (Bucket capacity 2.7 m3)	825	0.250	4.00
* Considering 10 months operation and 2 months equipment salvaging/shifting period in a year				

CIL Subsidiary-wise productivity during 2009-10 & 2010-11

Subsidiary	Productivity (TPD/Machine), 2009-10				Productivity (TPD/Machine), 2010-11			
	SDL	LHD	CM	PSLW	SDL	LHD	CM	PSLW
ECL	65	124	1492 (Jhanjra MIC)	86 (Jhanjra)	57	107	1388 (Jhanjra MIC)	158 (Jhanjra)
BCCL	66	42			74	44		
CCL	70	101			75	95		
SECL	102	210	1089 (NCPH)	98 (Balrampur)	90	186	0 (NCPH)	806 (Balrampur)
WCL	100	157	560 (Tandsi)		91	154	421 (Tandsi)	
MCL	67	146			60	191		
CIL	85	169			77	163		

10.5 Productivity of HEMM

The benchmarking of the shovels-dumper and draglines under standard geo-mining conditions (considering 330 working days) is as follows:

Sl. No.	Basic Parameters	Benchmark Productivity (Mm3 per Excavator per annum)	
A. Shovels			
1	20 m3 Electric rope shovel with 170 T rear dumpers	4.09	
2	10 m3 Electric rope shovel with 120 T rear dumpers	2.08	
3	10 m3 Electric rope shovel with 85 T rear dumpers	1.98	
4	5 m3 Electric rope shovel with 50 T rear dumpers	0.98	
5	5 m3 Electric rope shovel with 35 T rear dumpers	0.95	
6	4.5 m3 Hydraulic Excavator with 50 T rear dumpers	1.11	1.19
7	3.8 – 4.2 m3 Hydraulic Excavator with 35 T rear dumpers	0.95	1.04
8	2.8 – 3.2 m3 Hydraulic Excavator with 35 T rear dumpers	0.72	0.76
B. Dragline			
1	10/70 Dragline	1.18	
2	20/90 Dragline	2.83	
3	24/96 Dragline	3.45	
4	30/88 Dragline	4.38	

M/c	No. of Equipment		Availability			Utilisation		
	As on 1.4.2011	As on 1.4.2010	CMPDI Norms	% of Norms 2010–11	% of Norms 2009–10	CMPDI Norms	% of Normr 2010–11	% of Normr 2009–10
Dragline	40	40	85	92	92	73	91	99
Shovel	754	747	80	90	91	58	78	85
Dumper	3217	3366	67	99	99	50	70	73
Dozer	981	991	70	93	92	45	59	60
Drill	709	713	78	98	99	40	74	77

10.6 Percentage Availability and Utilisation HEMMof vis-à-vis norms:

10.7 Action for XII Plan for Improving Productivity

- i. Benchmarking of mining operations/ equipments
- ii. Optimizing size and capacity of the mine
- iii. Use of Man riding system in underground mines
- iv. Use of mechanised drilling and roof bolting machines.
- v. Replacement of tub transport system by belt conveyors in underground mines
- vi. Advanced shaft sinking methods, provision of high capacity skips in underground mines.
- vii. Maximum use of Mass production underground technology like longwall, continuous miner, road headers etc.
- viii. Bigger sizes of equipment in opencast mines.
- ix. Cutting down the idle time and breakdown time of machinery by better maintenance and timely procurement of spares.
- x. Correcting mismatch in excavation and transport equipment capacity, by action at corporate level
- xi. Training of workers for new technology, machinery, and maintenance
- xii. Better discipline at mines and increasing the working hours of men and machinery
- xiii. Standardization of equipment fleet at mine level as well as at company level. The Rope Shovels should be standardized to 3 or 4 sizes, e.g. 10 cum, 20 cum, 42 cum. Similarly the dumpers should be standardized to 100 T, 190 T, 320/ 260 T.
- xiv. Introduction of OITDS for all big opencast mines.
- xv. Rapid loading system for coal dispatch.
- xvi. Proper monitoring at every level
- xvii. Modern communication and reporting system

CHAPTER– 11

PROJECT FORMULATION AND IMPLEMENTATION

11.1 Formulation of Coal Projects

Proper formulation of coal/ lignite projects is the most critical area to meet the growing demand of coal in the country. Identification of adequate commercially exploitable coal deposits to support high level of production and building infrastructure for mining and transporting such large quantities of coal have to be meticulously pursued. The projected production targets can be achieved only by taking up well-planned exploration, project formulation, timely approval and implementation and monitoring. The planning cycle for coal production in each Five Year Plan should be initiated at least one Five Year Plan before.

11.1.1 Guidelines for Preparation and Approval of Project Reports

The formulation of coal sector projects is basically governed by the guidelines issued by the Planning Commission in 1992. MOC has issued Guidelines on 4th April 2011 for preparation of Mining Plans.

Earlier a Committee to look in to improvement in the procedural aspects of approval of projects under Shri Govindarajan the then Secretary (Heavy Industries) made a number of recommendations including doing away with pre PIB meetings and In Principle approvals for coal sector projects and empowering the coal companies. Now the coal companies are empowered to decide on capital investments in projects and approval of the same.

Mini Ratna Subsidiaries of CIL are empowered to approve projects upto ₹500 crores. Projects costing above ₹500 crores are sanctioned by CIL Board. For approval of projects costing more than ₹150 crores, financial appraisal by independent financial agencies is mandatory. ECL and BCCL can approve projects costing upto ₹20 crores. SCCL is empowered to approve investment proposal costing upto ₹500 crores. Proposal costing over ₹500 crores, are forwarded to Govt. NLC being a Navratna company is empowered to approve all their mining and power projects by their Board.

Project/ Feasibility reports are normally sanctioned in two Stages. The First Stage or Pre Feasibility Report is approved by the respective company's Board. The same is submitted along with Form-I for Environmental and Forestry Clearance. After obtaining relevant approvals, Stage- II or Final Report is approved by the competent authority. MoEF also has issued generic guidelines for preparation of Pre-feasibility Report.

11.1.2 Suggestive Measures for Improved Project Formulation

The project formulation must address the following basics:

- ✓ Fulfilling coal demand/Linkage;
- ✓ Taking advance action in respect of land acquisition and infrastructure development

- ✓ Exploration/ Geology;
- ✓ Geo-technical studies and investigations;
- ✓ Coal reserves/ Coal Quality/ Depth and extent of mining
- ✓ Mining Method
 - Formulating optimum strategy.
 - Planning future expansion should the need arises
 - Choosing right size of equipment
 - Minimizing coal losses
 - Choosing sites for OB dumps, resettlement, afforestation and infrastructure.
- ✓ Mine Development
- ✓ Targets & Production
- ✓ Power supply, Maintenance and production support facilities
- ✓ Water Supply
- ✓ Outsourcing
- ✓ Coal washing
- ✓ Evacuation & Dispatch
- ✓ Manpower and training
- ✓ Infrastructure Planning
- ✓ Safety
- ✓ Economic viability and evaluation
 - Up-dation of various technical and financial project parameters for estimating capital and operating expenditure;
 - Technical and financial optimization of the projects taking into account the type of mining technology;
 - Incremental viability analysis in case of capacity expansion/ modernization and technical up-gradation of projects etc.;
 - Proper definition of construction and capacity built up periods;
- ✓ Financing/ funding
- ✓ Access to Land
- ✓ R&R
- ✓ Environment & Forestry Issues
- ✓ Implementation Schedule
- ✓ Reclamation & Closure

11.1.3 Advance Action Proposals (AAP) – Formulation and implementation of AAP should be a prerequisite especially for new projects. Availability of land for at least 10 years of operation is to be ensured before sanction of PR. Constructing access roads, arranging power and water supply and site clearance activity are also to be implemented in advance. This practice was in vogue as long as the approval of projects by Government was necessary. Now few of the coal companies are following this procedure and it is important for all the companies to adopt the same.

11.1.4 Infrastructure Planning – Infrastructure layout should be so planned as it does not block any coal resource or cause hindrance to the exploitation of the same. The infrastructure should be in line with the Master Plan of the entire coalfield considering mines of different mine operators.

11.1.5 All projects are to be planned with 100% crushing, sizing and mechanized loading of coal. Provision is to be made for sizing to (-) 100 mm size or (-) 50 mm and Auto Mechanical Sampling as the case may be. Preference may be given for in-pit crushing and conveying systems for opencast mines.

11.1.6 Rapid loading Arrangement with silos should be provided in mines for wagon loading of more than 4 Mtpa capacity mines. No. of existing & proposed Rapid Loading System in CIL is listed below:

Sl.No.	Subsidiaries	Existing (nos.)	Proposed (nos.)	Total (nos.)
1	BCCL	Nil	2	2
2	CCL	1	10	11
3	ECL	2	5	7
4	MCL	2	17	19
5	SECL	4	12	16
6	NCL	11	3	14
7	WCL	Nil	Nil	Nil
	Total	20	49	69

11.1.7 Coal Beneficiation: Washing of non coking coal needs to be promoted and should form an integral part of project formulation. Utilisation and disposal of rejects also needs to be addressed.

11.1.8 Transport net-work: Transportation net-work needs to be addressed while formulating the mining projects. Each project should have connectivity with the nearest railway siding.

11.1.9 Economic viability – The financial parameters should be given due consideration in the changed economic scenario. The guidelines issued by Planning Commission and Ministry of Finance, should form the basis for economic and financial appraisal of the projects. The availability of resources and tying up of funds for timely execution of the project is of utmost importance.

11.1.10 Internal Rate of Return (IRR)– As per the guidelines of Planning Commission and Dept. of Expenditure, Ministry of Finance a minimum Financial and Economic IRR of 12% needs to be ensured for investment decision in the projects. Sensitivity analysis considering the different risk variables like sale value, cost of production, capital investment, production target etc. should be done to assess risk involved in attaining desired IRR of the proposal.

11.1.11 Projects on cost plus basis – when the proposed investment in a project does not yield the desired IRR, the coal companies may consider taking up the projects on cost plus basis in order to fulfill the requirement of 12% IRR on investments with the consent of the linked consumers.

11.1.12 Capitalization of coal mining projects

The guidelines of Ministry of Coal (Nov. 2004) in this regard are reproduced below:

- i) The periods of construction and capacity build-up have to be clearly defined in project reports.
- ii) The period of construction has to be defined to determine the commercial readiness of the project to yield production on a sustainable basis. Most of the basic infrastructure facilities like CHP, railway siding, developmental activities, service buildings, water supply, power supply etc. required for implementing the project would need to be completed within the construction period. The capacity buildup period should be minimal after the construction period is over.
- iii) In case of opencast projects, the volume of stripping of overburden and in case of underground projects, the completion of required developmental activities during the above period of construction have to be clearly defined.
- iv) Based on the above, the capitalisation of revenue expenses/ opening of revenue account will be decided. Revenue expenditure to be capitalised should be net of sales receipts of coal produced during the construction period.
- v) The initial capital of projects will be the investment till the year of achieving the rated capacity of coal production and corresponding overburden removal in that year for opencast projects. However, in case of lignite projects the existing practice of limiting the sanction of initial capital cost till the commissioning/ capitalisation of the project will continue.

11.1.13 Project Completion: Project should be completed according to the project report schedule with achievement of 85% of production capacity and completion of major infrastructure with 90% of capital investment envisaged.

11.2 Project Implementation

There are 117 mining and 13 non mining projects of CIL costing Rs, 20 Cr. & above, under different stages of implementation out of which 76 projects are on schedule and 44 are delayed on account of various reasons as summarized below:

Reasons for Delay	Mining Project	Non Mining Projects
Land Acquisition	24	1
Adverse Geo-mining Conditions	2	
Misc	15	2
Total	41	3

Analysis of Cost and Time overruns in Coal Projects reveals the following:

- χ Delay in forestry clearance
- χ Delay in Environment clearance

- χ Delay in Land acquisition
- χ Problems of rehabilitation of land oustees and Project Affected People (PAP)
- χ Adverse Geo-mining conditions
- χ Law & Order problems etc.
- χ Delay in Procurement of Equipment especially, HEMM
- χ Delay in construction of CHP
- χ Delay in construction of railway siding or evacuation network etc.

State Govt. can play a greater role for acquisition of land and help coal companies in settling the R&R issues. A uniform R&R Policy is desirable for all developmental projects in the country. Though there exists a National R&R Policy and CIL's R&R Policy, most of the state governments have their own policy and coal companies are invariably following them.

The State Governments should identify land which is available for compensatory afforestation. A Land Bank for compensatory afforestation should be created and land should be made available against payment to be made by project proponents. Responsibilities for acquisition of forest land may be restricted to payment of Net Present Value (NPV), afforestation charges etc.

The law also provides for utilization of degraded forest land equivalent to twice the area of forest land proposed to be diverted for compensatory afforestation. The State Govt. may create a land bank and put the details on public domain for speedier processing of the mining projects involving forest land. In the absence of certificate from the state government, MoEF has recently considered afforestation in degraded forest areas by one of the PSUs. The committee constituted by a Group of Ministers under the Chairmanship of Member (Energy), Planning Commission has made certain recommendations in regard to easing out the procedural aspects of forest land acquisition/diversion. The most important thing for consideration of the Government is online application process for EC and FC by MoEF which would help reducing procedural delays in acceptance of proposals. Once the online application is accepted, enclosure of any maps etc. may follow subsequently with the hard copy of the application.

11.2.1 Geo-mining constraints: Complete geo-investigation must be done, before taking investment decision especially for capital intensive UG technologies like longwall to eliminate any uncertainty later on. Sophisticated geological and geophysical, exploration techniques need to be adopted for advance forecasting of the geo-mining conditions.

11.2.2 Equipment Supply and turnkey Execution

The contract management manuals of coal PSUs are quite old and need a thorough review in line with the current developments. Scope for subjectivity should be avoided. More transparent mechanism with IT based procurement systems to be evolved within next two years to cut delays in paper work and decision making. Delegation of powers for procurement by subsidiary companies should also be reviewed.

E- Procurement of goods and services in next one year in all coal companies for better transparency and management should be adopted.

11.2.3 Package Based Contract Management:

A package based contract management system should be devised by coal companies within two years for implementation in coal mining projects with a view to improve contract management, reduce delays and better co-ordination and monitoring among different departments and agencies. The different activities of a project like construction of workshop, CHP, Rly. Siding, power supply arrangement etc. should be considered as a unit of the project and should be tendered, awarded, executed and monitored at appropriate level such that all the activities are completed in time.

11.2.4 Review of delegation of Power

The coal companies should review the delegation of powers to subsidiary companies in one year time at various levels below Board considering enhanced empowerment of coal companies.

11.2.5 Law and Order Problems

These are mainly related to R&R and land acquisition issues and local community engagement. Coal Companies should work closely with the communities affected such that the enduring value of coal mining is well appreciated by the local communities. Coal companies should also work closely with the local authorities in resolving the issues.

11.2.6 Project Monitoring Organization:

The system of monitoring at various levels has been standardized.

- The Director (Projects & Planning) of the coal company concerned is vested with overall responsibility of implementation of projects.
- Project monitoring is done by the Project Officer on monthly or at shorter intervals at, the area level by GMs / CGMs and by Director (Projects) and CMD at corporate level.
- Status of projects is also reviewed at every Company Board meeting.
- Mandatory review of the projects is carried out at the company level when the expenditure of the projects exceeds 50% of the sanctioned capital
- Projects, costing ₹100 crores & above, are also reviewed by CIL Board by exception.
- Quarterly Review in the MOC level by Secretary is taken for major projects costing more than ₹500 crores and more than 3 Mtpa.
- Progress reports in respect of projects costing ₹ 100 crores & above are also submitted to Department of Programme Implementation regularly.
- **Project wise PERT/CPM network (including resource base) for all activities using MS Project software is strongly recommended at area/GM/Company level.**
- Project implementation group needs to be trained in project-oriented software like MS Project in one year time by all coal companies for better control and monitoring of the project, entailing timely completion of the project.
- **Web monitoring system** has been established in many projects to monitor the

status of ordering, engineering, supplies, erection and the physical progress of the site activities. Such systems have been of immense help in identifying the bottlenecks and should be adopted for all the projects.

11.2.7 Sustainable development – Increasingly, with the integration of principles of sustainable development into national legal frameworks, environmental factors are given equal stature alongside economic and other considerations in governmental decision-making. Also emphasized are measures to conserve landscapes, natural and cultural heritage and biological diversity through prudent consumption of natural resources, especially non-renewable ones.

In this regard, preparation and implementation of approved Environment Management Plans, reclamation, rehabilitation and final mine closure of the mined out areas need special attention while planning and implementing the projects.

11.3 Coal Projects

In CIL, currently there are 257 (125 UG+ 132 OC) completed projects having total capacity of 247.77 Mty (52.23 Mty UG + 195.54 Mty OC) and 163 (58 UG+ 105 OC) ongoing projects having of 440.41 Mty (28.84 Mty UG + 411.57 Mty OC).

The number of projects costing more than ₹500 cr. (all OC), in CIL is 15, out of which 4 nos. (27.5 Mty) have been completed and 11 nos. (146.5 Mty) are ongoing.

In SCCL, there are 111 (87 UG+ 24 OC) completed projects having total capacity of 54.31 Mty (23.56 Mty UG + 30.75 Mty OC), and 26 (9 UG+ 17 OC) ongoing projects having total capacity of 39.89 Mty (10.83 Mty UG + 29.06 Mty OC).

The number of projects costing more than ₹500 cr. in (2 OC +1 UG) in SCCL is 3. Out of these OC (4.75 Mty) projects have been completed and 1 UG (2.81 Mty) project is ongoing.

In NLC there are four open cast mining completed projects including expansion totaling 30.6 MTPA of mining capacity.

11.3.1 New Projects

11.3.1.1 XI Plan Projects

CIL had identified 145 projects with an ultimate production capacity of 391.22 Mty in the XI plan period. Of these, 80 projects having ultimate sanctioned capacity of 195.78 Mty have been approved till July 2011 for a capital investment of ₹11293.27 Cr. and are in various stages of implementation. Out of these, 37 projects contributed 80.11 Mt in 2010–11. In 2011–12, 42 projects are expected to contribute 88.71 Mt. 65 identified projects of XI Plan period having a total estimated capacity of 195.44 Mty are under formulation/approval.

11.3.1.2 XII Plan Projects

In the XII Plan period production from Existing and Completed projects of CIL is expected to decline from 218.37 Mt in 2011–12, Terminal Year of XI Plan, to 192.42 Mt in 2016–17. Production from Ongoing Projects is envisaged to increase from 227.63 Mt in 2011–12, to 300.18 Mt in 2016–17 (TY XII Plan), i.e. by 72.55 Mt. Another 62.8 Mt is expected to come from new/expansion projects likely to be taken up during XII Plan. It is envisaged that around 70 new/expansion projects will be taken up by CIL in XII Plan besides around 50 spill-over projects of XI Plan, yet to be approved/formulated.

In SCCL, 33 projects were envisaged for implementation with a capacity of 56.674 Mty during XI Plan Period. Out of 33 Projects, 24 (36.72 Mty) Projects have been taken up during the XI plan period and production started. 2 projects were approved but could not be grounded due to land diversion/acquisition and Rehabilitation and Resettlement of displaced families; for 2 projects, Feasibility Reports (FR) are under preparation; 2 projects are likely to be commissioned during 2011–12; FR of 2 projects have been approved; and 1 project is proposed to be dropped.

For XII Plan, nine new projects are proposed to be taken up.

Group-wise, year-wise production plan of CIL & SCCL is given in Chapter–3.

Lignite production Programme of NLC

In the XII Plan period production from Existing and Completed projects of NLC is expected to increase from 26.02 Mt in 2011–12, Terminal Year of XI Plan, to 31.20 Mt in 2016–17. In NLC, four opencast mines having installed capacity of 30.6 MTPA are in operation. It is expected that production from the proposed Devangudi mines at Tamil nadu will get added from the year 2015–16, production from the proposed Hadla & Palana mines at Rajasthan state is expected from the year 2016–17 onwards.

11.6 Action Plan for XII Plan

- i. Preparation and monitoring of time schedules for Project report preparation for all XII Plan projects by coal companies to be clearly worked out alongwith schedule for obtaining EMP & Forestry clearances, approvals by competent authority, Land Acquisition, Procurement of Machinery, Development of Infrastructure and start of production etc.
- ii. Strict monitoring of project implementation using MS Project software as per PERT/CPM techniques in next one year by all coal companies.
- iii. Web based monitoring of project implementation in next one to two years.
- iv. Devising package based contract management for implementation of coal mining projects for improved contract management and reduced time schedules in next one to two years.
- v. Review CIL contract management in next one year for improving up on the delays in procedural aspects with simplified approach.
- vi. Introduction of E-procurement of goods & services in next one year in all coal companies for better transparency and efficient management.

- vii. Reviewing delegation of powers at various levels as per the enhanced empowerment of coal companies in next one year.
- viii. Online submission of application for EC and FC

CHAPTER– 12

ENVIRONMENTAL MANAGEMENT, LAND ACQUISITION AND R & R

12 Environmental Management

Coal mining like any other industrial activity leaves its environment footprint on the society. The endeavor of the industry is to make coal mining environment friendly in the best possible way. The important legislation relating to environment protection are:

- The Environment (Protection) Act, 1986
- The Environment (Protection) Rules, 1986
- The Indian Forest Act, 1927, Amendment 1984
- The Forest Conservation Act, 1980
- The Wild Life (Protection) Act 1972, Amendment 2002
- The Water (Prevention and Control of Pollution) Act, 1974
- The Water (Prevention and Control of Pollution) Cess Act, 1977
- The Air (Prevention and Control of Pollution) Act, enacted in 1981 and amended in 1987
- The Public Liability Insurance Act 1991
- The Biological Diversity Act 2002
- The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006

Besides, **Mines Act, 1952 & The Factories Act, 1948** also provide for the health, safety and welfare of the workers employed in mines.

12.1 Prior Environment Clearance (EC) for Mining Projects

As per the Environmental Impact Assessment Notification of September 2006 of MoEF, prior Environmental Clearance (EC) is a must for all Mining Projects or activities including that involving Expansion and Modernisation/ Change in lease area / change in capacity / change in product mix. The Clearance is accorded by the Regulatory Authority (RA) on the recommendation of Expert Advisory Committee (EAC), MOEF level or SEAC, State level.

Coal Mining Projects Involving more than 150 Ha. are categorised as Category–A for consideration at MOEF (GOI) and those involving 5 to 150 Ha., are categorised as Category–B for consideration at the State level Environment Impact Assessment Authority (SEIAA) (in the absence of SEIAA, by MoEF). The Initial application is to be submitted in Form– 1 with Pre Feasibility Report. The clearance process involves 4 stages:

- Screening:** applicable only for Category– B projects for sub-categorization into **B1**, requiring Environment Impact Assessment (EIA) Report or **B2**, not requiring EIA Report (as per MOEF guidelines)
- Scoping:** to give terms of reference (TOR), within 60 days of receiving Form– 1.
- Public Consultation:** Complying TOR for Public Consultation to SPCB;
Public Hearing (not required for Category.–B2 projects) is conducted by SPCB,

district wise. Whole process including notice and forwarding of proceedings is to be completed within 45 days. Applicant makes necessary changes in EIA & EMP and submits Final EMP/EIA to Regulatory Authority enclosing the discussions and recommendations of Public Hearing.

- iv. **Appraisal:** EAC/ SEAC give their recommendations on EMP within 60 days to Regulatory Authority (RA) who normally agrees with recommendations. Otherwise RA will refer it back to EAC/SEAC within 45 days, who gives back recommendations to RA within another 30 days which are final.

12.2 Delays in EC

As per EIA notification 2006, the EMP clearance process should take maximum of 210 days but the general experience of coal companies is that it invariably involves some 1½ to 2 years time. Coal companies have attributed this to:

- Delay in finalizing ToR
- Disproportionate details sought with applications
- Delay in conducting Public Hearing
- Delay in appraisal meetings
- Reopening of technical issues during various stages of appraisal
- Imposition of generalised Temporary ban for a broad area irrespective of the fact whether coal mining contribution is high or low.

12.3 Approval of Forestry Proposals

Forestry clearance is granted in 2 stages, Stage- I (in principle clearance) and after observing conditions imposed in St-1 clearance and payments for NPV, compensatory afforestation, etc., Stage- II clearance is accorded.

Project proponent submits details in prescribed proforma to the respective DFO/ Nodal Officer (Forest) of concerned State Govt. who forwards it to Conservator of Forest for formulation of forest proposal for processing of clearance under the Forest (Conservation) Act, 1980. The DFO surveys the relevant forest area required under the possible alternatives. Forest authorities conduct a cost-benefit analysis to assess the loss of forest produce, loss to environment vis-à-vis benefits of project. Compensatory Afforestation (CA) scheme is prepared to compensate loss of vegetation. Equivalent non-forest land is identified contiguous to or in the proximity of Forest. In respect of certain types of proposals, e.g. for Central Govt./ Central Govt. Undertaking, CA may be raised on degraded forest land twice in extent of forest area being diverted. The NPV rate varies from ₹5.8 to ₹9.2 lakh per hectare (as per MoEF Notification dt. 23.04.04) in case of opencast projects and 50% of that for UG projects.

- Regional Offices process cases up to 40 ha.
- Site inspection by Regional Offices mandatory for proposals involving more than 100 ha of forest land.

- Specific time limit for States and Central Govt. for expeditious processing of proposals (90/60 days for State Governments for fresh/ renewal cases and 60 days for Central Government) as per the guidelines of MoEF.
- No forest clearance was accorded in specified time limit of 150 days for fresh proposals and 120 days for renewal cases.

Forest Rights Act 2006

The project proponents are required to submit a no objection certificate from the Gramsabhas/ district authorities under the provisions of FRA 2006 wherever forest land diversion is involved. This process invariably causes delays mainly on account of non-fulfillment of quorum of Gramsabha meetings. As a result, the meetings need to be called for a number of times by the district authorities in order to comply with the provisions of the Act. This needs to be looked into to cut down the delays and obtaining NOC in time.

12.4 CEPI

MoEF through Central Pollution Control Board (CPCB) undertook a study of selected 88 industrial clusters/ areas to identify polluted clusters/ areas. As per the notification of MoEF dated 13/01/2010 (out of these 88 locations) 43 have been reported to be having Comprehensive Environmental Pollution Index (CEPI) score of more than 70. Seven areas cover the major coalfields namely Chandrapur, Korba, Talcher, Singrauli, Dhanbad, Ib Valley and Asansol.

The moratorium imposed on the above areas is delaying the process of Environmental Clearance (EC) for coal mining projects and leading to production loss. In fact coal mining operations do not produce any of the toxins that have been considered as the pollutants in this exercise. After obtaining the computation methodology for determining CEPI, case studies were made for many projects with the available existing environmental data. It was observed that the CEPI for coal projects ranges from 12 to 35, which is far below the adopted critical value of 70.

MoEF has lifted the moratorium from three coalfields namely Talcher, Ib and Singrauli till September 2011 and the same is yet to be lifted from Korba, Chandrapur, Asansol and Dhanbad.

12.5 Recommendations to Speed up the EC & FC Clearance

- i. The process requires Re-engineering with specific provisions for coal mining.
- ii. Standardising Terms of Reference to Opencast and Underground mining projects
- iii. The time taken by coal companies in generating base line data as per TOR can be cut short by taking advance action in collecting base line data.
- iv. Reduce time delays in conducting Public hearing – State authorities to appreciate the issue and cooperate

- v. The recent sequential approval of EC after FC is a deterrent in the progress of coal projects and augmenting coal production. MoEF has now modified the circular to allow simultaneous processing of EC and FC cases. However, the restriction of one year validity of EC continuous and therefore this modification will not be help if FC clearance continues to take 3 to 5 years.
- vi. MoC level review meetings with state governments to facilitate EC and FC
- vii. **EC for entire coalfield or cluster:** Mines be grouped together on the basis of unique environmental concerns, geographical separations for the purpose of preparing cluster-wise EIA/EMP where mines of same owners are located in close proximity
- viii. Coal companies should commence preparation of coalfield/ region wise EIA/ EMP immediately and complete them within next three years. The required hydro geological studies, collection of seasonal data etc. should be done concurrently.
- ix. The stand of MoEF to consider EC in case of expansion of mines up to 25% without deploying additional resources without the need for PH is not practical. Therefore, MoEF should be approached to relax the condition of non deployment of additional resources.
- x. MoEF to immediately adopt submission of online applications for EC and FC and maps if any can be submitted subsequently in hard copy by the proponent.
- xi. MoEF to develop a system of uploading digitized forest maps on their Web site to facilitate coal companies for using the maps for EC and FC applications.
- xii. The forestry clearance (FC) should be streamlined such that FC is accorded within the stipulated 150 days, in place of the current average duration of 3–5 years and more.
- xiii. The moratorium on extending EC on account of CEPI scores has been lifted in only three coalfield areas out of seven and the remaining also need to be cleared.
- xiv. MOEF vide Notification dated 03.11.2009, in Para (8) (i) & (ii), has directed for mandatory use of 25% of fly ash on weight to weight basis in mine stowing, and 25% of fly ash on volume to volume basis in external OB dumps in OC mines under the guidance of DGMS may be taken up for study and reviewed by Ministry.

12.6 Mine closure & Land Reclamation

Over the years of implementation of coal mining projects it has been observed that mine reclamation and mine closure have not been paid proper attention leading to environmental concerns. Ministry of Coal has issued a set of guidelines mandating all the mine operators to undertake reclamation for which approval of Mine Closure Plans by the competent authority is mandatory. Further, mine operators have to deposit an amount of ₹6 lakhs per hectare in case of opencast mine and ₹1 Lakh per hectare for underground mine in an escrow account to be opened jointly with Coal Controller Organization. The

amount from the Escrow Account will be released four years before the final Mine Closure depending on the acceptable reclamation of the mined out area.

The following explains about the land reclamation process in opencast mines in detail.

12.7 Land reclamation in Opencast Mines

About 80% of coal production in India comes from opencast mines. By its very nature of the opencast mining, the land surface is disturbed during the course of mining. The reclamation of the Mined out area commences only after 3 to 4 years of the initial mining operations. Normally the percentage of external dumps does not exceed 20 to 30 percent but increases with the gradient of seam or the stripping ratios. The external dumps are normally permitted to a height of 90 meters. The height of the internal dump is normally permitted upto 90 meters above the original surface level. Sub-benching of 30 meters is done to maintaining the stability of the slope.

Once the dumps get stabilized over a period of time, the biological reclamation of the same is undertaken. Plantation of trees is done in consultation with the local forest department. The species are also selected in consultation with forest department officials with a view to regenerate local flora and fauna. At the end of mining operation certain final void say 20% to 30% will be left out unfilled which remains as a water body.

Satellite Surveillance: In order to monitor the land reclamation work, CIL has introduced Satellite Surveillance Programme for all its OC projects. Presently, 163 OC projects are in operation in CIL out of which 50 major OCPs, are monitored every year. Other mines are being covered once in 3 years. Status of Land reclamation of CIL as on 31.03.2011 is as under:

Subsidiaries	Area Excavated(Ha)	Area Backfilled (Technical (Ha)	Area backfilled (Biologically Reclaimed (Ha)	Total Area Afforested Area* (Ha)
BCCL	2249.41	462.07	230.77	3094.00
CCL	4755.69	1200.00	996.71	4398.00
ECL	3111.10	376.80	215.80	2649.00
NCL	3064.26	996.56	701.56	4997.00
MCL	3652.39	1397.03	714.47	2178.00
NEC	119.62	21.07	19.80	159.00
SECL	6397.07	3908.23	2375.88	8445.00
WCL	5230.30	800.00	532.13	6375.00
Total	28579.84	9161.76	5787.12	32295.00

* The total afforested area includes area biologically reclaimed (on technically reclaimed area shown above i.e. 5787.115 Ha), afforestation over external OB dumps, afforestation in plain land and avenue plantation.

Details of land under possession and requirement during XII Plan

Company	Particulars	Land in Ha.
CIL	A. Total land under possession • Forest land • Tenancy land • Other (pvt. land)	NA
	B. Additional Land requirement during XII Plan	
SCCL	C. Total land under possession • Forest land • Tenancy land • Other (pvt. land)	23,276.12 5011.87 7783.03 10,481.22
	D. Additional Land requirement during XII Plan	7,845.20
NLC	A. Total land under possession • Forest land • Tenancy land (pvt. land) • Other (Govt. land)	13160.64 – 10597.46 2563.18
	B. Additional Land requirement during XII Plan	4666.13

12.8 Use of Fly ash for Land Reclamation

70% of the coal produced in India is consumed by the power sector generating large quantities of fly ash. As per an estimate, a total 160 Mt of fly ash was produced during the year 2009–10 and presently 300 sq. km. of land is being occupied by ash ponds. Thus the fly ash poses a major environmental liability; but at the same time because of its mineralogy and chemistry, it also serves as a re-source material for large-volume applications, e.g. Mine back filling (Opencast and under ground –Hydraulic stowing), stopping and roof supports in U/G mines, manufacturing of cement, road embankments, reclamation of low lying areas, haul roads, road construction, brick manufacturing, agriculture etc.

12.8.1 Present Scenario of Fly Ash Utilization

Environmental safe disposal of fly ash is a challenging task. MoEF's notification dated November 2009 stipulates that:

- No person or agency shall within fifty kilometers (by road) from coal or lignite based thermal power plants, undertake or approve stowing of mine without using at least 25% of fly ash on weight to weight basis, of the total stowing materials used and this

shall be done under the guidance of the Director General of Mines Safety (DGMS).

- No person or agency shall within fifty kilometers (by road) from coal or lignite based thermal power plants, undertake or approve without using at least 25% of fly ash on volume to volume basis of the total materials used for external dump of overburden and same percentage in upper benches of back filling of opencast mines and this shall be done under the guidance of the Director General of Mines Safety (DGMS).

Against the production of 160 Mt, A total of 80 Mt as i.e. only 50% is presently being disposed. There are various areas of coal mining where fly ash could be utilized:.

➤ **Open cast Mining operations**

Fly ash is being used as a backfill material in some of the abandoned mines only after **the case to case basis study of the environmental impact**, especially with respect to ground water quality and air pollution during backfilling and transportation. Some of the mines where this is practiced are South Balanda OC of MCL, Kathara OCP (Quarry no. 1), Sawang OCP (Karmatia colliery), Kargali OCP (6 quarries), Bokaro OCP (6 quarries), Amla Project (Bermo seam), Giddi C OCP (Quarry no. 4), Rajrappa OCP (4 quarries) of CCL and Damoda OC of BCCL.

However, as recommended by MoEF, disposal of fly ash in the working OC mines is not practical mainly on account of safety issues. Basically the blasted OB material swells by around 70% to 80% and occupies more space than the insitu material there by leaving little scope for accommodation of any external material. Where coal seams occur at a gradient, the available space for backfilling gets drastically reduced due to risk of sliding. Moreover the large size OB dumpers i.e. 100T, 170T, 240T carry OB material to dumps and operation of small size trucks carrying fly ash in the same area cannot be permitted.

➤ **Under Ground Mining operations**

Studies conducted by Fly Ash Utilization Programme under Dept. of Science and Technology, GOI, in association with CIMFR have demonstrated that fly ash can also be used as a stowing material to replace sand. The studies were conducted at Durgapur Rayatwari Colliery of WCL, Madhuban colliery of BCCL, PK-1 (Prakasham Khani) colliery and GDK 6A of SCCL. However, arrangement of separation of fines below 53 μ size is a constraint.

12.8.2 Generation and Utilization of Fly Ash in NLC

NLC is engaged in lignite production as well as power generation. NLC is disposing the dry fly ash to the Cement Manufacturing Companies (CMCs) and Brick Manufacturing Companies (BMCs). Presently 16 cement manufacturing companies and 54 brick manufacturing companies are taking dry fly ash from NLC's operated thermal power stations in Tamilnadu. Some ash is also being backfilled in mines, used in roads, flyovers, embankments construction and NLC's Own ash based products (other than bricks).

12.8.3 e-auction

NLC introduced e-auction in TPS– I Expansion for sale of dry fly ash. Out of the allocation to Cement Manufacturing Companies, (leaving 20% to Brick Manufacturing Companies), e-auction is being done for up to 50% of the quantity so far and will be progressively extended to all the Thermal Power Stations so that about 75% of the dry fly ash generated will be disposed off in this manner and the remaining quantity will be earmarked exclusively for brick manufacturing and own requirement.

12.8.4 Thrust by NLC in fly ash utilization:

- i. Use of flyash in civil constructions, brick manufacturing, road making, land reclamation, etc., is being promoted. Various R&D work has been undertaken for:
- ii. NLC is in touch with PWD, district administration, national highways and railways etc.
- iii. For the mines backfilling purpose a suitable methodology is being finalized by engaging a consultant.
- iv. NLC is in discussion with TNPCB for utilizing fly ash for sea reclamation for its proposed thermal power project (1000 MW) in Tuticorin, Tamil Nadu.
- v. NLC already entered into MOU with Tamil Nadu Agricultural University, Coimbatore for popularizing fly ash usage in agriculture as a state wide application fly ash in agriculture crops/soil and for development of fly ash based pesticides
- vi. Development of high performance highways using fly ash composites
- vii. Feasibility study on Calcium reduction in ground water and blow down water of thermal power stations using Zeolite to synthesized from Lignite fly ash :

12.9 Master Plan of Jharia & Ranigaj Coalfields

The problems of subsidence and fires are the result of unscientific mining carried out by the erstwhile mine owners over more than 200 years of operations in these coalfields of Jharia and Raniganj prior to Nationalisation. The population living in the old mining areas has increased many times over the years though these areas became unsafe for habitation. In–spite of the declaration of these areas unsafe by the local administration, the habitation increased unabated. The problem of subsidence and fire are being addressed by the Government from time to time. In this regard a High Level Committee was set up in December, 1996 under the Chairmanship of the then Secretary, Ministry of Coal with representatives from other Departments, Coal companies and the concerned State Governments to deal with the problem in a comprehensive manner.

Based on the recommendations of the Committee a Master Plan dealing with fire, subsidence, rehabilitation and diversion of surface infrastructure in Jharia and Raniganj coalfields within the leasehold of Bharat Coking Coal Limited (BCCL) and Eastern Coalfields Limited (ECL) at an estimated investment of ₹9657.61 crore (₹7028.40 crore for Jharia Coalfield and ₹2629.21 crore for Raniganj Coalfield) excluding ₹116.23 crore

sanctioned earlier for various Schemes under Environmental Measures & Subsidence Control (EMSC) Schemes was approved by the Government in August 2009 for implementation in 10/12 years in two phases of five years each and in case of BCCL 2 years pre-implementation period. Salient features of the Master Plan for Jharia and Raniganj are given in **Annexure– 12.1 to 12.4** respectively.

For implementation of the Master Plan, Jharia Rehabilitation and Development Authority (JRDA) and Asansol Durgapur Development Authority (ADDA) have been notified as implementing agencies by the respective State Governments of Jharkhand and West Bengal. A High Powered Central Committee under the Chairmanship of Secretary (Coal) with representatives from other Ministries/Departments, State Governments of Jharkhand & West Bengal and concerned coal companies, has been monitoring implementation of the Master Plan. Demographic surveys and land acquisition by JRDA and ADDA are in progress.

12.10 Land Acquisition, Rehabilitation and Resettlement (R&R)

Coal mining is a site-specific industrial activity and land is the primary input in coal projects associated with displacement, resettlement and rehabilitation of affected communities. The issue of land acquisition has become very delicate and sensitive in recent times and warrants active involvement of mining companies, Government & non-Government organisations and representatives of the affected communities. Lack of uniform approach by different States throws further challenge to a company like CIL whose operations are spread over in 8 States. Presence of multiple mine operators at the same location both from private and public sectors with their own policies and strategies make the issue more complex.

The issue needs to be addressed from the time of planning, during the execution and after closure of the mine. A uniform and balanced approach would enable the government and mining companies to work together with affected people to build sustainable and prosperous communities with employment and business opportunities and shared responsibilities for culture, religion, customs and values.

12.11 Existing R&R policies in India

- National Rehabilitation and Resettlement (R&R) Policy, 2007 – Ministry of Rural Development, Government of India.
- R&R policies of various coal-producing states of India.
- R&R policy of CIL– modified in 2008 in consonance with the National R&R Policy, 2007, which is more liberal than National Policy

While CIL has its own R&R policy, SCCL is following the R&R policy of the State Government of Andhra Pradesh. NLC is following National R&R policy while also considering Tamil Nadu Acquisition of Lands for Industrial Purposes Act 1997. Rates are settled under a tripartite agreement. For quickly settling the compensation for the acquired lands through Lok Adalat (Peoples' Court) at the rates negotiated publicly before the District Collector cum R&R Administrator and the Elected Representatives/Minister

from the constituency, Land is mainly acquired under the Coal Bearing Areas (Acquisition & Development) Act, 1957 and in certain cases under the Land Acquisition Act, 1894. Land is also purchased directly after negotiations with the land owners. Govt. coal companies make proposals to the Ministry of Coal under the CBA (A&D) Act, 1957. Proposals are scrutinized in the Ministry and the Central Government acquires land by issuing notifications under sections 4(1) (for prospecting/exploration for coal), 7(1) (declaring Government's intention to acquire the land and calling objections from the land owners/State Government) and 9(1) (for acquisition of land by Central Government). After acquiring the land, the rights and titles are transferred to the concerned coal company through an order under section 11(1). As per the provisions of this Act, the Lease for Coal comes automatically to the concerned Govt. Coal Company. However, getting physical possession of land poses some problems.

Proposals under the Land Acquisition Act, 1894 received from the coal companies are verified in the Ministry who makes requests to the State Authority (the District Collector) for acquisition of the land. Further action regarding issue of the relevant notifications etc. and transfer of land to the coal company is taken by the State Government. The proposals made by the coal companies for land acquisition are based on the project report for coal projects.

The salient features of the R&R policy being followed by Coal India Limited which contributes to about 85% of national coal production are as follows:

Besides receiving monetary compensation for the land acquired, persons from whom land is acquired will be entitled to:

1. One employment for every two acres of land acquired Subject to suitability and availability of vacancies OR cash compensation in lieu of employment:
2. Persons whose homestead is acquired: In addition to the above, resettlement benefits towards compensation of homestead land of the land losers are as under:
 - (a) Alternative house site measuring 100 sq. meter per family with all necessary basic infrastructure
 - (b) Each affected family that is displaced shall get a one-time financial assistance of ₹10,000 for shifting of the family, building materials, belongings and cattle.
 - (c) Each affected family that is displaced and has cattle, shall get financial assistance of ₹15,000 for construction of cattle shed etc.
 - (d) Each affected person, who is a rural artisan, small trader or self-employed person and who has been displaced shall get a one-time financial assistance of ₹25,000 for construction of working shed or shop.
 - (e) Each affected family will get subsistence allowance of 25 days Minimum Agriculture Wages (MAW) per month for one year;

OR

- (f) Each affected family will be offered one-time lump sum payment of ₹1,00,000 in lieu of all benefits given in 3(a) to (e).
- (g) Tribal affected family will be given one-time financial assistance of 500 days of MAW for loss of customary right or usages of forest produce.
- (h) Tribal affected families resettled out of the district shall be given 25% higher rehabilitation and resettlement benefit.

3. Sharecroppers, land lessees, tenants, day labourers, landless tribals, tribal dependent on forest produce: the subsidiary companies assist PAP to establish non-farm self-employment through the provision of infrastructure, petty contracts or formation of cooperatives or jobs with contractors. Contractors are persuaded to give jobs to eligible PAPs on preferential basis, where feasible.

12.12 Challenges in Land Acquisition

The acquisition problems are basically linked to R&R issues are non-availability of valid title documents, demand for higher compensation over and above that prescribed in the land acquisition rules, resistance to shifting to rehabilitation site even after receiving full compensation amount.

In absence of a specific National law prohibiting, purchase of land, settlement of population and construction activity in prospective mining area or coalfield, land mafia and vested interests also come into picture taking advantage of considerable time lag since the coal is first proved and a mine is projectised; and land is taken into possession by the mining company.

12.13 Strategies for Land Acquisition

- i. Acquisition and physical possession of land – Securing the active cooperation of State governments in the critical role of supporting land acquisition, possession, R&R.
- ii. Resettlement of people displaced by coal mining operations – arriving agreement on compensation for affected communities, especially where there is no scope for direct employment, with due regard for religious and cultural values
- iii. Effective engagement with communities – Achieving sustainable social and economic development through forward and backward linkages, including reaching long-term economic independence from the mining company
- iv. Overcoming negative perceptions of coal mining operations
- v. Addressing trauma related to home and livelihood displacement of affected people
- vi. Management and resolution of conflicts with communities affected by operations including lack of transparency

- vii. Sustainable and enduring local value of mining benefits during and after closure, including environmental considerations and appropriate land use after operations are over

12.14 Monitoring

For carrying out the above functions effectively, formation of the following set-up is suggested:

- The Inter-Ministerial Committee with the representations from key Ministries and State Governments for expediting land acquisition and securing environment and forest clearances. It will be headed by Special Secretary / Additional Secretary (Coal) and will meet once in four months.
- Co-Ordination-Cum-Monitoring Committee/ Taskforce under the Chairmanship of the Chief Secretary of the state concerned with the representatives from Ministry of Coal, concerned coal companies, district authorities, elected representatives of local area and community representatives. The purpose of the task force would be to address all issues related to the acquisition and physical possession of land as well as R&R. The High-level Task Force to meet at least once in every three months.
- District Level Committee in coalfield areas under the Chairmanship of the District Collector with representatives of the concerned coal company, other district authorities, elected representatives of local area, community representatives and local police authorities. Meetings to be held every month. The purpose of the Committee would be to follow up decisions made by the High-Level Task Force, ensuring implementation and reporting back on progress.
- Company-Level Committee under the Chairmanship of the Director of the concerned company project representatives, local representatives and relevant NGOs. Meetings to be held monthly. The purpose of the Company-Level Committee would be to formulate proposals for the project area, seek approvals and ensure that a suitable course of action is taken.

12.15 Govt. has recently introduced two new bills: one pertaining to sharing of 26% of profits with the PAPs and land acquisition bill with a proposal for enhanced compensation to the land losers. If these come through the coal companies would need to review their strategy for land acquisition and related matters.

12.16 Recommendations

- i. The process for securing approvals of land acquisition is cumbersome and takes an excessive amount of time to complete. The specified time period between different Sections, especially Sections 4 to 7 and 11 of CBA is commonly three years. This process should be reviewed in order to find ways to reduce the time period required.

- ii. State Government officers, Forest officials should be engaged on deputation to coal companies to expedite land acquisition and compensation arrangements.
- iii. Often, land records with State Authorities are inaccurate or incomplete. This leads to delays in processing acquisition of land and disputes over ownership and size of land plots. Updating and computerisation of land records supported through survey of land is essential.
- iv. Govt. should make suitable legislation to stop construction on coal bearing land.
- v. Value of land is negotiated with landowners on the basis of market value plus premium.
- vi. The needs of communities and project-affected people are taken into account in consultation with the affected persons in devising and funding R&R activities.
- vii. Schemes should be formulated and implemented at regular intervals for the sustainable economic development of affected communities.
- viii. Coal companies should take possession of the entire area of land required for the life of the project at one go. However, the existing provision of extending employment needs to be replaced with some innovative methods providing for regular monthly income to the land losers over the life of the project or for a period of thirty years from date of physical possession, whichever is more beneficial.
- ix. The existing company-level units for land acquisition and R&R should be strengthened to take responsibility for improving land acquisition processes, led by suitable senior staff.
- x. Information technology and systems should be given higher priority in policy, ensuring that resources are allocated to enable improved storage, retrieval and sharing of information to be achieved.
- xi. Focused approach on reducing land degradation and improved reclamation.
- xii. Funds set aside for mine closure, which is released according to progress. Government should monitor closure process to ensure standards are met.
- xiii. Coal companies should establish a separate cell to land reclamation and mine closure activities and strengthen them with experts/ professional manpower in next one year.
- xiv. Returning land to state government or others after cessation of mining activities.
- xv. CBA Act need to be amended to facilitate returning of reclaimed mined out land by coal companies.
- xvi. Coal companies to immediately declare the areas in mines where backfilling /stowing can be made using flyash.
- xvii. Future use of land is to be planned to enable economic development, agriculture, housing, industrial use, recreational amenities, forestry, fisheries, water storage etc.

- xviii. An effective monitoring mechanism will be used to ensure that activities are being managed as agreed and that complaints receive appropriate responses. Third party / external monitoring of mined out area to be implemented in all coal companies.
- xix. Government to devise schemes for economic benefit to the community.

CHAPTER-13

CLEAN COAL TECHNOLOGIES

13.1 The technologies employed and being developed to meet coal's environmental challenges collectively referred to as Clean Coal Technologies (CCTs). Broadly CCTs include washing of coal, Coal Gasification, Coal Bed Methane/Coal Mine Methane extraction, Underground Coal Gasification, Coal Liquefaction or Coal to Liquids (CTL), coal conversion technologies like Integrated Gas Combined Cycle (IGCC) for power generation, Carbon Capture and Storage (CCS), etc. Government has laid thrust on clean coal technologies to mitigate adverse impact of coal usage on environment.

13.2 Coal Beneficiation/washing:

The main drivers of promotion of CCTs are environmental stipulations as well as economic benefits. Following the MOEF's directive restricting use of coal of not more than 34% ash content at thermal power stations located far away from pit heads and load centres and critically polluted areas, usage of washed coal has assumed significance. This has also contributed to improvement in economics of operations of such power stations. The washed coal supplies increased from a level of 17 million tonnes in the beginning of the Tenth Plan to about 36 million tonnes by the end of the XI Plan. The requirement of washed coal for thermal power generation is projected to be around 250 million tonnes by the end of the Eleventh Plan. However, the capacities did not grow as desired. The present capacity of thermal coal washeries of about 96 million tonnes is envisaged to increase to 175 million tonnes by the end of the XII Plan, including CIL and private sector. Details are furnished in Chapter-7 on coal quality & Beneficiation.

13.3 Coal Bed Methane (CBM) & Coal Mine Methane (CMM)

Methane gas is an inherent component of coal which is associated with it in adsorption form. Methane in coal seams poses safety problems while mining coal, particularly through underground method. It is therefore important to extract the associated methane gas from coal before mining of coal, which would provide additional source of energy and reduce emission of potential green house gas in to atmosphere and improve safety of mining operations. Extraction of methane from virgin coal seams is known as Coal Bed Methane (CBM) and that from working mines is known as Coal Mine Methane (CMM).

Development of Coal Bed Methane/Coal Mine Methane was given fillip through a policy of Government of India in 1997 as per which Ministry of Coal (MoC) and Ministry of Petroleum & Natural Gas (MoP&NG) are working together and government has offered 33 blocks in four rounds of bidding for CBM covering 17416 sq. km of area. One block in Raniganj coalfield has commenced commercial production in 2007 and two blocks are in advance stage of commencing production. Director General of Hydrocarbons under MoP&NG is the regulator for CBM activities in the country.

CBM/CMM clearance house has been established in CMPDIL, Ranchi in collaboration with United States Environment Protection Agency (USEPA) which will provide information for development of CBM/CMM in India.

Coal Mine Methane (CMM)

One demonstration project of CMM through underground boreholes in BCCL has been implemented in association with UNDP/GEF. CBM obtained through vertical bore well in this project is producing 500KW of power and is being supplied to BCCL colony.

CMPDI has formulated a tender document after prolonged due diligence with the industry for commercial exploitation of CMM in 5 areas viz. Moonidih, Putki Balihari & Mohuda Block in of BCCL and Ashnapani-Jaranghdi block, North kithara-I,II & III and Uchitdih blocks in CCL, where coal seams have been extensively worked out in the upper horizons and lower horizons are virgin which can be targeted for CMM exploitation. However the tenders are yet to be finalised.

13.4 Coal gasification:

Surface gasification of coal is a method of converting coal in to gas in gasifiers by reacting the raw material at high temperatures with controlled amount of oxygen or steam for production of syn gas for various industrial purposes. Gasification is a more efficient way of using fossil fuel than directly burning the same. Now more advanced and highly efficient gasification technologies are available for application in the industries. Many by-products like ethanol, methanol, DME etc. and the gas produced is used as feedstock for manufacturing urea, Ammonium Nitrate etc.

Some of the earlier coal gasification plants of fertiliser industry were closed down for economical considerations. However, some of the sponge iron plants are planning for surface gasification route. Now more advanced and highly efficient gasification technology is available for application.

13.5 Underground Coal Gasification (UCG):

UCG has the potential to exploit the coal resources regarded as either uneconomic to work by conventional underground coal extraction or in accessible due to depth, geology or other mining and safety considerations.

Underground Coal Gasification is a method of converting un worked coal into a combustible gas which can be used for industrial heating, power generation or the manufacture of hydrogen, synthetic natural gas or diesel fuel. The main gasses produced are carbon dioxide, methane, hydrogen and carbon monoxide. The gas can be processed to remove its CO₂ content thereby providing a source of clean energy with minimal greenhouse gas emissions.

The feasibility of UCG has been examined in many countries and a few have undertaken field trials mostly in shallow depths. In Australia some major studies have been carried out on UCG at Chinchila project where gas generated was used for power generation.

However, some recent work in Europe has focused on exploitation of UCG in deep coal seams using guided drilling techniques. The technical feasibility of UCG at depth was demonstrated in field trials in Belgium and Spain. Currently, UCG operations on commercial scale are reported from Angren of Uzbekistan & Mazuba of South Africa.

Gasification of coal including surface gasification and UCG has been notified as one of the end uses under captive mining policy for allocation of coal blocks to potential entrepreneurs. Govt. has also issued guidelines for conducting UCG and five lignite blocks and two coal blocks have been identified for offer.

Coal India Ltd. and NLC have entered into an MOU with ONGC for development of UCG. ONGC in turn has entered into an MOU with Scochinsky Institute of Mining, Russia for UCG technology. GIPCL in association with ONGC has proposed to takeup UCG at the Vastan lignite block in Gujarat.

CIL has floated tenders for developing UCG projects in two of the blocks in their command areas viz. Kaitha in CCL and Tesgora in WCL. The tenders are yet to be finalised.

There are significant reserves of coal at greater depths encountered during the course of oil drilling and these can not be conventionally mined. Such areas should be targeted to develop UCG projects either through PSUs or through JVs or through PPPs.

13.6 Coal Liquefaction or Coal to Liquids (CTL):

It is basically a technology/process to convert coal into liquid fuel. The liquid fuels produced through this process are suitable for transportation application by the removal of carbon or addition of hydrogen, either directly or indirectly.

In direct coal liquefaction coal is converted to liquid fuel in a single process with catalytic hydrogenation. In indirect coal liquefaction coal is first gasified and then converted to liquid.

In this way coal can act as a substitute for crude oil. However, the cost effectiveness of coal liquefaction depends to a large extent on the world oil price with which in an open market economy, it needs to compete.

Germany produced substantial amounts of coal derived fuels during the 2nd World War and South Africa due to embargos during the period 1950 to 1980 and is continuing large scale production of liquid fuels today. The Secunda plant of SASOL, South Africa, is reportedly producing about 160,000 barrels per day or 7.8 million tonnes per annum of product fuels and chemicals.

Government has notified CTL as one of the end uses under captive mining policy and allotted two coal blocks in Talcher coalfields of MCL, one each to M/s Strategic Energy Technology Systems Ltd. (SETL) and M/s Jindal Steel & Power Ltd. (JSPL). The names of the

coal blocks allotted are North of Arkhapal–Srirampur Block to M/s SETL and Ramchandi to M/s JSPL. These projects are planned to produce some 80000 barrels of diesel per day in addition to other products and generation of power and are likely to be commissioned by 2017–18.

13.7 The clean coal technologies related to combustion of coal are mainly being dealt with in the power sector. These technologies are envisaged to improve the overall efficiency levels of power plants and reduce emissions of CO₂. Specific coal consumption levels are also envisaged to reduce with adoption of these technologies.

As compared to pulverised coal (PC) burning technology being adopted widely the fluidised bed combustion (FBC) techniques, super critical and ultra supercritical technologies and integrated gas combined cycle (IGCC) techniques are expected to provide for higher efficiency by burning available carbon in the coal and reduce specific coal consumption per unit of electricity generated and thus the gas emissions.

An **Integrated Gasification Combined Cycle, or IGCC**, is a power plant using synthesis gas. This gas is often used to power a gas turbine whose waste heat is passed to a steam turbine system (Combined cycle gas turbine). An Integrated Gasification Combined Cycle, or IGCC, is a technology that turns coal into gas – synthesis gas (syngas). It then removes impurities from the coal gas before it is combusted. This results in lower emissions of sulfur dioxide, particulates and mercury. It also results in improved efficiency compared to conventional pulverized coal.

IGCC along with **Carbon Capture and Storage (CCS)** is expected to minimise the CO₂ emissions and provide clean power. However, the technology is still under research stage and needs to be proved for commercial scales. Ministry of Power is the nodal agency for CCS related activities.

Power sector is pursuing the energy efficiency improvement programmes through renovation and modernisation schemes and adoption of super critical technologies. NTPC in association with BHEL is planning for a 100 MW IGCC pilot plant. AP Genco and BHEL have also taken up 100 MW IGCC Plant at Vijayawada in AP. However, the progress in this regard is not clear. IGCC using Indian coals is of importance to the industry as the earlier implemented IGCC Plants worldwide either used better quality coal compared to Indian coals or pet-coke.

Ultra Super Critical Technologies – Conventional coal-fired power plants, which make water boil to generate steam that activates a turbine, have low efficiency. Supercritical (SC) and ultra-supercritical (USC) power plants operate at temperatures and pressures above the critical point of water, i.e. above the temperature and pressure at which the liquid and gas phases of water coexist in equilibrium, at which point there is no difference between water gas and liquid water. This results in higher efficiencies. Supercritical (SC) and ultra –supercritical (USC) power plants require less coal per

megawatt-hour, leading to lower emissions (including carbon dioxide and mercury), higher efficiency and lower fuel costs per megawatt.

13.8 Carbon Capture & Storage or CCS involves reducing carbon emissions from fossil fuel power plants and other heavily emitting installations such as steelworks and cement factories. The process consists of three stages – capturing the carbon; transporting it by pipeline or ship; and storing it in suitable geological formations. While there are challenges in transporting and storing CO₂, they are relatively straightforward. Capture is the most complex and expensive stage, accounting for about 80% of the cost of CCS. There are three options: Pre-combustion capture converts the fossil fuel (the technology can be used for coal, oil or gas, and indeed for biofuels) into a mixture of hydrogen and CO₂ and then separates the CO₂, leaving the hydrogen to be used as a clean CO₂-free fuel. Oxyfuel capture burns the fossil fuel in pure oxygen rather than air. This raises the combustion temperature and produces CO₂ and steam. The CO₂ can be trapped by condensing the steam. Post-combustion capture removes CO₂ from the exhaust gases using Solvent.

Ministry of Coal is closely working with different forums (bilateral as well as multilateral) viz. Indo-US coal working group, Indo-EU coal working group and India-Japan coal working group for promoting clean coal technologies.

13.9 Action points for XII Plan

- CIL should take up at least two to three CMM projects in their command area in next two years
- CIL should take up at least one UCG project in next one year
- Government should consider giving Phillip to UCG by means developing a policy in line with CBM policy on urgent basis
- Government should consider allotting some coal blocks for surface coal gasification
- Coal beneficiation needs to be developed covering washing of all coals by the end of XII Plan

CHAPTER– 14

AUTOMATION & APPLICATION OF INFORMATION TECHNOLOGY

14.0 INTRODUCTION

Automation is the key to high productivity, production and safety. The information revolution of the country is gradually getting into mining industry and has a significant impact on mine operations. Information Technology (IT) is cited frequently as one of the most important tools for improving productivity and decision making.

14.1 Technology /Products for Automation

- Advanced Control Systems
- Supervisory Control & Data Acquisition System (SCADA)
- Wireless Sensor Networks
- Remote/ Intelligent I/Os
- Sensor & Sensor Networks,
- Display Systems
- Warning Systems
- Enterprise Resource Planning (ERP)/ Supply Chain Management Software
- Management Information System

14.2 Typical Applications of Technology

- On line Coal Analysis
- Real time monitoring of mine environment for prevention of fire in underground coal mines
- Robotic applications in difficult/hazardous areas of work
- Disaster Management System using real time data
- Geographical Information System for controlling movement of HEMM/Coal trucks
- Intelligent Transportation System Solutions for transport vehicles used in coal mines
- Safety of personnel
- Information flow
- Water level in underground mines,
- Lab analysis of quality of coal,
- Storage, transportation, order booking etc.

Some of the areas where automation/IT has been applied in coal sector are as follows:

- i. Real time Trip counting system at Open cast mines with latest technologies like GPS, GIS, GSM, RFID, Wi-Fi
- ii. Proximity Warning system for HEMM at Opencast mines
- iii. Truck movement monitoring system at weighbridges and coal handling plants mines with latest technologies like GPS, GIS, GSM, RFID, Wi-Fi
- iv. Online Underground air and gas monitoring systems (CH₄, CO, Temp.)
- v. UG communication system and Miners' tracking with Warning system for the miners entering the unsafe areas

- vi. Web based Mine management system
- vii. Computerization of Exploration department activities in central server architecture
- viii. Surveillance systems at sand stowing bunkers and for conveyor belt analysis
- ix. Slope Stability Radar monitoring tool to manage mining risk
- x. Mains power failure alarm with auto SMS alert at important locations like mines, ventilation fans
- xi. Blast Information Management System for storing, managing and retrieving drill and blast related information including Explosive Consumption & Costing (Pattern Analyser Software)

4.3 Application of IT

Enterprise Resource Planning (ERP)

An SAP-ERP system in coal mines in the country has been introduced by SCCL w.e.f. July 2008 covering the business processes related to Purchase & Stores, Marketing & Dispatches, Quality Management, Human Capital management, Finance & Accounts and Costing.. CIL is also considering integration of its operations through implementation of ERP systems. Now it is planned to enlarge scope by implementing all the functionalities available in SAP and which are relevant.

- EAS (Enterprise Asset management) viz. Plant Maintenance
- Project System for monitoring of all resources of all major projects
- IS Mining Solution related to Transport management, remote logistics, Ore blending etc
- Enlarge the HCM scope by implementing Career planning, Training, recruitment, RoR
- Production module for production system
- Provide a portal based interface for B2B transactions, E2E transactions, B2G transactions
- Real Estate Management for tracking all real estate assets
- e-Procurement system viz. PPS module for facilitating on-line bidding for procurements etc.
- CRM (Customer Relationship Management) for providing a portal interface to all Customers
- Business Objects for self design of reports & dash boards
- Simplify UI (User Interface) with 3rd party tools

Technical management of SAP system

- MDM (Master Data Management) tool for Master Data Maintenance & purification.
- Open Text / Data Archiving solution for archiving data
- TDMS (Test data management Server) to create test scenarios for sound testing & Volume testing.
- Server virtualisation & cloud computing

Mining equipment will increasingly be fitted with Global positioning systems, sensors and information-processing capabilities to control and manage operations. As advanced

equipment becomes more widespread, communications and data networks will enable mine-wide process integration and control capabilities to tie more operations at the mine site together. Ultimately, these networks will supply data to a central control where it will be layered in to provide a range of services and support functions, such as mine planning and equipment-maintenance solutions.

CIL's ERP Project

As recommended by IT Consultant M/s. Deloitte, Coal India Limited decided to adopt a new IT policy, since the existing IT set up was found to be inadequate to cater to the business needs due to its fragmented nature. It was recommended that CIL should go for "off the shelf Enterprise Resource Planning (ERP) system" to cater to their business needs covering its data, voice and video requirements.

The new project comprised of major four areas of operation viz network infrastructure upto project level; procurement of SAP license and its implementation; data centre establishment; and all related services and post warranty maintenance. The duration of the project is envisaged to be three years with one year warranty services and two years post warranty maintenance. However, the tenders are yet to be finalised.

4.4 Thrust Area in XII Five Year Plan – Coal Sector

Following thrust areas have been identified for Automation & Application of Information Technology in XII Five-year plan:

- i. **Infrastructure upto Colliery / Project Level:** Top Down approach of is to be adopted for various business functions including IT infrastructure is to be laid at subsidiary Hqs. and to be extended to area level. Use of Local Area Network (LAN), providing Nodes of area serving at various points (including weigh bridges, workshops *etc*) and wide Area Network (WAN) for connectivity with area servers. It is proposed to provide "**Internet Technology**" in each colliery/projects.

This system will provide information about outside industry through browsers like new technology of mining, mining equipments and their technical details, price of product, cost of production, government policies and other information *etc.* worldwide along with e-mail facilities.

- ii. **Coal Production**

It is important that as we introduce bigger sizes of equipment, auxiliary facilities like workshop also automated. Mechanised/ automatic dumper/dozer washing facility, automatic tyre handlers etc should be planned matching with HEMM.

- iii. **GPS Based Truck Dispatch System:** CIL has introduced the system in some of large OC mines. The system should be introduced in all opencast mines in next one year.
- iv. **Automation in workshop:** Dumper washing chamber should be introduced with full automation. The mobile workshop van with modern and sophisticated equipment should be introduced to attend the maintenance requirement at the face.

- v. **In underground mines, man riding system, or travel of persons through belts** as practices in other countries can reduce idle time.
- vi. **Online Weighment and Sampling System:** At all railway sidings and dispatch points, online weighment and sampling system should be introduced.
- vii. **Sophisticated Surveying Equipment:** Target less total station surveying instrument, terrestrial laser scanner should be introduced in mines. Pit and dump slopes should be monitored with slope monitoring radar to get the indication of failure beforehand.
- viii. **Sophisticated/modern blasting accessories:** The modern/ sophisticated blasting system including accessories should be used at the mines. Modern vibration meter should be used in case of opencast mine using large quantity of explosive to monitor the vibration level nearby the built-up area.
- ix. **Integrated Application Software:** The Software should be implemented in CIL, subsidiary Hqs. and all the areas of Coal India. This would introduce Uniform data and file structures, enhancement in Management Information System (MIS) etc. This Software is to be enhanced / enriched by providing support through standard ERP solution so that it could function as Decision Support System for the organization. The implementation of the software at mine / project level should be extension of the system from respective areas through redundant data communication system.
- x. **Planning Software:** Software MINEX, AUTOCAD etc. are being used for planning purposes. They should also be introduced at all projects. All old Feasibility Reports, Mining Plans and other reports should be digitized and stored in electronic form.
- xi. **Project Monitoring Software:** For monitoring of project activities software like, MS Project should be used.
- xii. **Geographic Information System (GIS):** Mapping, spatial concepts, and time/space operations technology is absolutely essential to effective mining. GIS technologies create efficiency and productivity opportunities in all aspects of mineral exploration and mining. GIS enables a mineral exploration geologist and mine operator to mine intelligently, efficiently, competitively, safely, and in an environmentally compatible manner. GIS can be introduced in the areas of Mine Planning, Mine Management, Social and Environmental Management. This will provide storage of all mine maps in digitized format making updation of the map easier, easy location/access of various installations and its shifting, Social Impact Assessment at Coal Mines like Resettlement and Rehabilitation, Provision of basic infrastructure in resettlement villages, General guidance on Environmental monitoring etc. It is proposed to introduce GIS Centre in each area of the subsidiary companies.
- xiii. **Integrated Safety, Production & Environment Monitoring and Control in Under Ground Mines:** So far IT application has not been introduced in Underground mines. It has been used for Voice communication only. A computerized system in mines to provide monitoring of Safe level of Hazardous Gases, Water level in Sump and Pumping System, running of Idle Conveyors, level of Coal Stock in the bunker, Health Monitoring of UG equipments, monitoring of SDL/LHD, Long Wall and

Continuous miners etc. are required to be introduced in these thrust areas so as to monitor and control these aspects of safety and production, from the pit head.

- xiv. Companies on Coal India Domain with a uniform user name identification. All the subsidiary companies will be able to utilize the Mail Server for external as well as internal Mail.
- xv. **Employee Biometric System:** As on date Identity Card with photo, Name, Employee No. Designation is issued to employees of Coal India and subsidiary companies. It is suggested to provide multipurpose Electronic Digital Card (Smart Card) to each employee with Biometric Identification. It will contain information such as Employee Personnel Details, Contribution towards Social Security, Salary Earnings and Deductions, Leave Details, Health Information etc. The card will be updated on regular basis and will be utilized for Attendance Recording, Personal Identification, Availing Medical Facility, Settlement of Terminal Dues, identification for CMPF Settlement etc. For this Card Reader/ Biometric Sensors should be installed at CIL, subsidiary Hqs., Area, Projects/Collieries etc.
- xvi. **E-Governance:** CIL has taken initiative towards e-governance by way of implementing sales and marketing through e-auction, corporate e-banking (in some of the subsidiaries), e-tendering etc. it is proposed to enhance the activity towards better and transparent customer/vendor relationship. The areas to be covered are introduction of e-banking for all payments, e-procurement, e-auction for Rail and Road Sales, Introduction of Document Management System for proper storage and quick retrieval of information / data.

14.5 Network Initiative

The broad scope of work for the implementation of IT, network infrastructure in XII Five Year Plan would involve setting up of Data Centers and interconnection between the data centres through VPN WAN Connectivity from two different ISPs, wireless network in the last mile, establishment/upgradation of LAN at all the locations, security for the entire network, VPN connectivity from external world, anti-virus, anti-spam, patch management and Enterprise Management System(EMS) and Network Management System(NMS).

The CIL network would be based on established standards, state-of-art technologies, and suitable topology with the flexibility to expand and upgrade to cover CIL and its subsidiary companies as per the table given below. All existing and future applications, communication and IT infrastructure would run across the same network. The CIL network will be a scalable and high capacity network to carry data, voice and video traffic between different offices and location of CIL and its subsidiary companies. The same network will also be a single point Internet gateway at CIL for all network nodes/office under CIL and its subsidiary companies. 100% connectivity of all offices and mines round the clock across CIL is a primary requisite

14.6 The Knowledge Hub

The need for an IT based Knowledge Hub in Coal India would be addressed which would help to connect, collaborate, learn and innovate. The Knowledge Hub would be an online

knowledge network for professionals in Coal India, cutting across geographical barriers. It would enable people from all parts of the company to work together and share experiences. This sharing and learning would improve services and bring in intellectual prosperity.

Knowledge Hub would take information from everywhere inside the system and many places throughout the web, and enrich people in things that they are engaged and interested in.

An openly-accessible online public library kind of system would contain good practice material recommended by peers. Common Knowledge would bring together shared understanding and intelligence on common subjects.

The Knowledge Hub will also facilitate data transparency, through its facilities for publishing open data and providing common tools for accessing data. CMPDI being the planning and design hub, and an appropriate centre for e-knowledge aggregation, would host the Knowledge Hub.

14.7 Information Technology at Neyveli Lignite Corporation

NLC is consistently and steadily involved in the computerization of various activities

14.7.1 IT Projects Implemented During XI Plan Period

- 1) OLIMMS: (Online Integrated Materials Management System)
- 2) Implementation of Biometric based Attendance Management System and integration with payroll processing
- 3) CCTV Video Surveillance System:
- 4) NLC campus LAN and WAN establishment:
- 5) Computerisation of Disposal Management System and Lignite Auctioning System
- 6) Centralised Project Monitoring System (CPMS):
- 7) Computerisation of Mine planning, Geological, Hydrological operations and Survey functions of the Mines
- 8) Mining Equipment Management System (MEMMS) implementation in all three Mines
- 9) Implementation of Cyber Security measures
- 10) Computerisation in Thermal Power Plants
- 11) NLC GH – Teleconsulting system with super specialty Hospitals

14.7.2. NLC IT Plans For Twelfth Plan Period

- 1) Centralised Database implementation with DC-DR IT infrastructure formation
- 2) End-to-end computerization of Corporate Contract Management System(CPMS).
- 3) Implementation of IPV addressing scheme
- 4) Drug Accounting System in NLC GH
- 5) Implementation of Online Performance Management System
- 6) Performance Appraisal System – PAR,
- 7) Performance Related Payment System (PRP) and

- 8) Productivity Plants and the Organization.
- 9) Re-engineering and restructuring of Payroll Personnel Accounting, Financial Accounting, PF Accounting Systems by workflow process and control tools
- 10) Implementation of Equipment Maintenance Management System for all Units
- 11) Centralized Project Management System
- 12) Implementation of Cyber Security Measures and strengthening the IT infrastructure against Cyber Threats :
- 13) Digital Access Library for all SME and CME equipments Drawing Management
- 14) E-Governance Activities
- 15) Computerisation of Legal Management System
- 16) Employee Records Document Management System
- 17) Retrofitting of Integrated Voice and Data Communication Network (IVDFN)

14.8 Action for XII Plan for Improving Automation & IT Application

The followings need to be implemented:

- i. GPS Based Truck Despatch System in next one year
- ii. Automation in workshop
- iii. Man riding system in underground mines
- iv. Online Weighment and Sampling System
- v. Sophisticated Surveying Equipment
- vi. Sophisticated/modern Blasting Accessories
- vii. Integrated Application Software
- viii. Planning Software like MINEX, AUTOCAD etc.
- ix. Geographic Information System (GIS)
- x. Integrated Safety, Production & Environment Monitoring and Control in UG Mines
- xi. Employee Biometric System

CHAPTER– 15

RESEARCH & DEVELOPMENT

15 RESEARCH & DEVELOPMENT

- 15.1** Soon after Nationalization of the coal industry in mid 1970's, the three pronged approach for Research and Development in coal, viz. Coal S&T Programme under the Standing Scientific Research Committee (SSRC) under Ministry of Coal, in house Research and Development Programmes of coal companies and Inter-Sectoral Science Technology Advisory Committee (IS-STAC) has been adopted during different Five Year Plans. R&D in coal is carried out under four major heads namely production, productivity and safety; coal beneficiation; coal utilisation; and environment and ecology.

The major thrust areas identified for R&D in the XI Plan were mapping of underground old unapproachable abandoned workings, coal gasification, dry beneficiation of non-coking coal, beneficiation of low volatile coking coals, coal liquefaction, Coal Bed Methane (CBM)/ Abandoned Mine Methane(AMM), Development of effective communication system in case of miners trapped in underground mine etc.

15.2 Some of the major projects completed

- Cable bolting for extraction of coal from standing pillars in thick coal seams.
- Rock Mass Rating (RMR) for underground roof support design.
- Demonstration of extraction of CBM and its utilization in one of the BCCL mines.
- Ground Penetration Radar (GPR) for detection of unapproachable old waterlogged mine workings to avoid inundation.
- Controlled blasting in opencast mines near surface structure
- Development of different types of steel props/chocks.
- Beneficiation of non-coking coal for power generation.
- Oil agglomeration for beneficiation of the fine coal and beneficiation of difficult to wash coal.
- Coal agglomerates for low rank, low grade, slack coal for domestic use.
- Humic acid from lignite for use as fertilizer.
- Use of fly ash as fertilizers.
- Bio-restoration of mined out opencast areas through microbial technology.
- Leaching effects of fly ash as mine fill in underground and abandoned open cast mines.
- Shortwall mining in SECL mines.
- Rapid volumetric analysis of excavated in-situ overburden in opencast mine by use of Airborne Laser Terrain Mapper (ALTM,) Terrestrial Laser Scanner
- Development of prototype powered support
- Development of accurate and rapid method of co-relation survey of underground mines

- Characterization of rock and parameters for optimal explosion energy utilization in opencast blasting
- Application of high pressure water injection for hard roof management of Churcha West, Colliery, SECL
- Development of nano-tubes / nano-fibers for advance detection of methane at room temperature.
- Robotic application in underground mines to detect trapped miners.
- Through an R&D study, it has been established that almost all coals except few are suitable for sponge iron industry.

15.3 Major On-going Research Projects

- (1) Development of CMPDI capacity for delineation of viable coal mine methane (CMM) / abandoned mine methane (AMM) blocks in the existing & would be mining area having partly de-stressed coal in virgin coal seams
- (2) Recovery & utilization of coal methane in Jharia and Raniganj Coalfields
- (3) Development of immediate roof fall prediction system in underground mines using wireless network
- (4) Demonstration of Cost-effective Technology for Dry Beneficiation of Coal by Allair Jig
- (5) Demonstration of Coal Dry Beneficiation System using Radiometric Technique
- (6) Assessment of prospect of shale gas in Gondwana basin with special reference to CIL areas
- (7) Development of indigenous Catalyst through pilot scale studies of coal to liquid (CTL) conversion technology
- (8) High resolution seismic monitoring for early delectation and slope failures in opencast mines
- (9) Application of Ground Penetrating Radar (GPR)
- (10) Integrated communication system to and locate trapped miners in underground mines
- (11) Development of self advancing (mobile) goaf edge supports (SAGES)for depillaring operations in underground coal mines

15.4 Status of XI Plan Projects

(a) Present status of Research projects

Sl. No.	Details	Nos.
1	Projects completed by June 2011	8
2	Projects expected to be completed by 31.03.2012	7
3	Projects likely to be spilled over to XII Plan	14
	Total	29

(b) Expenditure during X and XI Plan period:

Particulars	Plan		
	X	XI	
		Upto 31.03.11	Anticipated
Projects completed	51	38	45
BE (₹ in crores)	81.08	62.54	73.16
RE (₹ in crores)	52.81	43.86	54.48
Total fund utilized (₹ in crores)	51.42	44.67	55.29

(c) XII Plan projection:

Particulars	No. of projects	Anticipated Provision (₹ in crores)
Spill over projects from XI Plan	14	28.0
New projects –Coal	25	40.0
–Lignite	5	12.0
Total anticipated provision for XII Plan (₹ in crores)		80.00

15.5 Future Research Projects

- (1) Effective method to extract coal standing on pillars below infrastructure / developed area without stowing.
- (2) Safe parting between underground and opencast workings for simultaneous mining
- (3) Design and development of procedure to assess safe barrier width for advancing benches in opencast mines
- (4) Development of online remote field analysis and monitoring system for (a) optimal blast design (b) fragmentation measurement and (c) fly rock risk assessment
- (5) Introduction of water jet cutting technology in coal mines for seams on fire
- (6) CBM reserves estimation for Indian Coalfields
- (7) To produce 10% or less ash clean coal from washery slime
- (8) On-line washability analysis by using CT system
- (9) To study the caving behaviour of roof rock due to presence of OB dump on the surface /quarry floor and suggest suitable support design as well as minimum hard cover for safe caving of roof rock.
- (10) Fugitive Emissions of methane gas from opencast mines.
- (11) Early warning system for roof fall prediction in underground mines
- (12) Early warning system for predicting dump and highwall failures in opencast mines
- (13) High concentration fly ash slurry stowing in underground coal mines.
- (14) Shale gas estimation in coalfields
- (15) Development of technology for remote operations in underground coal mines

- (16) Improvement of suitable mining methods for extraction of thick / and steep coal seams.
- (17) Demonstration Plant 'zero reagent' based Multi Gravity Separator.
- (18) Simultaneous blasting of OB and Coal
- (19) Development of various flocculants and washing chemicals for use in beneficiation of non-
- (20) Highwall Mining
- (21) Method of Mining for multi-seam working.
- (22) Development of predictive models to determine the progress of fire in mine fire areas.
- (23) Effect of depletion of water table due to UG and OC mining.
- (24) Formulation of guidelines for determining optimal depth of residual void in Opencast mines

15.6 Emerging areas for coal Research:

- A. In-situ coal gasification.
- B. Liquefaction of coal.
- C. Coal Bed Methane(CBM)/ Coal Mine Methane (CMM) / Abandoned Mine Methane (AMM) reserves estimation& recovery
- D. Shale gas estimation & its recovery
- E. 3D seismic survey
- F. Study of structure of coal seam and roof rocks in hydro-fracturing areas.

15.7 Research & Development at NLC

NLC is carrying out R&D Projects in the field of Lignite Utilization, Value added product from lignite, Waste Utilization, Waste Land Reclamation, Prevention of corrosion on mining equipments etc. For implementing these projects, NLC is collaborating / associating with various Central & State agencies like IITs, Universities, National Institute of Technology, Central Institute of Mining and Fuel Research, Central Electrochemical Research Institute etc.

15.8 Details of Some of Major Completed Projects in the XI Plan

Sr No	Name of Project	Implementing Agency	Time Schedule	Rs in Lakhs	Status
1	Development of a process for the production of activated carbon from Neyveli Lignite. (CU 49)	NLC & RRL Trivandrum	Nov-2003 to Mar-2007	98.60	Completed
2	Transforming NLC Mine spoil into Productive agricultural land through Eco-friendly Integrated Farming System	NLC & TNAU/ Coimbatore	April 2004 to March 2008.	449.48	Completed
3	Pilot Plant studies on the stabilization, re-vegetation and restoration of Ecology in Mine Spoil.	NLC & TNAU/ Coimbatore	April 2004 to March 2008	139.05	Completed
4	Corrosion Studies in SME structures of Mine-II	NLC/CECRI	2008 to 2010	2.92	Completed
5	Organic petrology, geochemical and mineralogy studies on Neyveli lignite	NLC	2008 to 2012	22.41	To be completed by 2012
6	Corrosion studies in SWC pumps of Mines	NLC/ NIT, Trichy	2008 to 2012	97.50	To be completed by 2012
7	Development of customized Organic Coatings for corrosion protection of special mining equipments at lignite Mines.	NLC/CECRI	2011 to 2014	79.48	Spill over to XII-Plan

15.9 Proposed Projects for XII Plan

Sl. No	Name of the Project	Implementing Agency	Duration	Project Cost in ₹Lakhs	Remarks.
1	Evaluation of Coal Bed Methane in lignite zones by advanced geophysical methods	NLC/ IIT, Madras	4 years	100	It is proposed to develop suitable methodology by field investigation using advanced GPRS.

2	Development of suitable geophysical embedded technique for detection and mapping of hard strata / marcasite in Mines area	NLC/ IIT, Madras	4 Years	80	It has been identified that hard bands are creating problem in mining operations. Field investigation with advanced geophysical equipment for developing methodology to identify hard band.
3	Design and development of technology for effective haul roads inside open cast mines	NLC/ IIT, Hyderabad	3 Years	100	The study aims to improve the life of the haul roads with some additives.
4	CO ₂ Sequestration by Biological/ Bio-Engineering Methods	NLC/ NIT, Trichy	3 years	450	CO ₂ emission by the Thermal Power Stations will be absorbed by algal species for which the project is proposed.
5	Removal of moisture from thermal power plant flue gas	NLC/ Other partner to be identified.	3 Years	105	Main objective of the project is to develop and design suitable condenser to recover the water vapour.
6	Development of suitable methodology for detection and mapping of buried structures in shallow depth in advancing Mines area	NLC/ IIT, Madras	2 Years	30	It is proposed to evolve methodology to locate the buried structure by indirect economic methods

15.11 Action for XII Plan – Recommendations

In order to have wider involvement of institution in Coal R&D it is suggested that :

- Coal companies should invest at least 1% of their PBT in R&D every year
- Coal companies should plan for improvement & strengthening of S&T deptt.
- R&D needs to be mainly based on subsidiary wise analysis of operations
- Invitation of expression of interest by open advertisement in national and international news papers and related journals for seeking appropriate proposals.
- To encourage private sector participation in R&D work
- To involve reputed overseas institutions for R&D
- Encourage research scholars/ academicians/ coal sector employees pursuing Ph.D. in the emerging/ innovative areas of mining and other related activities by granting financial assistance

CHAPTER – 16

SAFETY & WELFARE

16 SAFETY

Safety of miners and operations is of paramount importance in coal mining operations and enhancement of production. Coal mining operations are governed by the Mines Act, 1952 and the rules and regulations framed there under in regard to safety and health of the persons employed in mines. The Mines Rules, 1955, The Coal Mines Regulations, 1957, The Mines Rescue Rules, 1985 are some of the major statutes framed under the Mines Act. The Directorate General of Mines Safety (DGMS), under the Ministry of Labour & Employment is the regulatory authority to enforce the statutes relating to mine safety.

There is a Standing Committee on Safety in Coal Mines, chaired by Minister in Charge of Coal. The meeting organized in this regard is attended by officers from Ministry of Coal, Ministry of Labour & Employment, DGMS, representatives of Trade Unions, Coal companies (All PSUs & Private companies), State Mines & Mineral Development Corporations. The Committee meets biannually to take stock of the safety situation in coal and lignite mines and suggests measures for bringing further improvement in the field of safety.

16.1 Accidents in Indian Coalmines

Table –1: Accident Statistics in Indian Coal Mines since 1991

Year	Fatal Accidents			Serious Accidents		
	No. of accidents	Fatality	FR/1000 persons	No. of accidents	No. of Serious injury	SR/1000 persons
1991	138	143	0.26	803	821	1.54
1992	165	183	0.33	810	834	1.62
1993	156	176	0.32	854	881	1.65
1994	156	241	0.46	717	735	1.48
1995	137	219	0.43	757	790	1.58
1996	131	146	0.29	677	703	1.43
1997	143	165	0.33	677	703	1.44
1998	128	146	0.3	523	542	1.14
1999	127	138	0.29	595	629	1.37
2000	117	144	0.31	661	679	1.54
2001	105	141	0.32	667	706	1.64
2002	81	97	0.23	629	665	1.57
2003	83	113	0.27	563	590	1.47
2004	87	96	0.24	962	991	2.45
2005	96	117	0.29	1106	1138	2.85
2006	78	137	0.36	861	891	2.31
2007	76	78	0.21	923	951	2.51

Year	Fatal Accidents			Serious Accidents		
	No. of accidents	Fatality	FR/1000 persons	No. of accidents	No. of Serious injury	SR/1000 persons
2008	80	93	0.25	686	709	1.87
2009	82	92	0.25	625	647	1.71
2010	100	120	0.25	420	449	1.18

The main cause of the accidents have been fall of roof and sides, accidents in rope haulage and conveyor system, fall of persons/objects, inundation, gas explosion etc. in underground mines and accidents due to movement of dumpers and other machinery in opencast mines.

General observation of mine accidents reveal that Obsolete equipment; Lack of management skills & training; Illiteracy of workforce; Absence of a safety culture; Poor motivation; and Shortage of investment in modern safety equipment have been some of the reasons.

Safety Monitoring

The management of the mines is responsible for strict compliance of the prescribed safety standards in mines. While the coal companies take all care in observing safety legislation, they have also a stringent safety monitoring mechanism at corporate and local levels mainly through Internal Safety Organisations.

The Workmen Inspectors are also deployed in each mine as per the statutory requirement and periodic reviews are held at colliery level, area level and corporate level involving workers representatives and management. Over and above, the regulatory authority the Directorate General of Mines Safety regularly undertakes safety inspection of the mines to enforce compliance of safety legislation.

In addition to compliance with the requirements of mine safety laws, Coal companies are taking the following actions to reduce number of accidents:

- Scientific roof support systems based on rock-mass-rating
- Increased use of steel supports and roof bolts in place of timber supports
- Avoiding exposure of workers to hazardous conditions by mechanisation of loading operations in underground mines through deployment of side discharge loaders (SDLs) and load haul dumpers (LHDs) etc. and replacing rope haulages with conveyor belts wherever feasible
- Introduction of continuous miner technology and long wall technology in underground mines where ever feasible
- Regular monitoring of mine environment for detecting inflammable and noxious gases using modern equipments like digital Multi-Gas Detectors etc.
- Before every monsoon preventive measures against inundation are implemented through:

- ✓ Strengthening pumping arrangements
- ✓ Emergency plan for keeping vigil on situations
- ✓ Check co-relation survey to establish the barriers between waterlogged workings wherever danger of inundation exists
- ✓ Filling up the surface cracks
- Implementation of Code of Practices for Heavy Earth Moving Machinery operators, maintenance staff & others
- Thrust on training & retraining of supervisors and workmen including contractor's workers to increase safety awareness
- Workers participation in safety management
- Regular safety audit of mines and risk assessment
- Safety monitoring through multi-disciplinary Internal Safety Organisation (ISO)

Further, the following mechanisms have been framed to monitor safety in coal mines:

1. **Workmen's Inspectors:** Safety status of each and every mine is monitored by representatives of the workmen, one each in Mining, Electrical and Mechanical disciplines through inspections the reports of which and status of compliance of recommendations are forwarded to the local DGMS office.
2. **Safety Committee at mine level:** The Safety Committee also monitors the safety status at each mine by inspection followed by a meeting for review of safety status of the mine. In this body two workmen are represented equally as management.
3. **Area Level Tripartite Committees:** The Area Level Committee comprising workmen's representatives, DGMS representatives and management representatives also periodically monitor the safety performance of the Area.
4. **Tripartite Safety Committee** at subsidiary company level consists of representatives of workmen, DGMS and management for review and monitoring of safety measures.
5. **Coal India Safety Board:** This is headed by the Chairman, CIL with workers representatives, D(T) CIL, D(P) CIL, CMDs of coal companies, the DGMS, a representative of the Ministry of Coal as members and E.D. (Safety & Rescue) CIL as Member Secretary. The Board reviews the safety status of CIL, formulates policies and gives guidelines for improving safety standards.
6. **Standing Committee on Safety in Coal Mines:** This committee is chaired by the Hon'ble Minister for Coal and acts as the apex policy formulation group for safety and reviews safety performance of coal companies.

Challenges in ensuring safety in coalmines:

For underground Mines

- Problem of Strata Control
- Problem of Gas, Fire & Subsidence Control
- Problem of Water Danger
- Problem of Communication & Tracking system
- Problem of Ergonomics' related UG machineries

For opencast Mines

- OB dump Slope Stability
- Automation of activities / intelligent mining
- Traffic Control Management; code of practice
- Safe Blasting Management
- Safety of contractor's workers

Approach for prevention of accidents

- **Risk assessment & management** approach to assess the potential hazards. Categorise all Risk-prone mine and update it at regular interval and workout mitigation measures
- **Safety Audits:** After risk assessment of each mine, their safety audit should be done by independent safety auditor.
- Various steps for prevention of disasters arising out of inundations; fires; explosions etc. in mines.
- Strata management control to avoid accidents due to roof and side falls in mines, continuous monitoring of roof movement, adopting roof bolting systems, conducting R&D.
- Improving emergency response systems etc. through mine-wise emergency action plans, conducting mock rehearsals, conducting rescue rehearsals etc.
- In case of open cast mines measures are being taken on continuous basis for reducing the accidents due to truck movement, imparting training to all the concerned, developing code of practices for HEMM operators, maintenance staff etc.

Following actions have also led in reducing accidents:

1. Design of system of support of roof in the development workings in underground mines by scientific support systems based on Rock Mass Rating (RMR) studies.
2. Increased use of Roof Bolting / Roof Stitching methods of support using steel roof bolts/ steel wire ropes with quick setting cement grout to arrest bed separation at early stages to impede deterioration of roof.
3. Introduction of modern drills like mechanised drilling machine to avoid exposure of support personnel to unsupported roof while drilling for roof bolting and greater use of quick-setting cement/resin capsules grouted roof bolts for support in development workings in underground mines.
4. Reduced exposure of workers to mining hazards by mechanization of loading operations by increasing use of SDLs and LHDs in belowground mines, Powered Support longwall (PSLW) system of mining, Continuous Miner Technology etc., are being progressively adopted in suitable areas.
5. Regular monitoring of mine environment by handheld gas detectors/alarms and flame safety lamps for detecting inflammable and noxious gases. Besides, for early

detection of situations that could lead to an outbreak of fire or an explosion, highly capital intensive computerized continuous mine environmental tele-monitoring system (ETMS) have been installed and are in operation in thirteen identified underground mines.

6. Introduction of surface miner, an eco-friendly technology to reduce hazardous operation like drilling, blasting and crushing wherever applicable.
7. Application of advance technology in surveying and digitization of mine plans.
8. Increasing mechanisation wherever feasible.
9. Introduction of Man-riding systems in more number of mines.
10. Better lighting through mobile towers with a cluster of lamps are provided in major opencast mines.
11. Deployment of large capacity equipment to reduce traffic congestion.
12. Preparing Risk Management Plans:
13. Carrying out Geo-technical Investigations and analysis through expert national and international agencies for successful operation of Long wall panels.
14. Upgradation of Rescue Services.

Disaster Prevention:

The primary thrust of the Safety Strategy of CIL has been towards averting accidents with a large number of casualties (accidents involving more than 10 fatalities are termed disasters in Indian mining parlance). Towards this end the following activities were taken:

- **Inundation:** Thrust on Safety Audit, Check Survey, Trials of Geo-physical Methods for detection of water bodies/proving parting, adequate preparation before monsoon season etc. Before monsoon details Action Plan for preventive measures against inundation were prepared, implemented and monitored.
- **To control spontaneous heating, fire & explosion in mine:**
 - More thrust on construction of sectionalization stopping
 - Fresh Pressure Quantity Survey
 - Initiated action to introduce Indigenous Chromatograph with software in place of age-old chemical method of mine air sampling for better accuracy.
 - Use of Local Methane Detector (LMD) for early and accurate detection of methane belowground.
 - Use fireproof foam materials for quick setting of stoppings.
 - Risk assessment based safety management plan by identifying principle hazards including fire potential

Emergency Response Systems

- **Emergency Action Plans (EAP):** As per the Coal Mines Regulations, 1957, it is mandatory for every manager of a mine having belowground workings to prepare an

Emergency Plan of action to be activated immediately on occurrence of an emergency. The Plan outlines the systems of information flow and duties and responsibilities of each mine official and key-persons. Emergency Action Plans (EAP) have been formulated in all underground mines of CIL. EAP of each mine are being reviewed from time to time and corrective action taken.

- Mock Rehearsals: conducting Mock Rehearsals from time to time to familiarize officials and key-persons in their duties for examining the efficacy of Mine-wise Emergency Action Plan as well as to monitor the failure points for corrective action.
- Demarcating Escape Routes: An exercise for demarcating Escape Routes in underground mines, on plans as well as below ground by fluorescent paint, display of the same at the entry to the mine has been done.
- State of the art Rescue Apparatus like BG-4 Self Contained Breathing Apparatus was introduced in Rescue Stations and Rescue Personnel were trained for their use.

16.3 Crisis Management Plan of the Government of India:

The Crisis Management Plan of the Ministry of Coal has been prepared which lays down the role of the MoC. The Secretary, MoC is to put into operation its Contingency Plan and constitute a Crisis Group. A damage assessment team of the MoC will reach the site within 24 hrs of the occurrence of any incidents so that the Ministry can assess damage and augment response.

Occupational health and safety

The most critical diseases that are to be taken care in coal mining include pneumoconiosis and silicosis affecting lungs, nystagmus affecting eyes, muscle disorders due to vibrations, and noise pollution impairing hearing. Though the safety legislation provides for addressing these diseases it is the duty of the management of mines to take all the required measures to detect the onset of any such cases amongst the workers and provide timely medical care and safeguards to improve working conditions in mines. This requires specially trained medical professionals to understand the health problems of miners.

Rescue Organization:

Rescue Stations have been established and are operating under Mines Rescue Rules 1985 framed under Section 58 of Mines Act of 1952 in CIL/SCCL.

- A Rescue Station should be available **within 35 km. radius** from any mine.
- Rescue Station should have at **least 18 trained persons**.
- Equipment schedule is mentioned in Section 11 of Mines Rescue Rules. Major equipment available at rescue stations.
- **Two hours self-contained breathing apparatus- 54 Nos.**
- **Resuscitating apparatus - 12 Nos.**
- Each mine has at least one rescue trained person for every 100 workers.
- At present there are 6 Rescue Stations, 15 Rescue Rooms-with-Refresher Training facilities and 18 Rescue Rooms in CIL.

16.4 Action Plan for XII Plan

- **Technological assistance:** Areas to be identified and provisions are to be made accordingly within India & abroad for transfer of technical know-how, wherever mining technological assistance is required.
- **Risk assessment & management** approach to assess the potential hazards. All mines should complete and act upon risk assessment and management plans thorough a well drawn Action Plan in one year. The Action Plan should be reviewed from time to time.
- **Safety Audit** of the mines by independent safety auditor.
- Wherever applicable, **Surface Miners may be introduced** to eliminate blasting operations.
- Introduction of **light weight modern cap lamps (LED type)** and suitable belts in all the UG mines to avoid fatigue and lower back injuries during incidental fall.
- Use of Public address system, awareness programmes, intensive training and introduction of best practices for improvement of safety and safety culture in mines.
- To establish wireless communication in all opencast mines and modern communication systems in underground mines.
- To provide each miner with RFD in next one year.
- To relief the stress of the mine workers, **training on Yoga and Meditation** may be imparted and Meditation Halls may be established in coal fields.

For Underground mines:

UG Mechanization:

1. As per recommendation of 10th National Safety Conference, phasing out of manual loading in underground mines.
2. Application of Mass Production Technology like Continuous Miners, Long wall Mining in underground mines.
3. Need for air conditioning in UG mine at greater depth for better working environment.
4. Man- riding Systems: With view to reduce fatigue of workmen, Man-riding system may be provided at below ground mines. The followings are criteria for selection of mines for installation of man- riding system, namely
 - i. If the gradient of travelling road is steeper than 1 in 3 and life of mine is 5 yrs or more
 - ii. Where the gradient of travelling road is steeper than 1 in 4 and the distance of working face from the opening is more than 1 Km and the life of the mine is more than 5 years.
 - iii. Where the gradient of travelling road is less than 1 in 4 but distance of working face from the opening is more than 1.5 Km and life of the mine is more than 5 years.

Strata Management:

1. **General Ranking of coal seams as per RMR value:** Categorization of UG mines according to their seam RMR values.
2. Complete mechanization of roof-drilling operation in UG mines for complete phasing out of manual drilling of holes by hand held electric drill. This would enhance quality of roof bolting.
3. Formation of Strata Control Cell in each UG area of the Subsidiary company.
4. Strata control and monitoring device / system to be installed in all UG mines, where strata conditions are weak and all depillaring with caving districts.
5. Phasing out of Cement Capsules and replacing it with Resin Capsules

Prevention of Disasters due to Mine Fires and Explosion

1. Introduction of Gas Chromatograph in each UG mine for ensuring better accuracy and quick analyzing of mine air samples.
2. Introduction of location Tracking System in UG for workers going to remote old working as well as use it during rescue and recovery operation.
3. Efforts to be made to classify coal seams prone to spontaneous heating and fire.
4. Better mine ventilation by identifying problem through Pressure-Quantity (PQ) survey.
5. Expediting construction of sectionalisation stoppings, isolation stoppings, ventilation stoppings and explosion proof isolation stoppings as per requirement

Others measures for UG:

- Introduction of LED type Cap lamp replacing heavy weight acid type cap lamp in all UG mines.
- Installation of Man Riding System for all UG mines having arduous travel and sufficient mineable reserves.
- Risk assessment based Safety Management Plan for all UG mines.

For opencast mines

1. Procurement of at least one Simulator in each subsidiary company to impart training for all HEMM operators within two year.
2. Incorporation of suitable and binding safety clauses for contractual / outsourced operation as per recommendation stated in 10th national safety conference.
3. Use of slope stability radar for monitoring dump stability.
4. More stress on using eco-friendly surface miners.
5. Switching over to conveyor belt transport in place of truck transport wherever feasible.
6. Risk assessment based Safety Management Plan.
7. Formation of Slope / Dump Stability Cell in each OC Area

Other measures for OC mine

- To improve the Overall Safety Monitoring of Mining Machineries, Conveyors, Dumping Yards, Subsidence checks, Operational Areas etc., it is proposed to install **Safety Monitoring System** at the above functional areas under the Safety Management Plan.
- Seismological studies/ monitoring system at NLC Mines.
- **Specialized Training on Intensive Fire Fighting** (30 days continuous program) on Fire Prevention / Fire Fighting Techniques for key and positional persons and also for other employees working in Fire Accident Prone Production Areas should be arranged.
- **Safety in new mining projects/blocks:** It should be made mandatory to incorporate a Long Term Safety Plan for the life of the Project for all new projects. Similarly, safety of coal mining operations by operators working new coal blocks should be monitored by government.

Other Proposals on application of modern technology in Safety

- Design of Computerized Mine Safety Information System in every mine.
- Information Database for uploading gist of accident enquiry to the company web-portal
- Providing facilities for uploading safety related information to company web site for interactive database, where mine level executives can share their experience.
- Establishment of virtual reality training facilities at Central Training Institute in all coal companies in next two years.

RESCUE SERVICES

At least two numbers of following equipment should be made available at each Mine Rescue Station (MRS).

- Hydraulic stone / rock cutter.
- Airlifting bag
- Power winch
- Mobile winder – to be kept at Central Workshop of each subsidiary.
- Water mist fire extinguisher.
- Rescue Mannequins
- LCD projector for bringing awareness in safety aspects to mine workers

WELFARE ACTIVITIES: PRESENT STATUS & PROGRAMME FOR XII PLAN

EMPLOYEES WELFARE (existing facilities available):

One of the major considerations for nationalization of coal sector had been to bring rapid improvement in the quality of life of the miners and the surroundings of coalfields. Coal Companies were entrusted to create a well-organized delivery system for health care and

education initially for the miners, which were extended to the periphery of the mining area and subsequently were further expanded to cover the entire coalfields. 'Corporate Social Responsibility' in the forms of 'Employee Welfare' & 'Social Welfare' were therefore, embedded with the coal sector since its nationalization and all the PSU coal companies have been paying due attention for the well being of the miners, their families and the immediate vicinity of mining areas in particular, and the society in general.

HOUSING: Present status

Prior to nationalization, miners had been mostly staying in clusters of shanties without any access to potable water or basic sanitation. Whatever, housing facilities provided by a few of the organized private coal mining companies were mostly substandard. At the time of Nationalisation, Coal India Limited took possession of 1,18,366 housing accommodations starting from Bungalows for senior executives to staff quarters and sub-standard dwellings in coolie lines. By the end of 2010-11, the total number of housing in CIL fold has increased to 4,19,594 meeting 100% requirement – a key mission of coal mines nationalization.

WATER SUPPLY:

A massive scheme covering nine States of the Country was undertaken by eight PSU coal companies under the tutelage of CIL to provide drinking water in coalfields. By their endeavours coverage populace could be increased by more than tenfold between 1973 and 2010 from a level of 2.27 lakhs to 22.96 lakhs.

MEDICAL FACILITIES:

Nationalized coal companies have developed three tier medical facilities for its employees from primary health centres (Out Patient Department) to central hospital and finally referral apex level hospitals at the company headquarters. Specialist physician and modern equipments have been made available in these referral hospitals for providing state-of-the-art medical treatment to the employees and their families. Whenever, the in-house facility is felt inadequate, the patient is referred to empanelled super speciality hospitals in India for necessary treatment.

Presently 86 Hospitals with 5,835 Beds, 423 Dispensaries, 640 Ambulance and 1524 Doctors including Specialists are available in PSU coal companies in the Country. This excludes, the facilities provided by SCCL, DVC and SAIL in coal sector and NLC in lignite sector. Besides 12 Ayurvedic Dispensaries are also being run in the Subsidiaries of Coal India Limited to provide indigenous system of treatment to workers.

There is a, Special emphasis for community health and all coal companies have been periodically taking up Occupational Health, HIV/AIDS awareness programme for the employees, their families as well as for the local populace.

EDUCATIONAL FACILITIES:

At present eight PSU coal companies have been providing financial assistance to 62 project schools and infrastructure facilities to 54 project schools, like DAV Public Schools, Kendriya Vidyalaya, Delhi Public School etc. and also providing occasional financial assistance to other recognized educational institutions. Financial assistance, by way of recurring grant-in-aid in packages/infrastructure facilities are also provided by ECL, BCCL and CCL in their operating areas to 290 privately managed schools. These apart, eight coal companies have also been providing time to time grant-in-aid/infrastructure to Educational Institution operating in and around coalfield areas as a part of CSR activities.

In order to encourage excellence in education, Coal India Limited have initiate general and merit scholarship for the wards of its employees. following special endeavours have been initiated by Coal India limited:

(a) Coal India Scholarship Scheme (Revised – 2001)

In order to encourage the Sons and Daughters of the employees of Coal India Limited two types of Scholarship namely General and Merit Scholarships. Financial assistance in general scholarship is provided from class-V onwards up to Graduation/Post-graduation level in any discipline subject to securing prescribed percentage of marks. Merit Scholarship is provided to those who have secured 95% and above marks in ICSE/CBSE/ISC Exam (Class – X and XII) where merit is not declared and to those who have secured 1st to 20th position in Class-X and Class-XII examinations conducted by any State Board. The details during 2010-11 are as under:

CIL Scholarship (Revised-2001)	Merit Scholarship		General Scholarship (Class-V onwards)	
	Number of wards	Amount (Rs. In Lakh)	Number of wards	Amount (Rs. In Lakh)
TOTAL	24	2.69	15,120	154.28

- (b) **Cash Award and certificate of appreciation:** Every year Cash Award of Rs.5000/- and Rs.7000/- respectively are provided to the Meritorious Wards of CIL employees who secure 90% or above Marks in aggregate in 10th and 12th Standard Board level Examination. The status during 2010-11 are as under:

Cash Award	No. of employees wards	Amount of Cash Award (Rs. In Lakh)
TOTAL	369	12.90

- (c) Considering the high cost of technical and medical education in the country Coal India Limited is providing financial assistance towards meeting the cost of education of the dependent children of Wage Board Employees to the extent of Tuition Fees and Hostel Charges who secure Admission in Engineering in such Colleges viz., IITs, NITs, ISM etc which are short listed by CIL for conducting campus selection and also dependent children securing Admission in Govt. Medical Colleges from the Academic Session 2009–10 onwards. The details during 2010–11 are as under

Financial assistance towards cost of education	Engg. Students (IITs, NITs, BE, B.Tech in Selected Govt. Engineering Colleges)		Medical Students (MBBS)	
	No. of employees wards	Amount (Rs. In Lakhs)	No. of employees Wards	Amount (Rs. In Lakhs)
TOTAL	193	66.84	125	34.42

Other Welfare Measures:

In accordance with the provision of the Mines Act 1952 and Rules and Regulations framed there-under, subsidiaries of Coal India Limited are maintaining various statutory welfare facilities for the coal miners such as 481 Canteens, 530 Rest Shelters and 35 Pit Head Baths. Besides this, by the active encouragement of coal companies 24 Central Co-operatives and 128 Primary Co-operative Stores are functioning in the Coalfield areas for supplying essential commodities and Consumer goods at a cheaper rate in the coalfields. 181 micro-credit Co-operative Societies are also functioning in the Coal Companies.

Banking Facilities:

In order to curb the menace of age-old exploitation of the miners by the illegal credit operators, Coal Companies have been providing infrastructure facilities to Nationalised Banks for opening their Branches and Extension Counters in the Coalfields. All employees are now being paid their salaries and wages through Bank. 485 branches and extension Counters of nationalized banks are now operating in the command areas of eight PSU coal companies. Intensive campaign programmes are arranged by coal companies to educate workers for banking operation. Welfare officers of the coal companies have been taking active part to inculcate the practice of thrift amongst coal miners for the benefit of their families.

Promotion of Sports and cultural activities:

Coalfield areas of the countries have rich social and cultural heritage. Maintenance of traditional ethos of tribal culture and at the same time bringing the best of the modern culture to the miners has been considered a focus point in the welfare activities of the

coal companies. Accordingly promotion of Sports and Cultural activities of the employees & their wards get special attention. Every year sports events in 15 different disciplines are organized by coal companies under the aegis of Coal India Sports Promotion Board. Inter Colliery & Inter Area level sports & Cultural meets are also held in the coalfields. Rural sports and Handicapped sports are important events of the coalfields.

Community and Peripheral Development

Public sector coal companies have been regularly undertaking different Community and Peripheral Development activities in and around the coalfield areas for the benefit of the local people.

During the first three years of the XI Plan , the expenditure for Community and Peripheral Development by the subsidiary companies of CIL grew from a level of Rs. 30.15 Crores in 2007-08 to Rs. 40.14 Crores in 2009-10.

CORPORATE SOCIAL RESPONSIBILITY (CSR):

The growth of coal sector is directly dependent on the availability of land. Support of local populace being an intrinsic requisite to achieve sustainable growth of coal sector, CSR should be considered as a strategic tool for sustainable growth. CSR means not only investment of funds for Social Activity but also Integration of Business process with Social process. So far as PSU coal companies are concerned there is already a well-defined CSR policy on the basis of DPE guidelines covering all the aspects of the needs of the Society. PSU coal companies have already increased their coverage area under CSR from 8 Kms to 15 Kms for every Project and Area. Further, their Board of Directors can approve specific cases beyond mining areas outside the state under special circumstances.

CIL has already increased its fund allocation for CSR activities from Rs.1/- per tonne of Coal production to 5% of the retained earning of the previous year subject to the minimum of Rs.5/- per tonne of coal production of previous year. From a level of Rs. 152.33 Crores spent during 2010-11, CIL has increased its budget allocation to Rs. 553.33 Cores in 2011-12 for CSR.

XII Plan programme for Employees' Welfare and Corporate Social Responsibility for PSU coal companies:

Following are the thrust area for XII Plan period:

1) Nuclear Townships:

Each project is to be equipped with nuclear Townships with all the amenities, like Dispensary, School/College, Recreation Club, STD booths, Banks, Adult Education Centre, Places of worships, Stadium and Parks etc. Presently, the colonies are scattered and therefore, either facilities attuned to modern living could not be provided or if available are not being optimally utilized and therefore are not economically viable.

2) **Promotion of Sports activities:**

In each coalfield at least one Sports Academy is planned to be developed for the most popular sports of the region. The sports academy will offer training and coaching facilities to employees and their wards and also to outside talents of the neighbouring areas. Suitable policy would be formulated to promote career growths of promising talents in various discipline of athletics and sports.

3) **Opening of Medical and Engineering Colleges:**

In order to provide opportunity engineering and medical education facilities to the wards of the employees and local populace, efforts shall be made to open at least one Medical and one Engineering College in each subsidiary of Coal India Limited.

4) **Upgradation of existing Hospitals:**

The existing Hospitals in the Project shall be upgraded by extending required facilities so as to reduce the referral cases outside. The employee-bed ratio shall be improved further.

5) **Upgradation of Canteens:**

The existing Canteens near the Project sites shall be upgraded and efforts are to be made to make them Air-conditioned with facility of subsidized meals.

6) **Health Awareness Camp on major Medical heads like:-**

Regular health awareness programme for the local population in the coalfields are to be undertaken by PSU coal companies on AIDS, TB and Leprosy, on Social evils like alcoholism, smoking, drug abuse etc., on family welfare issues like Child and Mother care, Diet and Nutrition. Coal Companies would also organize Blood donation, eye care including cataract operation to help the people of the peripheral area.

(7) **Social Empowerment:**

Coal Companies will support various schemes on Self/Gainful Employment Opportunities, Assistance to villagers having small patch of land for developing mushroom, medicinal plants and other cash crops farming to make them economically dependent on their available land resources. Trainings will be provided by agricultural experts for application of modern farming methods. Various training programmes shall also be organised for women on tailoring, embroidery designs, making various food items like pickles, jam, fruit drinks etc., painting and Interior decoration and other Vocational Courses.

(8) **Liberalization of R&R Policy of CIL**

In view of changing aspiration of the PAPs, fast acquisition of land and to meet other R&R issues, CIL is in continuous process of liberalization of its own R&R Policy. Ministry of Coal has also constituted a committee consisting of Chief Secretaries of Coal Bearing states, Secretaries of Ministry of Rural Development, Department of Land Revenue, Ministry of Tribal Affairs, Ministry of Environment

and Forests, CMDs of all subsidiaries of CIL and Director (P&IR), CIL to examine for further liberalization of CIL's R&R Policy and to redress to examine for further liberalization of CIL's R&R Policy and to redress aspirations of PAPs and to evolve a 'PAP FRIENDLY R&R POLICY'.

Need for formulating uniform Welfare & CSR Policies for coal sector:

As per the projection of XII Plan, detailed in Chapter-4, contribution of captive coal blocks and private mining is envisaged to increase from a level of 10% in 2011-12 to 15% by the end of TY of XII Plan (2016-17). By the turn of XII Plan these mines are envisaged to contribute 30% of the all India production. While, the employee welfare scheme and CSR activities of PSU coal companies are already structured under various Government Guidelines and Agreements, viz. DPE guidelines and National Coal Wages Agreement, such uniform policies are not applicable for private sector. A uniform national policy framework needs to be formulated for coal sector in respect of employee welfare and fund allocation for corporate social responsibility. Since a multiple number of corporate entities shall be operating in the same coalfields, third party agency, may be the local elected bodies, will be required for implementing rehabilitations and local area development projects for optimum utilization of resources and avoidance of wastage of resources through creation of duplicate and or excess infrastructure, a distinct possibility in case of execution of projects by the individual corporate entity. Therefore, in the policy formulation for corporate social responsibility, a pre-defined fund allocation needs to be made mandatory commensurate to production, which shall be deposited to the designated execution agency.

Unless a level playing field is created across the sector for sharing the societal cost of coal mining through uniform rule, it will be difficult to maintain the improvement in habitat of the coalfields achieved so far and the quality of life may ultimately regress back to pre-nationalization era.

CHAPTER 17

HUMAN RESOURCES REQUIREMENTS

17.1 INTRODUCTION

Since the time of Nationalization when all India coal production was to the tune of 80 Mt, a phenomenal growth has taken place. The upward trajectory has only increased in intensity over the immediate past as a result of a significant escalation in demand. The production went on to 100 Mt during 1978–79, crossed to 200 Mt during 1989–90, surpassed 300 Mt during 2001–02, exceeded 400 Mt in 2006–07 and vaulted over 500 Mt by 2008–09. The accelerated rise in coal production has necessarily matched with burgeoning demand of coal. As per the current projections, all India coal production according to ‘business as usual’ scenario in the terminal year of XII Plan (2016–17) is expected to reach a level of 715 Mt, of which the share of Coal India will be of the order of 556 Mt. However, the crying need for coal for power sector may require vastly augmented coal production and it is envisaged that indigenous coal production may have to be augmented to the level of 1000 Mt. In this context, a relook is necessary on the area of the human resources requirements to meet production, productivity and safety mandates, besides the requirements of a new order of mechanization for the coal industry.

Coal India Ltd is a major constituent of the all India coal production with greater than 80% contribution to the national pool. Using Coal India as a case study one can safely predict the requirements of human resources for the national coal sector and work out a stratagem for upgrading skills for new levels of productivity and performance. The basic prerequisite to help accomplish this objective is to have an effective and goal oriented training system in place with detailed mapping of manpower requirements of appropriate/required skills. The coal industry needs an innovative framework to attract, select, deploy and develop the industry’s human capital, which is radically different vis-à-vis, other industrial sectors.

As the demand for coal increases, the size of a capable and experienced workforce decreases, and a potential watershed is fast approaching. Manpower availability, their development, training and retention at all levels within the coal sector thus emerge as a core issue.

17.2 A Situational Analysis

The coal industry, and CIL in particular, is emerging as a geriatric organization with average organizational age over 50, with vanishing skill set based on experience and reduced ability to “learn to learn”. The age profile is clearly demonstrated in the following table:

Age Profile of work force

Company	< 25 Yrs	26-30 Yrs	31-35 Yrs	36-40 Yrs	41-45 Yrs	46-50 Yrs	51-55 Yrs	56-60 Yrs	Total Manpower
Total CIL	4,738	11,596	23,167	46,014	63,523	75,420	79,632	76,675	3,80,765
Total CIL (in %)	1.2	3.0	6.1	12.1	16.7	19.8	20.9	20.1	

The categories of workforce in the case of CIL could be distinguished as follows:

- Executives, Supervisors and workers (skilled/unskilled), and
- A further sub-set of surface and underground workforce.
- Statutory personnel (Executive and Non-executive)
- Specialist cadres.

The following table presents an overview of grade-wise manpower in CIL as on 1.04.2011, which shows that executives constitute only about 4.7% of the aggregate manpower in CIL.

Grade-wise Manpower of CIL (As on 01.07.2011)

Category	Total CIL	Percentage
Executive	17,768	4.7%
Supervisor.	34,932	9.2%
Skilled	1,48,094	38.9%
Unskilled	1,51,923	39.9%
Ministerial	23,840	6.3%
Casual	117	0.0%
Badli	270	0.1%
Others/ Co (T)	3,863	1.0%
Total	3,80,807	

The current status of executives occupying statutory positions is shown in the following table.

Statutory position of Executives (As on 01.05.2011)

Company	2 nd Class Managers			1 st Class Managers		
	Required.	Available	(-) Short/ (+) Surplus	Required.	Available	(-) Short/ (+) Surplus
CIL	2,688	1, 755	-932	1,422	1,654	+232

The data on the non-statutory persons in place in CIL are shown in the following table and highlights the critical gaps that could impact on safety and performance.

Non-Statutory Manpower vis-à-vis Shortage (As on 01.05.2011)

Company	Category	Requirement	Available	-Shortage/+Surplus
CIL	Over-man	6,069	4,986	-1,082
	Mining Sirdar	8,250	6,581	-1,693
	Surveyor	1,036	966	-70

On an overall synthesis of the manpower data the following scenario emerges:

- CIL is faced with a shrinking base of experienced front-line supervisors, be it of over-man, mining sirdars, surveyors and electrical supervisors, who provide the key surveillance inputs for safety and production at the working face and are responsible for day-to-day operations. The situation may exacerbate with the poaching of CIL's experienced pool of supervisory staff by the new entrants in the coal sector.
- On an annual basis, attrition accounts for some 4% to 5 % of the total manpower strength, which mandates a massive drive for induction of fresh manpower. This also calls for significant augmentation of training infrastructure for alignment of inductees with CIL's vision, need-based skills and competency training inputs.
- Over 105,000 unskilled daily rated workforce available to the company need to be suitably trained for improved competence and value addition to the company.
- The looming shortage of executives in XII Plan period due to freeze in induction of executives between 1997 to 2008 has created a veritable vacuum, which needs to be filled in aggressively with a new strategy of making Coal India, the " employer of choice".

- The changing technology paradigm in coal mining calls for new and innovative training aids such as extensive use of simulators and recourse to video conferencing based training programmes.
- To deliver enduring high performance, coal companies need an innovative framework to attract, select, deploy and develop human capital of every category of workforce.

17.3 New Training Initiatives

In order to meet the challenges of manpower for the production targets of the XII Plan, the industry has to undertake a major skill gap analysis for all its employees, which will have to comprehend both the quantitative and qualitative dimensions. There is also a compelling need to create specialist cadres for dealing with the new order of technological functions and for research. In CMPDI, there is an emerging crisis in manpower availability, with large-scale exodus of technically skilled manpower. There is also the likelihood of CMPDI developing as a research wing of the coal sector. Over and above the initiatives required for bridging the quantitative gap in demand for skills, the development of new skills for changes in technology, especially for the underground sector, call for implementation of new HR initiatives.

The current infrastructure for human resource development will need to be revamped, with new training aids and tools, realignment of the focus of the training efforts and evaluation of the effectiveness of training inputs. One can foresee the application of 8–10 new simulators for surface and underground mining and new modes of delivery of training inputs through video-conferencing. From IICM, one can envision that training programmes will be beamed to 30 odd training centres every day for a massive shake up in training delivery. Setting up of specialized training centres for supervisory staff at 4/5 strategic locations around the industry may also be required.

In summary, CIL faces a massive challenge for training of its workforce and also of executives which mandates the following:

- Radical shift in the focus of training initiatives, with multi-skilled workforce prepared and groomed for new levels of performance;
- Assessment of training techniques that strengthen the miners' ability to act competently in emergencies;
- Use of simulation to enhance the perceptual judgment and decision-making skills of workers confronted with mine hazards;
- Revamping of VTCs with state-of-the-art facilities for video presentations of new training materials on safe performance;
- Extensive utilization of computer-aided instruction and use of simulators in Training Institutes;

- Transformation of IICM into an open university beaming courses through video-conferencing directed at executives and management trainees. This will call for strengthening the faculty at IICM.

17.4 Key Recommendations:

In respect of development of human resource for the coal sector the key recommendations are as follows:

- Keeping in view the gigantic task ahead for human resources development of the coal sector, a national level high-power committee may be constituted to examine in depth the issues involved to frame an actionable agenda. Coal Industry manpower has to face the rigours of living in not – so – hospitable remote locations of the country and is denied the facilities and infrastructure such as living accommodations, schools, hospitals and other social amenities which impinge on the induction and retention of manpower. Unless special pay scales as incentives can be provided or fast track career progression assured, development of high calibre human resources for the coal industry will not be possible. The benefits and amenities to be extended to highly skilled executive manpower in the coal industry have to be distinctly different and attractive vis-a-vis other PSUs.
- The training of non-executive manpower in the coal sector deserves a heightened focus of attention and the existing VTCs and training institutes need to be revamped for new quality of training. Audit of the available facilities in VTCs including training modules around the coal industry is urgently required to identify and bridge the gaps in training facilities. Setting up of specialized training centres for supervisors at 4/5 strategic locations in the coal industry is urgently required. CIL subsidiaries may take up at least one polytechnic in their command area and re-equip the same with advanced learning tools and delivery systems for upgrading the skills of new trainees and the existing manpower.
- Indian Institute of Coal Management (IICM) should expand its footprint as a Centre of Learning for the coal industry. The institute has to oversee the training needs of senior and middle management level executives and for this purpose has to emerge with a new mantle of Open University. The institute facilities for beaming training modules for video conferencing have to be significantly enlarged; the institute also needs to spawn training units at each subsidiary level and use the model of Indira Gandhi Open University for offering its programmes including interaction with the coal industry personnel under training. The institute has to expand its reach and establish collaborative link with overseas institutions for training of coal industry's senior executives. The institute will also formulate modular programmes for training of middle and junior level executives, which can be made available through video conferencing.
- The skill deficit at the level of executives, especially at the level of mining engineers, dictate that the coal industry must undertake some 'hand holding' with mining

engineering faculties around the country to prepare mining professionals required by the coal industry. The coal sector has to develop closer links with institutions to develop appropriate programmes, which address specific requirements of the industry. The coal industry will also have to support research at the institutions and provide adequate facilities for training undergraduates with scholarships so that the graduates choose Coal India as 'employer of choice', which could be mutually beneficial.

Indian coal industry faces a daunting challenge of human resource development at all levels – from front line supervisors to senior level executives – for a new order of performance. For the new paradigm of mechanization, the coal industry has to refocus the initiatives on human resource development if only to attain the production goals it has set for itself.

CHAPTER-18

ACQUISITION OF COAL ASSETS ABOARD

18.1 Need for coal imports to India

The proved geological reserves amply reveals the fact that in India there is scarcity of domestic reserves pertaining to good quality metallurgical and low ash thermal grades of coal which can be economically mineable. Moreover, timely supply of these types of coal from domestic sources is additionally constrained by their occurrence in densely populated areas, making land acquisition very critical, complex and usually a long drawn process not meeting to nation's requirement. The need for acquiring coal resource abroad has assumed larger dimension in view of increasing gap between domestic demand and indigenous availability, which is projected to be more than 265Mt (35Mt of coking coal and 230 Mt of non-coking coal) by the end of XII Plan and to further increase to 423 Mt by the end of XIII Plan.

In respect of widening of the demand-supply gap, it is felt prudent to formulate a national policy for acquiring coal assets abroad. The government has an important role to play in terms of creating enabling conditions for Merger & Acquisition (M&A) and initiating Government to Government (G2G) discussions on various issues to enable the Indian companies, both Private and Government, work through a unified "Indian coal Inc." approach to effectively compete with companies from Asian counterparts like China, Japan, Korea and also from Brazil, Australia, South Africa and the oligopoly of large coal MNCs.

18.2 The current trend of international coal trade

The analysis of data of imported coal for the last decade or so reveals the fact that coal imports have grown exponentially in the recent past. The CAGR% for coal imports last 20 years and 10 years stands at 13.2% and 15.5% respectively. Majority of coking coal are imported from Australia while thermal coal imports are primarily from Indonesia and South Africa. Coal import into India is expected to substantially increase from present level of about 89 Mt to about more than 265 Mt in 2016-17 and thereafter. It, therefore, needs to be explored to what extent the present sources (i.e country/coalfield/port) can sustain or increase the exportable production level to meet India's need both from the view of coal production and coal evacuation. It also needs to be seen how much coal can be secured by Indian companies in face of stiff competition from countries like China, Japan, Korea, Taiwan etc. The hot pursuit for coal assets globally also creates the necessity to identify the emerging coalfields in the known coal exporting countries and also identify new countries which could be a potential source for importing coal to India.

18.3 The indicative coal reserve and the reserve to production ratio for the Countries which could be potential source for import of coal into India is given in Annexure 18.1.

18.4 The global trade in coal is divided into two distinct flows viz.

- Atlantic market: where most of the coal flows into Europe. The key countries supplying this market are South Africa, Russia and Colombia – Venezuela.
- Asia-Pacific market: where most of the coal flows into East Asia and now India also. The coal to this market is supplied by Australia, Indonesia and South Africa.

The trade in both the markets in 2008 is furnished in the chart given in Annexure 18.2

18.2.1 A graphical representation of import trends of different Asian countries as given in Annexure 18.3 reveals the following:

- In 2002 Japan led the market share of Asian thermal coal trade with 47% share which has subsequently decreased a level of 39% in 2008.
- The market share of Korea and Taiwan has remained stable at around 23.5% and 19.5% respectively.
- China, which had minimal thermal coal import in 2002, significantly increased its import to about 10% of market share by 2010.
- The market share of India from 2002–2008 has increased from a level of 5% to 10%.
- The overall CAGR percent of imports by Asian countries from 2002–2008 stands at about 7%.

18.2.2 An analysis of growth in global thermal coal exports of major coal exporting countries as given in Annexure 18.4 reveals the following:

- Australia occupied the maximum share of Asian thermal coal trade in 2002 comprising to about 21%, which decreased to 17% by 2008.
- Similar trends has been observed for South Africa and China where exports have decreased from the level of 15% in 2002 to 9% in 2008 in case of China and from 15% in 2002 to 6% in 2008 in case of South Africa.
- Russia and Columbia have shown significant increase in market share. In case of Russia, the market share rose from a level of 7% in 2002 to 13% in 2008 while in case of Columbia the market share rose from 8% in 2002 to 11% in 2008.
- The most significant growth in market share was observed in case of Indonesia, which rose from 14% in 2002 to 26% in 2008.

- The overall CAGR% of exports into Asian markets from 2002 to 2008 stands at 5.5%

18.2.3 An analysis of activities related to expansion in thermal coal production and infrastructure capacity building reveals the following scenario

- The export capacity of Australia is expected to increase to a level of 213 million tonnes by 2020 from a level of 115 million tonnes in 2007.
- Indonesia is expected to export 240 million tonnes by 2020 increasing from a level of 173 million tonnes in 2007.
- Columbia is also expected to increase its thermal coal export to a level of 109 million tonnes in 2020 from the level of 65 million tonnes in 2007 and the incremental production is expected to come from new mining areas of El Descanso.
- However, the export from South Africa is projected only at 87 million tonnes in 2020, which is only a 20 million tonnes increase from its 2007 level. This is primarily due to decrease of production capacity arising out of closure of old mines and constraints in rail/port logistics for evacuation of coal from new/virgin coalfields.

18.3 Indian coal import scenario :

An analysis of above information and studies made by the different agencies on the future options of coalfields/countries for sourcing coal to India was made. The key observations which emerge have been grouped separately for thermal and coking coal. While on one hand there are concerns going forward regarding enhancing imports from leading exporters like Indonesia and South Africa, on the other hand, there are possibilities of meeting the import demand importing from new countries or from new coalfields of known countries. A brief futuristic view of each country, which is either already an exporter of thermal/coking coal or could be a potential source in future, is presented below:

Country	Overview	Advantage	Disadvantage	Way Forward
Indonesia	<p>Largest thermal coal exporter to India.</p> <p>Future production will come from East Kalimantan and Sumatra.</p> <p>Central Kalimantan has semi-coking and high CV thermal coal resource.</p>	<p>Lowest freight cost to India.</p> <p>Low cost of mining due to opencast-able reserve.</p> <p>Availability of river network.</p> <p>FDI allowed in coal mining.</p>	<p>Likely option of export of low CV coal.</p> <p>Meeting domestic market obligation (DMO).</p> <p>Future production from Sumatra and East Kalimantan will low CV high moisture coal.</p> <p>Legal framework.</p> <p>High logistic cost from Sumatra.</p>	<p>Beneficiation of high moisture coal to enhance GCV.</p> <p>Enhance production to meet DMO quantity.</p> <p>Investment in logistics in Central Kalimantan and Sumatra.</p> <p>Sensitize bilateral platform for G2G allocation of coal assets.</p>
Australia	<p>Highest exporter of coking coal to India.</p> <p>Superior grade coal reserve.</p> <p>Suitable investment climate.</p> <p>Galilee, Surat and Gunnedah are emerging thermal coal regions but logistic is an issue.</p>	<p>Superior quality of coal reserve.</p> <p>Availability of state-of-art technology and human resources</p>	<p>Constraints in ports and railway capacity.</p> <p>Introduction of MRRT will squeeze import.</p> <p>Landed cost of thermal coal from Australia to India is apparently high.</p>	<p>Utilization of sovereign funds to create logistic infrastructure.</p> <p>Infrastructure-mining Consortium of Indian companies should collectively invest.</p> <p>Western Australia can be a competitive source of thermal coal import to India.</p>
South Africa	<p>Comprises of 30% thermal coal exports to India.</p> <p>Production from known coalfields are depleting.</p> <p>Limpopo province is an emerging region.</p>	<p>Availability of superior quality thermal coal.</p> <p>Availability of technology and human resources.</p>	<p>TRANSNET has capacity constraints.</p> <p>RBCT has capacity constraints.</p>	<p>Focus on coal of GCV 5000–5500 Kcal/kg.</p> <p>Infrastructure-mining Consortium of Indian companies should collectively invest.</p> <p>Option for evacuation of coal from Limpopo through Mozambique may be explored.</p>

				G2G allocation of coal blocks.
Mozambique	<p>Emerging destination for sourcing thermal and coking coal to India.</p> <p>Proven reserve in Tete province.</p> <p>Known reserve in other provinces.</p> <p>VALE and RIVERSDALE to start production shortly.</p> <p>SENA railway line started operation.</p> <p>Coal has to be hauled over a large distance to ports.</p>	<p>Nearness to India.</p> <p>Availability of coal resources.</p> <p>Favourable FDI policy in coal mining.</p> <p>Availability of coking coal.</p>	<p>Constraints in Railway capacity.</p> <p>Ports cannot handle large size vessels.</p> <p>High ash percentage in ROM coal.</p> <p>Railway hauling distance is large.</p>	<p>Develop deep sea ports to handle cape size vessels.</p> <p>Build alternate railway line to Beira and Nacala.</p> <p>Explore barge (through Zambezi-railway option).</p> <p>G2G allocation of coal blocks.</p> <p>Infrastructure-mining Consortium of Indian companies should collectively invest.</p>
USA & Canada	<p>Has large reserve of good quality metallurgical and thermal coal.</p> <p>Existing network of railway and port.</p> <p>Some quantity of thermal coal and metallurgical coal has been exported to India.</p>	<p>Favourable FDI policy.</p> <p>Availability of technology and human resources.</p> <p>Metallurgical coal trade can be competitive with large size vessels and low cost of mining.</p> <p>Large quantity of high CV thermal coal is available for export.</p>	<p>Very high freight cost unless Cape size vessel is used.</p> <p>Thermal coal has high sulphur percentage.</p>	<p>Use Cape size vessel for coal export.</p> <p>Develop long-term contracts of thermal coal on cost + basis.</p> <p>Invest in metallurgical coal mines.</p>
Columbia & Venezuela	<p>Known source of coking and thermal coal reserve.</p>	<p>Can be a new source for thermal and</p>	<p>High maritime freight cost.</p>	<p>Special price regime to be worked out.</p>

	Primarily exporter in Europe and USA. Investment in logistics required.	coking coal to India.		G2G allocation of coal blocks. Infrastructure-mining Consortium of Indian companies should collectively invest.
Russia & Mongolia	Known reserve of coking and thermal coal.	Good quality reserve available for acquisition.	High inland cost for transport.	Special coal corridor through China required from Mongolia. High price of coking coal make investment in Russia justified for metallurgical coal.
Botswana & Madagascar	Known source of Anthracite and Bituminous coal. Govt. inviting investment.	Available coal reserve. Favourable FDI policy.	High logistic cost. Infrastructure required to be built up.	G2G allocation of coal blocks. Infrastructure-mining Consortium of Indian companies should collectively invest.

18.4 Issues and concerns in respect of acquisition of assets abroad:

18.4.1 Coal – a strategic asset:

Recent global trends of Merger & Acquisition (M&A) in coal market reveals the fact that countries like China, Japan, Korea and Taiwan are in a aggressive spree to acquire coal asset in different countries all over the world, which illustrates the thrust of competing nations on long-term energy security. The burgeoning demand-supply gap in India is of a great concern for the energy security of the nation and thus the issue of enhancing energy security through imports is a matter of strategic importance.

It has to be understood that whenever any coal asset is acquired by any Indian company, the resource and reserve belonging to the coal asset is virtually added to the national inventory of energy resources. Therefore, the value addition achieved at the cost of the forex outflow has a long-term potential bearing on the capacity of the nation to energize

industrial growth, whose bottom line is manifested in overall improvement in quality of life of the people. Thus acquisition of coal asset by an Indian company is strategic in terms of increasing the energy inventory of the country.

Acquisition of oil and gas asset abroad by Indian companies had taken place much ahead than for coal asset because of import-dependability of India with respect to oil and gas requirement is very high. With passage of time coal imports into India over the last two decades has increased manifold and is expected to increase exponentially in future. Therefore, import dependability of coal is on the rise and the trend is likely to make coal asset acquisition or coal imports as strategic as oil and gas sector. Therefore, acquisition of coal asset abroad needs to be viewed by the Government, as acquisition of “strategic asset” and Indian coal companies needs to be facilitated and encouraged for such acquisition.

Therefore, the outlook of the Government in terms of strategic policies and initiatives for overseas M&A deals has to be of equal stature for coal and oil & gas asset so that the much needed energy security of the nation is ensured.

18.4.2 Potential threat from Chinese Govt. backed M&A Model

A close look at the M&A deals in the recent past in oil and gas, mineral and infrastructure sectors across the world has proved beyond doubt the success of Chinese M&A model for acquisition abroad. Chinese Govt. adopts a policy wherein two Chinese companies are rarely seen competing with each other in foreign soil for acquiring the same assets. The Chinese companies are backed with soft loans from China Investment Corporation (CIC) so that the companies can acquire assets that do not apparently appear to be attractive based on prevailing rate of market borrowings but looks attractive considering soft loans from CIC.

The Chinese Government also extends its diplomatic umbrella to sensitize G2G initiatives to bring favours for Chinese companies in case of acquisition of mineral assets on nomination basis. It has been seen in many cases that the Chinese government has provided sovereign funds for development and creation of infrastructure in various countries, specially in the African continent so that the relationship can be later leveraged by the Chinese companies to acquire mineral assets. In the face of such Govt. backed Chinese M&A model it would become difficult for the Indian companies to acquire coal assets or any other mining assets for that matter, in emerging economies like Mozambique, Indonesia and South Africa.

18.4.3 Creation of Sovereign Fund for Infrastructure development

An analysis of situation in various countries in Section-II clearly brings out the fact that in most of the new or emerging coalfields or coal basins, investment in coal mining cannot be on a stand along basis and would invariably require more investments in logistics and

infrastructure capacity building. This results in the following difficulties for coal mining companies:

- a) In some cases, the coal companies may have the financing capabilities for investing in development and operation of coal assets, but not for creation of entire logistic infrastructure. But unless investment in logistics is tied up the investment in coal asset does not appear to be feasible as the coal business model would depend on developing the value chain for transportation of coal from the mine to the nearest port and availability of port capacities for loading the ships for export to India.
- b) In most cases, even if a coal company has the capability of investing in the logistic projects, it would require assurance from other coal companies working in the vicinity to enter into contracts for long-term transport of coal through the logistic infrastructure. In foreign land this creates another set of complexities for a mining company to handle and the investment finally is not made despite the coal resources being technically attractive.
- c) This would require assistance of the Government in the area of either creating sovereign fund to be spent in countries for creating railway and port infrastructures where consortium of Indian coal mining companies finds it attractive to invest in the coal resources. The infrastructure projects can be through Indian infrastructure companies who may set up separate logistic companies to manage the logistic network. The consortium of Indian coal mining companies can enter into contracts with the Indian infrastructure companies so that entire ownership of the value chain from coal mining-railway line-port is of Indian ownership.
- d) It had been the experience of Indian companies who are pursuing initiatives for acquiring meaningful resources in foreign land, particularly Africa, that the political closeness of the Governments can create preferential status for the companies of that country. Thus in some cases the initiatives for acquiring mineral resources, including coal, needs to be preceded by first forging a friendly political climate in form of exchange of diplomatic missions, execution of MoU and treaties and creation of bilateral working groups for specific asset like coal. It is suggested that the Indian coal companies may need to follow the same route and put up a strategy paper to the Government furnishing a list of underdeveloped and developing countries which has prospective coal assets. The government may, therefore, consider taking a lead in creating a political alliance first followed by M&A alliances between the companies of the countries.

18.4.4 Specific issues for empowering Govt. owned enterprises

While all the above issues pertaining to the Indian coal companies, both government owned and private. There are few specific issues which are consisting the Government owned Indian enterprises both in coal and mineral sectors for successfully acquire asset abroad. The ensuing sections brings out some of the key issues :

- a) Any proposal of acquiring coal asset overseas through Joint Venture or otherwise, and the subsequent mining operation and transportation of coal will involve certain risks.

Needless to mention similar risks also exists for coal mining business in India. Any acquisition proposal for foreign coal asset spells out in detail the identified risks and their mitigation measures. But the confidence for negotiating risk in foreign land can only be developed by implementing projects and gaining experience over time. For the maiden proposals, Board of Govt. owned coal companies has to build the risk appetite and proceed for acquisition. However, absence of clear-cut Govt. guidelines allowing PSUs to be strategically aggressive for maiden foreign acquisitions impedes decision making process.

b) Acquisition of coal asset is a different ball game than procurement of machinery or consumable items in India. There are “Purchase Manual” in place duly vetted by regulatory government agencies for procurement of goods and services and the tender route is generally followed for such procurement. Identification of coal asset abroad to be taken up for acquisition cannot be done through a tender route for the following reasons – firstly, reputed coal companies which intend to sell coal assets do not respond to the tender; secondly, there cannot be a cost or price based selection of a coal asset as conventionally followed in buying of goods or services. Acquisition of coal asset is based on a combination of technical and financial parameters and no structured process based selection of such asset, like that of a conventional tender, is possible. This necessitates clear guidelines from the Govt. to allow the PSUs to follow a need-based strategy for acquiring coal asset or for that matter any asset abroad without any prejudice to existing guidelines for procurement of goods and services. Such guidelines shall also need to have due endorsements from regulatory Govt. agencies like CVC, CAG etc.

c) There is an urgent need to put into place a policy to appoint Investment Bankers on nomination basis to incentivize them for bringing exclusive deals which can be transacted on one-to-one basis.

d) Typically as per practice followed by Govt. owned coal companies, the project proposal involving domestic coal blocks are prepared for life-of-the-mine spanning over a period of 20-25 years. Such project proposals are backed up by extensive data generated through exploration and drilling programme involving substantial investment. Generally owners of foreign coal asset only undertake limited exploration and drilling programme to take the asset to a saleable level and limited investment is made in such exploratory programme. With the available data mining plan and business plan can be made for a period of say 5-10 years and for the remaining period of the mine assumptions are required to be made regarding possible production, logistics, price etc. Therefore, unlike the domestic projects, in-depth detailed business plan cannot be made for such foreign coal asset and therefore a large part of the enterprise valuation would have to be done based on assumptions made on the basis of market knowledge and understanding made by Investment Banker, Technical Consultants and CIL’s in-house expertise. Therefore, like to like comparison of proposal for acquiring coal asset abroad to that of investment proposal in domestic coal assets is not possible and such shortcomings have to be recognized for approving proposal for acquisition of coal assets abroad. Moreover, it may be worth-mentioning here that guidelines for investments in

domestic coal projects exists in terms of critical IRR % but no such guidelines are available for investment abroad. IRR in Indian Rupee terms (INR) is not practicable and hence IRR% must be defined in terms of the currency applicable in the country where the investment is to be made. This creates the need for either circulation of guidelines regarding critical financial parameters like IRR %, ROI (Return on Investment) etc. specially for acquiring foreign coal asset or the coal PSUs which intend to acquire such assets need to be empowered to take decision based on their own judgment and on the merit of acquiring any coal asset as a strategic asset to be acquired for enhancing the energy security of the Nation. The Company Board's decision in this respect should be taken as final and the Board should be empowered accordingly.

e) In most of the target countries for acquisition, coal mining is undertaken by private entities and only very limited numbers of such entities are listed. Therefore, acquisition of coal asset in these countries would necessitate deals with private entities (either listed or unlisted) only, particularly in working coal mines or developed coal blocks. The decision making process of a private company is comparatively much faster than that of a PSU in India as because the inflexibilities in decision making of public sector creeps in most of the time. As a result the timeframe for completion of deal as envisaged by the private entities cannot be complied with. In cases, where the sale of equity in coal asset is done through bidding process the competitors in the bidding process are also private entities who have faster decision making process. The time taken in decision making in Govt. owned companies has time and again proved to be stumbling block to put Govt. companies out of the race due to inability of submission of offers within specified time frame. In spite of the sellers of the asset having strong inclination to enter into partnership with Indian PSUs because of its unique position, failure to comply to the time bound bidding process led Indian PSUs unsuccessful to clinch the deal in which the position was favourable.

f) It is also pertinent to note that a particular coal asset of any listed company may not necessarily be a listed entity in itself. Under the ongoing scenario of aggressive acquisition of coal resources by Indian Private Companies as well as other global coal companies, Coal India might not get good proposals due to this distinction between listed and unlisted companies. It has also been observed that the valuation of coal assets of listed companies is usually priced higher as compared to those from unlisted entities.

g) Acquisition of coal asset abroad, particularly, in view of widening demand-supply gap, should be viewed as strategic acquisition rather than a mere investment. While acquisition of oil and gas asset abroad is viewed as a strategic acquisition, similar strategic direction from the Government is not yet in place for acquisition of coal assets. In case, there are guidelines for strategic acquisition of oil and gas asset the same should be applicable for acquisition of coal asset also, so that more and more coal reserve in foreign countries are added to the national inventory of energy sources.

h) Based on the deliberation above it is strongly felt that the government has to put into place policy and guidelines for acquiring coal assets abroad which would explicitly

delegate the Board of Govt. owned coal companies with the powers and flexibilities akin to those of private entities so that CIL is ensured a level playing field in the race for acquisition of coal assets abroad.

18.5 Suggestive guidelines/steps to facilitate acquisitions abroad:

18.5.1 General matters :

- (i) Government of India may consider creating a sovereign fund for investment in creation of logistic and infrastructure in coal bearing countries, particularly in emerging coalfields where this is an opportune moment to consolidate the position of Indian companies so that substantial quantity of coal supply for long-term period can be secured from these coalfields.
- (ii) The Govt. of India may consider securing soft loans for Indian coal companies, so that effective IRR percentage can be attractive enough for investment, particularly for coking and high CV thermal coal assets which are of strategic importance, but which at prevailing rate of market borrowing do not appear to be attractive.
- (iii) Acquisition of coal asset needs to be viewed by the Government of India as acquisition of strategic asset and all the guidelines and policies applicable to acquisition of oil and gas asset abroad shall be applicable to coal asset abroad. This change in the policy outlook will greatly encourage the Indian coal companies, particularly, those which are Govt. owned, and enable them to successfully complete M&A deals in coal asset and add valuable resource to the national inventory.
- (iv) As a national policy, the government should encourage the Indian coal companies and Indian infrastructure companies to work as a consortium wherever investment in coal mining and logistic projects are required to implement in a harmonious manner.
- (v) Government may consider creating a consortium of Indian coal companies and Indian logistic companies so that the coal mine-railway-port value chain is of Indian ownership.
- (vi) The Government should take immediate steps for creation of new bilateral working groups in coal or activate the existing coal working groups to sensitize the foreign Govts. for allocation of coal assets to consortium of Indian coal companies on nomination basis. The Indian government owned flagship coal company, Coal India Limited, may be the lead company in the consortium and suitable arrangement can be entered into with other government owned or private companies to jointly develop the coal assets abroad. The countries will be identified by the consortium of Indian companies and handed-over to the MOC for implementation of the envisaged strategy.
- (vii) Government may envisage creation of an Indian Coal Inc., which is a consortium of Indian coal companies both government owned and private, who can hold time to time meetings under the aegis of MOC so that diverse efforts of these companies can be converged in a cohesive manner towards enhancing energy security of the nation. CIL may take leadership role in steering this Indian coal incorporate under the guidelines of MOC.

18.5.2 Specific empowerment for Government owned enterprises :

As part of the national policy it is proposed that the Government of India may accord the following empowerments/flexibilities to the government owned enterprises to enable them to compete in the global coal market for coal M&A deals and emerge successful:

- To acquire Greenfield/Brownfield coal assets overseas dispensing with the existing rigid bindings with regard to establishing strategic relationship with listed entities only. The current approach must get replaced by a more professional outlook with definite goal oriented process.
- Framing guidelines for evaluating coal assets, either Greenfield or Brownfield along with the criteria that should be followed for the selection of target coal assets.
- A defined framework to establish itself as a major importer of thermal coal in India by leveraging its position with the existing coal consumers.
- Tools/Guidelines related to financial parameters for quick decision making to fast track the entire Merger & Acquisition (M&A) transaction. Guidelines in respect of critical financial parameters like Enterprise valuation, IRR/ DCF or multiple approaches need to be formulated and finalized for all future acquisitions.
- There are definite risks involved in any M&A transaction, more so when the price volatility is observed to be significant due to market fluctuations. This would require an approved guideline to safeguard the potential risks involved in any Merger & Acquisition (M&A) process.
- Merchant Bankers/Investment Bankers (MB/IB) should be accepted for appointment on nomination basis so that they can develop and bring lucrative opportunities for our consideration. Fees for the MB/IB could be defined in the guidelines as event based on the success of the deal.
- Capital requirements for setting up infrastructure/logistic support would be required in some of the target countries which may have to be financed by Sovereign Fund from the Govt.
- Govt. Guidelines, if any, for acquiring strategic Oil and Gas assets abroad should also be applicable for coal assets.
- It would also be appropriate to include a suitable clause for reviewing the proposed financial powers of the Board related to foreign investment periodically, say, after 3 years or post completion of a successful transaction, whichever is earlier.

CHAPTER 19

INVESTMENT ENVISAGED

19.1 Review of XI plan

For the XI Plan period, the Planning Commission had approved a capital outlay of Rs.37,100.07 crores (cr.) for the Ministry of Coal. However, the overall outlay for the Ministry of Coal was revised downward in the Mid-Term Appraisal (MTA) in September, 2009 to Rs. 32,623.55 cr. Against the original approved outlay of Rs. 17390.07 cr. For CIL, revised to Rs.16090.68 cr. at the Mid-Term Appraisal (MTA), it is anticipated that the utilization would be Rs.13,400 Cr. Similarly, against an approved outlay of Rs. 3340 Cr for SCCL, revised to Rs.3802.07 Cr at the MTA, utilization is anticipated to be Rs. 5070 Cr. The original approved outlay for NLC was Rs.15044 Cr, which was revised to Rs. 8475 Cr at the MTA and the anticipated utilisation is Rs. 7904.20 Cr.

Fund allocation and actual expenditure, including departmental schemes, in the X Plan and the approved outlay of the XI Plan, as per the original document and MTA are as below:

Fund allocation & actual expenditure in X and XI Plans

Sector	X Plan		XI Plan		
	Approved Outlay	Actual Expenditure	Approved Outlay	Revised in MTA	Anticipated
CIL	14310.00	7208.22	17390.07	16090.68	13400.00
SCCL	2113.00	1450.59	3340.00	3802.07	5070.00
NLC – Mines	6125.84	1251.90	2826.00	2334.39	1510.71
NLC – Power	8007.64	1063.32	12218.00	6140.61	6393.49
NLC Total	14133.48	2315.22	15044.00	8475.00	7904.20
Dept. Schemes	1034.52	922.95	1326.00	4255.80	1500.00
Total for MOC*	31,591.00	11,896.98	37,100.07	32,623.55	27,874.20

* Including Departmental Schemes of MoC.

The company-wise break-up of the above details is appended in Annexure 19.1 & 19.2.

19.2 XII Plan Projection

The table below provides the summarized assessment of capital outlay for Coal and Lignite sector in XII Plan. Capital Outlay projected for the XII Plan is summarized below:

(In Rupees Crores)		
Sl.No.	Company	Capital outlay proposed for XII Plan
1	Coal India Limited	25,400.00 + 35,000.00*
2	Singareni Collieries Company Limited	10,350.00
3	Neyveli Lignite Corpn Ltd.	
	Mines	3,481.01
	Power	27,710.50
	Total	31,191.51
A	Sub Total PSUs	66,941.51 (1,01,941.51) including investment abroad by CIL
	Central Plan Schemes	
4	Promotional Exploration	456.52
5	Detailed drilling in Non-CIL Blocks	974.69
6	EMSC (Jharia & Ranigaunj Master Plan)	4,950.05 (3,200.05 from CCDA & 1,750 from CIL)
7	R&D	80.00
8	Conservation and Safety in Coal Mines	820.00
9	Development of Transport Infrastructure	600.0
10	Coal Controller Organisation	1.25
	Sub-total Central Plan Schemes	7,882.51
	TOTAL	74,824.02 (1,09,824.02) including investment abroad by CIL

The proposed Public Sector investment for the XII Plan for supporting their production plan is Rs. 66,941.51 Cr. The outlay proposed for coal PSUs for the XII Plan is Rs. 34,316.96 Cr more than proposed XI Plan outlay (MTA) of Rs. 32,623.55 Crores (excluding Departmental Schemes). The proposed outlay for Departmental Schemes in XII Plan to be supported through domestic budgetary support is Rs. 7,882.51 Cr. Thus the total plan outlay proposed for MoC for the XII plan is Rs.74,824.02 Crores (Rs.66941.51 Cr for PSUs + Rs. 7,882.51 Cr for departmental schemes through domestic budgetary support). Besides this ad-hoc provision of Rs.25,000 Crores has been made for acquisition of coal assets abroad by CIL and Rs.10,000 Crores for development of coal blocks in Mozambique. Total plan outlay envisaged for Coal sector, excluding captive coal block development, is Rs.1,09,824.02 Crores which includes investment abroad proposed by CIL.

19.3 Projected Resource Position for XII Plan (2012– 2017)

At the end of the XI Plan, anticipated surplus for CIL will be around Rs. 52741.20 Cr. The estimated internal and extra budgetary resource (IEBR) position of the PSUs under the MoC for the XII Plan is tabulate below:

(Figures in Rs. Cr.)

Companies	IR	EBR	IEBR	Plan Outlay
CIL	86995.83	Nil	86995.83	25400.00
SCCL	7460.00	2890.00*	10350.00	10350.00
NLC	9357.45	21834.06	31191.51	31191.51
TOTAL	103813.28	24724.06	128537.34	66941.51

* Loan from Financial Institutions

Against the estimated IEBR position of Rs. 1, 28,537.34 Cr. the proposed plan outlay of PSUs is Rs.66, 941.51 Cr. While the resource position of CIL is surplus, the resource position SCCL and NLC is not sufficient to meet the plan outlay, and the companies have to depend on EBR.

Besides, the above investment position for public sector and departmental schemes of MOC, additional investment is required in coal sector for development of captive blocks and washery. Till 2010–11, production commenced in 28 blocks and yielded a production of 34.64 Mt. At the end of the XI Plan, it is anticipated that 34 blocks will be in operation and the likely production is expected to be 36.60 Mt. It is estimated that the production from Captive coal blocks would increase to 80.7 Mt (incremental production of 44.55 Mt) in the terminal year of XII plan. It is expected another Rs.20–25 thousand crores will be invested by the promoters of captive blocks during XII Plan period for achieving envisaged level of production.

Thus the total plan outlay proposed for MoC for the XII plan is Rs.74824.02 Crore. (Rs.66941.51 Cr for PSUs + Rs.7882.51 Cr for Central Plan schemes through domestic budgetary support). The break-up of CIL of the above details is appended in Annexure 19.3 .

CHAPTER – 20

POLICY INITIATIVES ON COAL SECTOR REFORM

20.1 Status of implementation of policy /reforms during the XI Plan

Reports / recommendations of the following committees were reviewed:

- Working Group report on Coal and Lignite for XI Plan – 2006
- Coal Vision 2025
- Integrated Energy Policy – 2006
- Expert Committee on Road Map for Coal Sector Reforms – 2007
- Report of the Committee on National Mineral Policy – 2008

The status of implementation of key areas of policy / reforms is as below:

S.N	Recommendations / Suggestions	Status of implementation
1	<p>Opening up of coal sector</p> <ul style="list-style-type: none"> • Coal mining should be opened to private players without the restriction of captive use. • Increase FDI caps to 100% and permit it under the automatic route for coal and lignite mines for captive consumption 	<ul style="list-style-type: none"> • Coal Mines (Nationalization) Bill, 2000 is pending in parliament • Done
2	<p>Captive Coal Mining</p> <ul style="list-style-type: none"> • Competitive bidding system for allocation of coal blocks should be introduced. • Incentives as well as punitive penalties such as cancellation of block should be evolved. • Captive block holders must be permitted to sell incidental coal surpluses during the development and operation of a block to CIL. • Coal blocks held by CIL that cannot be brought into production by 2016-17, should be made available to other eligible candidates for development with the condition that they be brought into production by 2011-12. • Provision for short term linkages in case gestation period of end use project is earlier • Notify in-situ coal gasification and coal liquefaction as end-uses under the current captive consumption policy. 	<ul style="list-style-type: none"> • Under implementation • Penalties / corrective actions already initiated. • Implemented • New list of 81 Blocks allotted in the last round came from CIL blocks • Tapering linkages have been given out as per the recommendation by CIL • Done

S.N	Recommendations / Suggestions	Status of implementation
3	<p>Coal Pricing and rail freight rationalization</p> <ul style="list-style-type: none"> • Market determined prices based on e-auction upto 20% of the production. • High quality coking and non-coking coals, which are exportable, may be sold at export parity prices as determined by import price at the nearest port minus 15%. • Switch over to a fully variable GCV based pricing system should be expedited. • Rail freight rates for coal transport should be rationalised. Alternate means for moving coal through coastal shipping, river/ canal movement and coal slurry through pipeline must be promoted where feasible. 	<ul style="list-style-type: none"> • Currently done up-to 10 - 12% of production • Largely been implemented by CIL • Still pending for want of a suitable consensus between CIL and consumers • Not implemented
4	<p>Coal Linkage Policy</p> <ul style="list-style-type: none"> • Enter into long term Fuel Supply and Transport Agreements (FSTA) with bulk consumers. 	<ul style="list-style-type: none"> • FSA' executed. IR have decided to continue with their existing arrangement
5	<p>Land and R&R</p> <ul style="list-style-type: none"> • Enactment of legislation for Land acquisition and uniform centralised R&R policy • Constitution of a task force in concerned state Secretariat to help companies in acquisition of land to expedite environment and forest clearances and acquisition of land • Enactment of central legislation to prevent habitation over coal bearing areas and establishing suitable authority for implementing Master Plans for Jharia and Raniganj Coal fields 	<ul style="list-style-type: none"> • The new LAR&R Bill, 2011 introduced in Parliament • The suggestion has not been acted upon • No Central legislation enacted. Authorities established for implementation of Master Plan
6	<p>Environment and Forest Clearances</p> <ul style="list-style-type: none"> • Fast track clearances of Environment Management Plan and forestry clearance • A Special Task Force, constituted under the Secretary (Coal) must closely monitor the approval process. • Green credits - The present system of mining 	<ul style="list-style-type: none"> • The suggestion has not been acted upon • The suggestion has not been acted upon

S.N	Recommendations / Suggestions	Status of implementation
	<p>companies applying for opening new mines having to show equivalent land for compensatory afforestation. They can be encouraged to take up afforestation in advance and given “green credits” for specified acres of new forest created. These could be used in lieu of compensatory of afforestation when new applications are made.</p> <ul style="list-style-type: none"> • Forest clearance applications should be cleared within 6 months. To minimize delays at DFO (evaluation of cost / benefit and tree enumeration); such work should be outsourced to competent private sector consultants • Mining being a site-specific activity, diversion of forestland for mining should be considered for a longer period of, say, 50-100 years or till the exhaustion of the ore body. Further existing leases should be automatically renewed till the ore in the deposit lasts • At present, the FCA processing takes place at multiple levels, it is suggested that the levels at the state government be reduced to three, i.e. District Forest Officer, Nodal Officer, and Secretary, State Forest Department. 	<ul style="list-style-type: none"> • Not acted upon • The suggestion has not been acted upon • Not done • Not done
7	Regulatory Body – A regulatory mechanism should be put in place	<ul style="list-style-type: none"> • Under consideration
8	<p>Government Support</p> <ul style="list-style-type: none"> • All the benefits and concessions extended to Infrastructure industry may be extended to coal and lignite also. This will attract more investment in the sector. • Ministry of Finance may consider granting special exemption from Service Tax in respect of site formation and clearance, excavation and earth moving services in coal industry and include coal industry in the exemption clause under Section 65 of the Finance Act. 	<ul style="list-style-type: none"> • The suggestion has not been acted upon • The suggestion has not been acted upon

S.N	Recommendations / Suggestions	Status of implementation
9	<p>Coal and Lignite exploration</p> <ul style="list-style-type: none"> • Need to continue the schemes of Promotional Exploration and Detailed Drilling in non-CIL blocks during the XI Plan for expeditious allocation of coal blocks to captive users. • In line with detailed drilling in non-CIL blocks a new scheme namely detailed drilling in non-NLC lignite blocks has been proposed. • Need to identify forest areas as 'Yes' and 'No' zones for exploration, if the nation is ready to sacrifice the coal resources lying below so called 'No' zones. The exploration in 'Yes' zones may be facilitated with faster clearances. • Exemption from the need for 'Prospecting License for CMPDI, SCCL and NLC • A time-bound plan to cover the entire country by regional mapping in 15 years should be prepared by GSI, CMPDI and MoC. • CMPDI's current capacity of drilling 3 lakh meters per annum must be raised to at least 15 lakh meters per annum 	<ul style="list-style-type: none"> • Under implementation • The suggestion has not been acted upon • In 9 coalfields forest areas have been classified as Category A and B. However approval process has not changed. • The suggestion has been acted upon • Progress is slow • Process initiated
10	<p>Labour Laws</p> <ul style="list-style-type: none"> • Coal mining sector should get exemption from provisions u/s 10 of Contract Labour (Regulation & Abolition) Act (Prohibition of employment of contract labour) 	<ul style="list-style-type: none"> • Reform needs to be initiated
11	<p>Underground mining</p> <ul style="list-style-type: none"> • Wherever the techno-economic parameters of the geological resource demands development of underground mine, related technology must be encouraged by giving incentives to operators 	<ul style="list-style-type: none"> • Action initiated
12	<p>Flexibility in Project Formulation and appraisal</p> <ul style="list-style-type: none"> • To accord greater flexibility in project formulation, CIL could be granted the status of Navratna Company or 	<ul style="list-style-type: none"> • Done – CIL has since been listed on Indian Stock

S.N	Recommendations / Suggestions	Status of implementation
	else the subsidiaries of CIL could be granted the status of Mini Ratna companies.	Exchange. It has also since been given a Maharatna status.
13	<p>Human Resource Management</p> <ul style="list-style-type: none"> • The manpower planning process at CIL needs to be thoroughly reviewed and strengthened. • CIL has to revise its promotion policy and evolve incentives. • CIL should devise a well thought out HRM plan would gradually groom the employees to take up higher responsibilities • Creation of a SENIOR MANAGEMENT SERVICE for technical and administrative cadres in CIL and SCCL. • CIL should sponsor a large number of polytechnics and Industrial Training Institutes in all the districts where there are coalmines. • Indian Institute of Coal Management (IICM) in Ranchi should be given a greater role in functioning as a central Apex training institution for coal industry and all facilities for training in Technical and Managerial aspects of the industry. 	<ul style="list-style-type: none"> • Being carried out • Being carried out • Being carried out • Being carried out • The suggestion has not been acted upon • IICM has taken some initiatives, but more needs to be done

20.2 Key reform initiatives proposed in XII Plan

20.2.1 Exploration and Project Formulation

- Coal exploration to be speeded up manifold to ensure availability of more explored coal blocks for mining by private and public sector. Multiple suggestions of enhancing CMPDI capacity as well as involving private sector in this respect are being made:
- Multiple technical agencies to undertake coal exploration effort. Apart from CMPDI, MECL and State Directorates, more players should be brought in and current capability of exploration agencies should be enhanced for increasing exploration effort.
- A time-bound plan to cover the entire country by regional mapping in 10 years should be prepared by GSI.
- CMPDI's current capacity of drilling 3 lakh meters per annum must be raised to at least 15 lakh meters per annum.

- CMPDI should be asked to speed up detailed exploration by engaging institutions/companies, selected based on competitive bidding, which could take up exploration of the blocks under the Indicated and Inferred categories. The corresponding cost may be recovered from the prospective allottees for respective block
- New exploration technologies such as geo-physical logging, satellite imagery should be extensively used for this purpose
- A countrywide study needs to be carried out to classify the total coal resource in the country as per JORC / UNFCC Classification. For this purpose a high level task force should be set up to carry out this activity in a time bound manner.
- There should be no necessity for FC for exploration, provided the exploration agency commits to necessary restrictions as may be imposed by MoEF. The number of boreholes can be taken as per UNFCC guidelines.
- Need to strengthen the institution of RQP through greater scrutiny of their capabilities.
- Further, either Coal Controller's Organisation or else proposed Coal Regulator should be given the mandate for monitoring the implementation of the approved Mining Plans.

20.2.2 Clearances and Licenses – Environmental and Forest

- To expedite clearances a co-ordination committee at the Centre and State level should be set up (Single window concept) with senior representation from the concerned departments.
- A Special Task Force, be constituted under Secretary (Coal) to closely monitor the approval process. An Apex Committee of Secretaries headed by the Cabinet Secretary, consisting of the Secretaries from the Ministries of Coal, Power, Environment and Forest, Finance, Home, Railways, and Planning Commission, review the process of important matters related to environment / forest clearances, land acquisitions, possessions, law and order, etc.
- To ensure a leaner, transparent and efficient approval process, there is a need to ensure Forest and environmental clearances in a time-bound manner. Also the number of levels and stages should be reduced.

20.2.2.1 Specific recommendations in respect of forest clearances include:

- FC applications should be cleared within 6 months. DFO work – evaluation of cost / benefit and tree enumeration to be outsourced to competent private sector consultants
- Levels for granting Stage II FC clearance should be reduced, as it is only compliance to the in principal approval.
- Diversion of forestland for mining should be considered for a longer period till the exhaustion of the ore body.

- To avoid delays in FC levels at the state government be reduced to three, i.e. District Forest Officer, Nodal Officer, and Secretary, State Forest Department.
- Green credits – Coal mining agencies can be encouraged to take up afforestation in advance and given “green credits” for specific acres of new forest created to be used in lieu of compensatory afforestation when new applications are made. Green credits should be allowed to be traded openly and anyone should be allowed to undertake afforestation anywhere in the country.
- Coal companies should hand over forestlands and revenue forestlands to respective State Government Departments.
- State Governments to be directed to complete the process of determining and conferring the rights of scheduled tribe and other traditional forest dwellers in six months.
- Till 31.03.2011, applications for environmental clearances can be filed independent to the status of forestry clearance. Now for seeking environmental clearance involving forestland, in-principle approval of forestry clearance is a prerequisite. This needs to be done away with.

20.2.2. Specific recommendations in respect of Environmental Clearance are:

- Projects for benefit of XI & XII Plan to be taken at priority or if necessary, a Special Task Force with adequate powers may be set up to examine environmental related issues for such project. Further, environmental clearance may be sought and awarded for production at least 25% more than the initial required mine capacity.
- There is wide disparity in environmental performance of coalmines in the country. A system of third party audit or the adoption of a ‘Green Rating System’ can bring out the best practices and establish benchmarks for those not doing so well to improve.
- EC once given should be valid so long as there is no expansion or major modifications in the mine/washery; it should not be required afresh merely because lease is being renewed.

20.2.3 Clearances and Licenses – Land Acquisition and R&R

- Enactment of a central legislation to ensure uniform R&R policy and speedy land acquisition
- Delineation of coal bearing areas in each state and to put the information on the concerned State Govt website should be carried out in a time bound manner by MoC. The State Government have to obtain clearances from MoC before issuing any license for setting up any industry / infrastructure
- Enactment of central legislation to prevent habitation over coal bearing areas
- Specific recommendations in respect of land acquisition process are:
- Coal companies should actively restore post mining land into agricultural land with some effort and investment.

- Companies should be encouraged to take up land for mining on long term lease to be returned back on completion of mining to the land holders
- Tripartite Committee of the concerned District Collector/Special Land Acquisition Officer, representative of company official and representative of the landowners may be formed to review and resolve problems in acquisition and handing over of land.
- CBA needs to be reviewed and modified to make it more growth oriented

20.2.4 Captive Coal Mining

- Appropriate measures for increasing coal availability from captive coal mining blocks by amending the Coal Mines Nationalization Act.
- Future blocks should be allocated on the basis of a transparent bidding process, with bidders placed on a similar platform. Multiple suggestions have been made in this respect:
- Blocks to be brought for Competitive bidding should be free from factors like presence of wild life sanctuaries etc which will stand in the way of the Clearance.
- Time allowed for commissioning should be suitably revised taking into account the ground realities in respect of prospecting license, forestry & environment clearances and time taken for land acquisition and execution of lease agreement.
- Prospecting license should be issued along with the block allocation letters.
- Time period of 2 years for completion of exploration should be counted from the date of grant of forestry clearance within a certain time limit.
- Power Projects having cost of coal, as a “Pass through” item should not be allowed to participate in the bidding process.
- A bidder’s mining experience should be considered during the qualification stage. The mining experience of the mining company will help the consortium in ensuring expeditious development of the Block
- A Member of the Consortium should be allowed the advantage of the strength of its promoter/associate company in the Group for meeting the qualification criteria.
- The bidding document should contain all available information including geological information, data on Rail and Road connectivity; Extent of Forest Cover; Presence of water bodies like River, Nalah, Lake etc.; Human Habitation; Nearness of high tension power sub station etc

20.2.5 Captive / MDC / Other Government Company block owners

A substantial investment in mining activities would also be made by companies who have been allotted blocks under captive or government dispensation, as production is expected to rise substantially from these blocks in the XII Plan.

One of the key challenges being faced by these block owners in development of their blocks is their inability to create / access infrastructure for evacuation of coal to their end use plants. It is therefore, desirable that an agency should be created – Special Area

Development Authority in consultation with State Governments so that Master Plans for these facilities can be prepared coalfield-wise. The committee therefore recommends creation of an institutional mechanism for planning and development of common infrastructural facilities for use by all the block owners:

- A Local area Development authority should be created with participation of block allocates, coal mining companies and respective state governments to develop comprehensive plans for infrastructural facilities and requirements in each identified coalfields areas.
- The authority shall award the development and operations of the said infrastructure facility on BOO basis to a developer on a PPP basis.
- The developer is expected to take defined revenues for each unit of capacity, which will be paid for by the users of the facility.
- A pre-defined (standardised) User Agreement based on capacity would be executed between the developer and the captive block owners for the same
- A Regulator may be designated to monitor the performance of the PPP Developer and also adjudicate on any dispute arising between the developer and the users
- Where CIL is also operating blocks in the same coalfield and has developed infrastructure; wherever surplus capacity is available in the infrastructure developed by CIL, the same should be made available for use by the block allocatees, through the authority against the payment of user charges fixed by the regulator. In certain situations, the capacity of CIL infrastructure can be increased by making marginal investment / modification / addition thereto. The same should be made through the authority on PPP basis and the capacity so created, can be shared by block allocatees. This will avoid creation of parallel networks and may also provide ready access to Right of Way land in many cases.

20.2.6 Regulation and Governance in Coal Sector – Industry structure

- The coal sector regulator should be set up on a priority basis
- National Coal Council – Advisory Board, which may be called the National Coal Council in which all stakeholders are duly represented to be set up headed by Minister for Coal.
- Infrastructure status should be extended to the coal industry. Duties on capital goods imported for coalmines must be lowered to put them at par with duties on imports for other energy sub-sectors.
- Amend the provisions of Contract Labour (Regulation & Abolition) Act, 1970 to facilitate offloading of restricted activities in coal mining for improved economics of operations.
- Coal mining should be opened to private players without the restriction of captive use. To this end, the Coal Mines (Nationalization) Bill, 2000 should be passed.

- Conservation of Coal resources – A high level task force should be set up to formulate a set of principles / rules for ensuring conservation of coal resources / maximising the exploitation of resources from opencast and underground means.
- Coal and CBM / CMM – Need for treatment of Coal and CBM exploitation in an integrated manner and not as an independent energy sources as being done currently leading to conflict situations. MoU between Coal and Petroleum Ministry to be reviewed and a comprehensive policy on CBM along with coal mining needs to be evolved
- Given the high commercial risks and large capital investment requirement even to assess the viability; UCG should be provided similar fiscal initiatives as available for CBM.
- It is recommended that either CMPDI is made an independent organization or an independent organization be created to develop and maintain the repository of all geological information in the country on the lines of CEA or DGH.
- For acquisition of coal assets outside the country, Govt. of India should create a sovereign fund out of which loans can be made available to the Indian Companies interested in acquiring overseas Coal Assets.
- For Public sector companies an empowered group should be created so that proposals for Asset acquisition abroad can be examined by this Group and decisions taken.

20.2.7 Development of Underground Mining:

- Coal companies should develop a comprehensive plan for improving their performance in underground mines
- Government should consider options such as cost plus pricing, cross subsidies, to improve the potential returns currently available from underground mining activities
- Government Companies should also be encouraged to create JV arrangements for exploitation of high value UG reserves such as Coking coal properties where the JV partner takes responsibility for the development and operations of the mine and CIL shares a premium based on a transparent bidding process
- For encouraging UG mining, fiscal incentives like exemption from customs / excise duty for equipment, any applicable cess and exemption from payment of NPV for forest cover should be provided.

CHAPTER-21

MARKETING STRATEGY & MECHANISM FOR GRIEVANCE REDRESSAL

21.1 Background:

Demand – supply rationalization remained a critical area for the nationalized coal sector of India since its inception due to several reasons. Even after allocation of a large number of coal blocks to consuming sectors on the one hand and bringing coal under open general license in the liberalized era, the emerging demand–supply gap continues to be the most vital issue for deciding all marketing related strategies till date. The most important strategic decision taken in respect of marketing in XI Plan period is New Coal Distribution Policy (NCDP), again concentrating only on distribution of coal.

Distribution will continue to occupy the centre stage of the marketing strategy document. Nevertheless, product and technology development for economic use of coal is also of vital importance to ensure sustainable growth of coal sector and energy security of the Country. Movement logistics is another key area of coal marketing strategy of which source rationalization is a major component. Application of information technology for optimum utilization of logistics resources, customer service and relationship management including redressing grievances need also to be included as important components of the marketing strategy document.

21.2 Product positioning & product development strategy

A. Product positioning:

- a) **Positioning the Low ash indigenous coal:** Grades A to C with GCV ranging between +6400 to 5400 Kcal/Kg can be considered as import substitution grades of coal because of comparable heat value with the coal being imported in the country.
- b) **Positioning the high ash coal (D to F grades):** Leaving the requirement of the pithead consumption centres of about 200 Mt, essentially those of power sector (including captive power plants) aside, the balance quantity by the end of XII Plan may be offered in the market after processing.
- c) **Coking coal:** The existing positioning strategy for varieties with already established metallurgical use may continue in the XII Plan. However, considering the increased dependence of steel plants for imported coal, it will be of national importance to find use of at least a part of the non-linked washery (NLW) grades of coking coal in steel making. While technology development for using NLW coal in steel sector will be the thrust area in XII Plan,
- d) **Washery by-products:** Middling of coking coal washeries is already an established product for catering the fuel need of the power sector. Proven technology is available worldwide for FBCC boilers for using fuel of 70–72% ash content. Therefore, washery slurry and reject based power generation units may be

promoted in XII Plan. Government may take policy initiative to compel washery promoters to have slurry/reject base captive power plant. Normally, no fuel supplement is required for running such plants. However, in a few instance, because of higher efficiency of the washery, the heat content in the reject/slurry may be at sub optimal level. In those cases the small quantity, that may be required as fuel support can be procured from e-auction platform. Therefore, such initiative does not require any permanent coal procurement arrangement.

B. Product development strategy: The product development strategy essentially needs to take care of the issues covering improvement in product features and improvement in fuel combustion equipments.

a) Improving product features:

i) Reducing ash content and bringing consistency in coal quality: Beneficiation of coal: Beneficiation of coal is of vital importance for bringing consistency in coal quality and reducing ash content and. As reported by Coal Controller's Organization, the existing washing capacity of the Country is to the tune of 126Mt, 30Mt for coking and 96Mt for non-coking coal. CIL has already taken steps to have captive washeries for all new coal projects of 2.5MTPA & above production capacity and not linked to captive consumers. It is expected that in the first phase, by 2014-15, CIL will have washing capacity of about 150MTPA, including the existing washing capacities of about 39Mt. Thus actions have already taken for creating total washing capacity of 237 MTPA, 47Mt coking and 190Mt non-coking coal. Out of the total requirement of 680.08 Mt coal for power utilities, it is estimated that about 104 Mt would be required for power plants located at pitheads. There is a plan for increasing washing capacity substantially in the second phase by CIL. Similar approach needs to be taken by other coal producers as well.

ii) Despatch of sized coal: While coal is normally subjected to crushing and sizing before dispatch, in some cases, particularly during peak production months, ROM coal is dumped in make shift stockyard. During XII Plan, Coal Companies shall deploy mobile crushers for these stockyards before dispatch. In order to ensure 100% sized coal dispatch all the Railway sidings would be declared fit for loading both BOXN & BOBR rakes

iii) Reducing the bandwidth of existing coal grading system: This will improve consistency of coal quality. Coal companies will have to be extra vigilant for maintaining supply of coal as per grade, improving quality of coal.

b) Improved production technology: Under ground mining and use of surface miner in opencast mine are likely to bring substantial improvement in coal quality. These technologies will also, to some extent, be capable to take care of the sizing problem.

c) Improvement in combustion equipments: The emerging gap between demand and indigenous availability calls for efficient and economic use of coal. Combustion equipments also need to be capable for handling variant blending mixes of imported and

indigenous coal. A strategy initiative needs to be taken for encouraging promotion and use of upgraded technology. Innovative rewarding schemes like, green channel recommendation for issuance of letter of assurance, supply from specific sources as per the requirement of the technology, fixed tenure price escalation compensation etc.. may be introduced during XII Plan period.

21.3 Pricing strategy:

Having moved away from the normative cost-based coal pricing during the administered price regime with annual revision of price on BICP formula to obviate the inflationary pressure on coal sector, in the post decontrol scenario since 1996 (partial) and the year 2000 (full), the enhancement in coal prices has been competitively low when seen with other energy inputs like oil products, international coal prices, growing open market coal prices as well as the inflationary trends in the country. In fact, PSU Coal Companies shared a portion of its cost efficiency with the consumers and the increase in coal price had been consistently less than the level of inflation.

After import of coal was brought under open general license and e-auction was introduced, two additional benchmarks were available for price determination. The landed price of imported coal could provide a platform for comparison of the price of indigenous coal of equivalent heat value and E-auction provided a fair idea about the price acceptability level of the market. Using these two important benchmarks, recently the concept of dual pricing has been introduced; one for consumers in the regulated sector (i.e. power, fertilizer and defence) and another for consumers in the non-regulated sector (i.e. sectors other than power, fertilizer and defence). Since the price of end products of the coal consuming industries in the non-regulated sector are quite volatile and are driven by demand supply scenario, prices of coal for supply to the consumers in the non-regulated sector have been kept at 30% higher than the price of coal for supply to the consumer in regulated sector. Further prices of Grade A and Grade B of coal have been fixed on import parity basis for supply to all the coal consuming sectors. The economic rationale behind increasing the prices of Grades A & Grade B coal is that the A & B grades of coal are import substitutes and have demand even at import parity price. In fact, this pricing strategy has been in line with the findings of the Integrated Energy Policy (IEP), wherein it was recommended that:

“ High quality coking and non-coking coal which is exportable should be sold at export parity prices as determined by import price at the nearest port minus 15%. This practice is currently being adopted for supply of good quality coking coal to the Steel Industry. However, since substantial amount of coking coal is imported, domestic coking coal should be priced at import parity price.”

Even after the recent efforts of Coal India, there has been a substantial margin between the notified price and the market price of coal. Availability of only 10% of production through e-auction is not sufficient to bring price equilibrium in the market. This has been, in a few cases, providing impetus for diversion of coal to the grey market. The pricing strategy, therefore, should, as far as practicable, be gradually driven by the

market force. This has also been recommended by IEP. Further, the effective price concession being offered at present is acting as a deterrent in increasing production from the blocks allotted for captive use. The market driven price for all deregulated sectors, the size of which is about 20% of the total coal market of India, should be brought under e-auction platform.

21.4 Distribution strategy:

The New Coal Distribution Policy:

Persisting problems in the extant distribution policy led to a series of litigations between consumers and coal companies. Ultimately the Apex Court, in one such dispute, ruled that Government should come out with a New Coal Distribution Policy taking view of all the stake holders. A committee under the Chairmanship of Secretary (Coal) was formed by the Government with the following terms of reference:

- Review of existing classification of consumers into “Core and “Non Core” sectors.
- Suggest a Mechanism for supply of coal to consumers in different sectors.
- Mechanism for supply of coal to small/tiny consumers who are unable to access coal directly from coal companies.
- Strategies to bring about transparency in coal distribution by use of Modern Technologies including Information Technology.

After several round of discussions with all stake holders the proposal of the committee was approved by the Government and the ‘New coal Distribution Policy (NCDP)’ was announced on 18th October 2007.

Salient Feature of the New Coal Distribution Policy:

- Core & Non Core classification done away with
- New Classification – keeping in view the regulatory provision
- Defence & Railways to get full requirement at notified price.
- Power & Fertilizer Sectors to get 100% of normative requirement through Fuel Supply Agreement (FSA) at fixed price to be declared/notified by coal companies.
- All other consumers to get 75% of normative requirement through FSA.
- Small & Medium Enterprise Sector having requirement up to 4200MT per year to get coal from Agencies to be nominated by States/Union Territories.
- All existing linkage holders are required to execute FSA for continuation of coal supply.
- For new commitments to Power, Cement and Sponge Iron sectors – CIL to issue Letter of Assurance (LoA) after approval of applications by the Standing Linkage Committee
- For other sector CIL will be responsible for issuance of LoA
- LoA will have validity for 24/12 months for Power/other consumers respectively.

- LoAs to be converted to enforceable FSAs after completion of stipulated milestones/conditions within the given time.
- CIL, to meet full domestic requirement of coal under FSA, even by resorting to import, if feasible
- 10% of the annual production of CIL to be earmarked for e-auction
- Introduction of forward e-auction scheme to provide a long-term coal sourcing platform for industrial consumer
- Supply to Steel Plants on FSA –on the basis of import parity price.
- Discipline in economic use of coal is a thrust area.

While the NCDP envisaged all supplies to be regulated through enforceable bi-lateral Fuel Supply Agreements (FSA) at the same time it has put the supplying coal companies on an onerous task of meeting the entire domestic coal demand under the FSA, if need be, even by resorting to import.

The gap between the domestic demand and growth in indigenous coal production has been steadily widening, even after introduction of commercially enforceable FSA regime. Due to widening gap all new projects including those covered by SLC (LT) are not being issued fresh recommendations for issuance of Letter of Assurance. Initiatives of PSU coal companies to import coal for bridging the gap between demand and indigenous availability is yet to find definitive response from the consumers.

No foolproof system could be developed to ensure discipline in economic use of coal, a thrust area of the NCDP. In fact, the differential between the notified and the market price of coal has been the continuous motivator for diversion of coal to grey market.

In view of the above, the Working Group observes the following:

- a) The motivator for diversion of coal being directly proportional to the gradients in price differential in the market, bringing more numbers of consuming segments under the common platform of e-auction to minimize price differential which may bring discipline in economic use of coal.
- b) About 80% of the indigenous demand is from regulated sectors, viz. Power & Fertilizer. The remaining 20% of the consumers are purely operating in a market driven price regime. Their business decisions are taken purely on the prevailing market condition. In the milieu of scarcity, it is therefore necessary to develop a system where only the most deserving would get access in coal source which only can ensure discipline in economic use of coal.
- c) Integrated Energy Policy (IEP) also recommended that 20% of the indigenous production should be offered in e-auction.
- d) Bringing all deregulated sectors under e-auction platform would provide level playing field to all consumers – old and new, without any specific consuming sector-wise preference.
- e) The additional availability of coal in e-auction platform is likely to correct the aberration in the pricing mechanism

21.5 Logistics strategy:

Presently coal is sold on Free-on-Rail (FOR) colliery basis; commercial implication of which is that onus of arranging transportation is the responsibility of consumers. In absence of a tri-partite agreement, both for indigenous and imported coal, between Coal Companies, Railways and Consumers, the existing FSA cannot ensure coal reaching the consumption points.

In spite of huge gap between demand and indigenous availability, pithead stocks at coal companies have been accumulating for consecutive years. There are instances that while a few power stations have been receiving coal much higher than the annual contracted quantity others are persistently under coal stock crisis, the reasons of which are embedded in operational conveniences of Railways and or inept unloading facilities at the consumption points. Transport logistics happens to be a major bottleneck for effective implementation of the distribution policy.

Ultimately, the entire system can run on sustainable basis on the efficiency of each stack holder, i.e. coal companies, transporters and consumers. The constraints and shortcomings in the arena of each stakeholder's ambit have multiplier effect on the overall system.

In view of the above, following issues need to be resolved during XII Plan period:

- a) Implementation of tri-partite Fuel Supply & Transport Agreement for all rail-borne FSAs
- b) Rationalization of coal sources for optimization of transport capacity —both for indigenous and imported coal
- c) Investment by coal companies in creating logistics infrastructure in the field of railway track, rolling stock, port capacity
- d) Developing and augmenting alternate mode of transport like inland waterways, coastal shipment for easing out burden on railway system
- e) Promoting logistics companies through PPP Model by major stakeholders in upcoming coalfields for creating track network and transfer points with Indian Railway system. Investment in creating facilities and developing core competence in end to end logistics solution for movement of both indigenous and imported coal would also be a priority area.

21.6 Introduction of IT enabled Sales Management

In today's changing business environment the enterprise needs to extend presence all the way to suppliers, business partners, retailers and end customers – internet provides less expensive way to adopt a multitude of business tools like ERP, SAP, SCM and CRM to increase the business horizon by adopting e-commerce as the way of efficient, cost effective transparent business mechanism.

Coal sector though slowly but have lately picked up to adopt the benefit of the ICT to harness its full potential– it further required to reduce human interface on day to day business activities and to harness the leveraging technologies to extend the benefit to all

consumers and stake holders . A few advantages of the implementation of the information technology in coal sector could be:

- Extending 24 X 7 operation
- Global Reach: The service can be widened to coal consumers across the length and breadth of the country
- Reduction in cost to service the customer
- Building an extended enterprise connected with all stakeholders– Customers, bankers, transporters, statutory authorities
- Improved customer service (CRM)
- Development of technology oriented customer interface
- Capturing database on customer's buying behavior

More than 50% of the coal is moved by Indian Railways catered by different Railway Zone with their zonal, divisional and central controls at different places necessitating a huge effort in proper co-ordination to match the demand for coal evacuation and at the same time to protect the commercial interest of all the stakeholders – Railways, Coal Companies and the Consumers. In spite of the dedicated efforts of both Railways and coal companies often it is seen the movement is uneven resulting somewhere accumulation of coal stock due to non availability of wagons again in the other point wagons remain idle for non availability of loadable stock at sidings. Information technology has a great potential to address the issues related to logistics bottleneck. Proper supply-chain management supported by Business decision making applications integrated with the production system, transporting system including the FOIS (Freight Operation Information System) of Indian Railways may prove to be a real value addition for coal companies, railways and consumers. Real time monitoring would enable every stake holders to take the best advantage of the available resource minimizing the avoidable cost on system inefficiency.

Additionally, implementation of comprehensive IT system with a strong information network backbone through dedicated communication lines would provide opportunity to utilize multiple specialized Business Support systems such as Business Intelligence (BI)/ Decision Support system (DSS), Corporate Performance Management (CPM) Tools, Plant Information Management system (PIMS)

In view of the above, during the XII Plan period following should be aimed at:

1. Computerization and bringing all weighbridges within the network for capturing the elementary input by recording the consumer name, invoice particulars, which shall be cleared online by the Financial transactions thereby creating an unique commercial transaction to be monitored at management level in the way it is required.

2. Capturing Real time stock position and making the information accessible by all the stakeholders – daily loading end stock position is essential for optimizing the resources to despatch the coal in the minimum possible time frame. Availability of such information would automatically provide a dispatch solution through decision support system (DSS) applications.

3 Integration of entire rail dispatch system with the FOIS of Railways: this will add value in the supply chain management both for the supplier and the consumer providing opportunity to monitor real-time delivery position and wagon availability, route congestion etc to take a business decision saving substantial cost.

4. GPS enabled Truck Dispatch System – when integrated in the main system shall instantly make viable the stock position for loading for better logistics management.

5. Teleconferencing : Corrective measures often comes too late due to lag in communication between the operation level and decision making level resulting in loss in terms of financial loss and loss in credibility . Proper IT system would make it easy to identify the accountability at each stage meaning better management control and improved efficiency through audio-visual communications even in places located remotely.

Under the present trend of converging technologies – the progress made in Railways, Banking and other similar sector should be considered as bench mark and in order to imbibe professionalism in all spheres of management the industry is required to harness the ICT with right earnest and put in place right system to confront the high technological obsolescence in the field of technology and to remain contemporary always.

21.7 Customer Relationship Management Strategy (CRM):

CRM has evolved as one of the key business function for any growing industry, though more relevant to service sector and FMCG industries but the effectiveness of CRM has been realized in almost all sphere of activities and established as an important tool to sustain market share and improve consumer satisfaction.

Presently, the CRM in coal marketing is limited to interaction with the customers in the periphery of FSA clauses. In a few isolated cases, particularly where the customers are located in the pitheads, like NTPC power plants or a few integrated steel plants or other bulk consumers getting supplies through captive mode of transport, the supplying coal companies have been maintaining close liaison in respect of stocks at plants, placement schedule of captive transport, status of plant operation including coal handling. However, there has been no structured CRM strategy being practiced in the industry.

The major objective of the CRM strategy would be to:

- Prepare customer dossier with all relevant particulars including demographical details in a comprehensive data base driven system
- Allocate unique identity to all consumers with classificatory codes
- Matching demand pattern with the projected production and linked sources

- Introducing monitoring system of milestone management of letter of assurances and create automatic log-records of all exchange of instructions and compliance.
- System integration with payment gateways – railway weighbridges– wagon/truck dispatch and electronic invoice/RR weighment records.
- System generated messages/alerts to consumers and or suppliers regarding each activities and failures.
- Integration with after sales services wherever applicable like quality management report, complaints and grievance redress mechanism.

Customers may be classified in two broad groups as per their commercial importance, profile and kind of back-up service requirement to decide CRM strategy for each groups, such as

- i) Major accounts
- ii) Other accounts

Relationship management for each major account is essentially to be tailor-made preferably under responsibility of Group head and down below to account heads. For example, Group-Head NTPC account shall be responsible for all supply issues to NTPC power stations – account heads under the NTPC Group are persons responsible to track each power station under the NTPC group monitoring supplies from each coal companies. Since supplies are from multiple sources, for proper coordinated actions, the CRM needs to be handled from the Corporate Headquarters, particularly for major accounts. Smaller accounts would be mostly served through web-based information technology and engaging services from professional call centers.

The call centre should be capable to handle fulfilling expectations of consumers in respect of providing routine operation related information like on day-to-day offer/indent to the Railways, allotment granted by the Railways and also supply and loading of wagons on his account. Similar facilities in respect of road dispatch like truck placement schedule, position of loading etc. This would not only remove traffic congestion at the colliery but would also reduce freight cost of the consumers on account of no demurrage. Consumers may also be provided information in respect of payment made by him from time to time and adjustment on the same by way of bills raised by the coal company and balance that is available at any point of time.

The CRM system has the potential to build up strong customer base. With proper technological support, it can be used as a gateway for all e-commerce service. Quality control, payment-refund and other checks and balances can be ensured with leveraging technologies.

21.8 Development of Grievance redressal mechanism:

Procurement of coal by the consumers needs meticulous planning and follow up action in the framework of policy, procedure & systems laid down by the Government or Coal Companies from time to time. The major steps involved for procurement of coal are:

- a) Application for long term coal linkage to the Standing Linkage Committee (SLC).

- b) On the basis of the recommendation for issuance of LOA by SLC (LT) furnishing financial guarantee and achieving stipulated milestones in a given time frame
- c) Producing requisite documents for signing FSA for supply coal within a given time schedule

In the entire gamut of activities and procedures relating to procurement of coal there are multiple interfaces starting from Parent Ministry for approval of the project to Ministry of Coal for recommendation of LOA and Coal Companies for converting LOA to FSA for supply of coal and finally Railways for movement of coal from Collieries to consumption Centres. Again interfaces at Coal Companies and with Railways are taking place at multiple layers from the Corporate Headquarters of Coal Companies or Railway Board for policy guideline to Area level at Collieries and Divisional level at Railways for physical movement of right quantity of right quality of coal at right time at the consumption centres. The exposure of risk for the consumer start from the process of getting linkage and entering into FSA through the mechanism of LOA and continues till the supply is materialized in terms of quality as well as quantity.

In this multitude of interfaces a very effective and transparent platform for dispute resolution and grievance redressal for delivery of prompt and effective services with real time information flow and timely settlement of all transactions is very much essential.

The essential feature of such platform should be a computer based mechanism integrated with all the interfaces involved in the process of delivery with data available on real time basis for taking prompt remedial actions and providing feedback to the consumers.

The grievances of the consumers need to be classified on the basis of the nature of complaints. Again these complaints can be re-grouped on the basis of the identified action points for redressal. While the action points would be delivering the redressal, the system would ensure that a mechanism is available for on line monitoring up to the apex level on action taken for each of the complaint.

Apart from grievances, the consumers should be extended the facility for on line rating of services extended by each level of customers' interface on the basis of the predetermined parameter. Consumers' rating and the nature and action points of specific complaints received would be used for creating a database to identify the erring points for initiating corrective actions.

At the base level complaints logged on registered login and password based system may be acknowledged through SMS. Each complaint may be tracked through its registration within stipulated period creating a log for response from each level which can be accessible by the registered complainant. The call centre proposed for CRM may also take care of registering customer grievances.

Apart from on line complaint registration system, customer's grievance can also be addressed through the 24x7 Customer care cell proposed for introducing CRM. In view of the above, following is suggested as the action plan for customer's grievance redressal during XII Plan period:

1. Introduction of on line grievance registration and response system

2. Creating on line retrievable database for monitoring purpose across the hierarchy of the management of coal company
3. Complaints which could not be redressed/responded to within the scheduled timeframe are to be separately listed and forwarded to the Competent Authority for fixing responsibility for delay
4. Introduction of online customer rating system
5. Formation of a fixed tenure adjudicating/reviewing Board with adequate decision making power comprising of representatives from coal companies, Ministry of coal, Railways and ministries of important consuming sectors.

CHAPTER-22

RECOMMENDATIONS

Coal demand & Supply

- 1.0 In the perspective of widening gap between demand and indigenous availability of coal, time bound fast-track implementation of coal projects should be given highest priority. Necessary stimuli needs to be imparted to the system to ensure production from captive coal blocks within the specified time period from the date of allocation.
- 2.0 Removal of logistics bottlenecks is one of the most critical areas in supply side management. Project-wise task force involving all stakeholders to monitor synchronization of coal production, evacuation and consumption.
- 3.0 There had been no substantial progress in the execution of the identified critical railway infrastructure projects of XI Plan. These projects need close monitoring during XII Plan to ensure smooth evacuation of incremental coal production from the potential coalfields.
- 4.0 Developing inland waterways and giving stress on coastal shipment for movement of imported and indigenous coal may be given due importance for easing out stress on the railway capacity.
- 5.0 Railway connectivity between ports and hinterland consumption centres would be of vital importance for movement of imported coal.
- 6.0 Improvement in coal utilization technology including development of versatile combustion equipments capable of using different proportion of indigenous and imported coal in blends may be given due attention for demand side management.
- 7.0 Necessary amendment may be brought in the existing distribution policy in line with the recommendation of the Integrated Energy Policy to allow market dynamics managing the demand side for all non-regulated consuming sectors.
- 8.0 The increase in lignite production during XII Plan is planned in line with the projected demand. Synchronization between the projected demand and production, therefore, needs to be closely monitored for achieving planned growth in lignite sector.

Coal quality & beneficiation

- 9.0 The process of implementing all the identified new washeries needs to be expedited.

- 10.0 In order to ensure supply of washed coal to all TPS located 500 Kms away from the mines within the next three years, washing capacity needs to be augmented to matching level.
- 11.0 100% crushing and sizing of coal before dispatch must be ensured by coal companies within next two years.
- 12.0 Auto mechanical samplers to be installed at all dispatch points/mines within XII Plan period.
- 13.0 Mobile laboratories need to be deployed for coal sampling and analysis.
- 14.0 Deshaling of ROM coal, if not complete beneficiation, needs consideration wherever feasible.
- 15.0 Strengthening/ Renovation and modernization of existing coking coal washeries for improved yield and to match the raw coal feed quality needs immediate consideration.
- 16.0 Augmenting coking coal and LVMC coal production to feed the washeries needs proper attention.
- 17.0 New washing technologies including dry coal beneficiation needs consideration.
- 18.0 Utilization and disposal of washery rejects in an environmentally acceptable manner should be given due importance.
- 19.0 Rail evacuation facilities for new washeries should be considered at the time of preparation of Project Reports.
- 20.0 Coal sector should switch over to GCV based system in place of UHV based system for trading of non-coking coals.
- 21.0 The current rate of SED of Rs.10 per tonne was last revised in June 2003 and this needs to be suitably enhanced for addressing the proposed funding of the Master Plan.

Exploration of Coal & Lignite

- 22.0 Promotional Exploration for coal and lignite has been demonstrably effective in increasing the national Coal and Lignite Inventory at a faster rate and should, therefore, continue till the coverage of coal/lignite fields is broadly completed.

- 23.0 For expeditious allocation of coal blocks to captive users, the Non-CIL blocks need to be explored in details on priority at faster pace. The increase in detailed exploration will require outsourcing of jobs.
- 24.0 The creation of a coal/ lignite resource data base to provide Net-accessible resource information needs to be continued for their successful completion and maintenance.
- 25.0 It is recommended that Developmental Exploration in working mines should be given adequate attention and organization to help reduce surprises and, thereby, the cost of mining.
- 26.0 The assessment of CBM resources needs to be continued in XII Plan. In addition assessment of Shale Gas potential in coal formations of different coalfields may be taken up.
- 27.0 The present guidelines more or less satisfy the requirement of regional exploration for coal as at least one borehole per sq km is required to categorize the resource under 'Indicated' category as per the ISP. However, 15 to 20 boreholes are needed to be drilled per sq km for open cast and underground prospects, respectively, to 'Prove' the resources to the desired level of confidence for mine planning. The above guidelines do not address the requirement of detailed exploration and need to be revised to allow 15 to 20 boreholes per sq km immediately.
- 28.0 CMPDI, SCCL & NLC are premier organizations in Detailed Exploration of coal. Hence they may be included in the list of organisations exempted from seeking 'Prospecting License' as is the case with GSI/MEC.
- 29.0 A total of 21 blocks have so far been identified for CBM exploration and exploitation, covering an area of about 8800 sq.km. Majority of these blocks are available in the deeper part of different coalfields which have not been covered by Regional and Detailed exploration. In view of the fact that some of the CBM blocks have already been offered and the remaining are in the process of offering, a policy decision needs to be taken whether Regional Exploration and Detailed Exploration can be taken up in such identified CBM blocks to assess the national inventory of coal.
- 30.0 The increase in exploration activities entail enhancement of drilling capacities as well as technical support system both in terms of drilling equipments and manpower (both Geology & Drilling). Modernisation in 'Drilling Techniques', 'Data Acquisition & Transmission', 'Data Storage & Retrieval', 'Data Processing' & 'Deposit

Modelling' 'Resource assessment' and 'Plan/Report Preparation' is considered necessary to achieve the targets set for 12th Plan.

31.0 With the allotment of a large number of regionally explored coal & lignite blocks to private entrepreneurs it has become necessary to evolve a mechanism of data flow from these entrepreneurs to the GSI through CMPDI (which is the nodal agency for detailed coal exploration in the country other than SCCL areas) and NLC for lignite block (which is the nodal agency for detailed lignite exploration in the country) in respect of exploration activities undertaken by these entrepreneurs to upgrade the resources for updating of the national inventory of coal & lignite. It may, therefore be made mandatory on the block allocates to provide data/GR on the resources explored by them before approval of Mining Plan.

32.0 It is necessary to formulate in association with concerned Ministries, Regulatory/legal framework and Policy guideline for concurrent Exploration/development of Coal/lignite blocks through Conventional mining, CBM/CMM Recovery, UCG etc.

MINING TECHNOLOGY

33.0 In India around 90% of the coal is produced by opencast method, therefore, bigger size of HEMM is finding greater application for higher production and productivity. 42 cum rope shovel shovels, 240 T rear dumpers and 33 cum Dragline have already been deployed. Future mines need to be planned for a maximum depth of 300 to 500 m with still larger sizes of HEMM, e.g. 56 cum Shovels 400/320/260 T dumpers and crushing conveying of coal and OB. Contribution of production through surface miners needs to be expanded from the present level of around 25 % for eliminating the need for drilling, blasting and sizing.

34.0 About 12% of underground production still comes from manual loading operation which needs to be totally phased out through suitable mechanisation during XII Plan period.

35.0 The Powered Support Longwall and Continuous Miner technology is being applied with success in many mines and there is a need to popularise and establish these as predominant underground technology especially for greater depth. The allied areas like tele-communication, transport, ventilation, manriding system should also keep pace with the development.

PRODUCTIVITY AND BENCH MARKING

36.0 Average manpower productivity in opencast mines is around 10 tonne per man-shift. Some coal companies have attained a level of 20 tonne/ manshift. This calls for a proper analytical approach like benchmarking. The lower availability and utilization of machinery in some mines and coal companies need to be addressed by cutting down the idle and breakdown time of machinery, better maintenance and timely procurement of spares, eliminating mismatch between excavating and transportation capacities and better discipline and training of workmen.

37.0 In order to improve the OMS of around 0.7 tonne in the underground OMS, large scale mechanization and automation should be initiated.

FORMULATION AND IMPLEMENTATION OF COAL PROJECTS

38.0 During project formulation the specific conditions of geology, geography, resource, quality, production potential need to be carefully assessed and addressed to. The project-specific development of infrastructure, evacuation system has to be suitably planned keeping in mind the future potential and the entire coalfield.

39.0 Software and web based project monitoring system should be used for better evaluation of the implementation. Enhanced empowerment of coal companies to be delegated down the line at various levels and devising suitable contract management practices should be initiated for eliminating delays in project implementation.

ENVIRONMENTAL MANAGEMENT, LAND ACQUISITION AND R&R

40.0 The process of EC requires Re-engineering with specific provisions for coal mining. Mines should be grouped together on the basis of unique environmental concerns, geographical separations for the purpose of preparing cluster-wise EIA/EMP where mines of same owners are located in close proximity

41.0 Coal companies should take possession of the entire area of land required for the life of the project at one go. Often, land records with State Authorities are inaccurate or incomplete. This leads to delays in processing acquisition of land and disputes over ownership and size of land plots. Updating and computerisation of land records supported through survey of land is essential. Suitable legislation should be made to stop construction on coal bearing land.

42.0 Uniform R&R policy for coal sector irrespective of Public or Private sector needs to be formulated for providing level playing field.

CLEAN COAL TECHNOLOGIES

43.0 Clean coal technologies should be considered as the thrust area for XII Plan to mitigate adverse impact of coal usage on environment.

44.0 The clean coal technologies related to combustion of coal are mainly being dealt within the power sector. Highlighting the advantage of cost efficiency through reduction of specific coal consumption, these technologies need also to be promoted to other coal consuming sectors.

AUTOMATION & APPLICATION OF INFORMATION TECHNOLOGY

45.0 In order to successfully implement automation and information technology in the coal mining sector, top-down approach needs to be adopted for various business functions including IT infrastructure beginning with corporate headquarters and subsequently to be extended to area and unit level to individual.

RESEARCH & DEVELOPMENT

46.0 R&D thrust need to be given in some of the emerging new areas , viz. in-situ coal gasification, Liquefaction of coal, Coal Bed Methane(CBM), Shale gas estimation & its recovery, 3D seismic survey, Study of structure of coal seam and roof rocks in hydro-fracturing areas.

47.0 Coal companies should consider investing at least 1% of their PBT in R&D every year. Private sector participation in R&D work should also be encouraged. Participation from academic institutes, research scholars and reputed overseas institutions should be promoted.

SAFETY & WELFARE

48.0 Measures such as Simulator to impart training for all HEMM operators and virtual reality training facilities at Central Training Institute need to be established in all coal companies to reduce the incidence of accidents in opencast mines.

49.0 Suitable and binding safety clauses for contractual / outsourced operation as per recommendation stated in 10th national safety conference needs to be incorporated.

50.0 In each OC Area, a special cell needs to be created for formation of Slope / Dump stability. Use of Slope stability radar for monitoring dump stability should be made mandatory in OCM.

51.0 Definite project-wise safety management plan may be formulated on the basis of risk assessment

52.0 Specialized training should be imparted on fire Prevention / fire fighting techniques for key and positional persons and also for other employees working in Fire Accident Prone Production Areas

53.0 It should be made mandatory to incorporate a Long Term Safety Plan for the life of the Project for all new projects. Similarly, safety of coal mining operations by operators working new coal blocks should be monitored by government.

54.0 Each mine should have Computerized Mine Safety Information System.

55.0 All Coal Companies should establish virtual reality training facilities in next two years.

56.0 A safety portal needs to be developed at the level of DGMS for sharing of mine level experience of accidents, safety related information and other updates.

57.0 All rescue stations should be equipped with

- Hydraulic stone / rock cutter.
- Airlifting bag
- Power winch
- Mobile winder – to be kept at Central Workshop of each subsidiary.
- Water mist fire extinguisher.
- Rescue Mannequins
- LCD projector for bringing awareness in safety aspects to mine workers

58.0 In order to provide level playing field to all players in the coal sector, a uniform welfare policy framework needs to be formulated. The practice adopted by CIL may be considered as the benchmark for formulation of such policy.

Human resource requirement

59.0 Keeping in view the gigantic task ahead for human resources development of the coal sector, a national level high-power committee may be constituted to examine in depth the issues involved to frame an actionable agenda.

60.0 Considering the difficult living conditions in coal mining areas, the benefits and amenities to be extended to highly skilled manpower in the coal industry have to be distinctly different and attractive vis-a-vis other PSUs.

61.0 The training of non-executive manpower in the coal sector deserves a heightened focus of attention and the existing VTCs and training institutes need to be revamped for new quality of training. Audit of the available facilities in VTCs including training modules around the coal industry is urgently required to identify and bridge the gaps in training facilities.

- 62.0 Setting up of specialized training centres for supervisors at 4/5 strategic locations in the coal industry is urgently required. CIL subsidiaries may take up at least one polytechnic in their command area and re-equip the same with advanced learning tools and delivery systems for upgrading the skills of new trainees and the existing manpower.
- 63.0 Indian Institute of Coal Management (IICM) should expand its footprint as a Centre of Learning for the coal industry. The institute has to oversee the training needs of senior and middle management level executives and for this purpose has to emerge with a new mantle of Open University. The institute facilities for beaming training modules for video conferencing have to be significantly enlarged; the institute also needs to spawn training units at each subsidiary level and use the model of Indira Gandhi Open University for offering its programmes including interaction with the coal industry personnel under training. The institute has to expand its reach and establish collaborative link with overseas institutions for training of coal industry's senior executives. The institute will also formulate modular programmes for training of middle and junior level executives, which can be made available through video conferencing.
- 64.0 The skill deficit at the level of executives, especially at the level of mining engineers, dictate that the coal industry must undertake some 'hand holding' with mining engineering faculties around the country to prepare mining professionals required by the coal industry. The coal sector has to develop closer links with institutions to develop appropriate programmes, which address specific requirements of the industry. The coal industry will also have to support research at the institutions and provide adequate facilities for training undergraduates with scholarships so that the graduates choose Coal India as 'employer of choice', which could be mutually beneficial.
- 65.0 Indian coal industry faces a daunting challenge of human resource development at all levels – from front line supervisors to senior level executives – for a new order of performance. For the new paradigm of mechanization, the coal industry has to refocus the initiatives on human resource development if only to attain the production goals it has set for itself.

Acquisition of coal assets abroad

- 66.0 A sovereign fund needs to be created for investment in developing logistic and infrastructure in coal bearing countries, particularly in emerging coalfields where this is an opportune moment to consolidate the position of Indian companies so that substantial quantity of coal supply for long-term period can be secured from these coalfields.

- 67.0 Assistance in securing soft loans for Indian coal companies may be considered, so that effective IRR percentage can be attractive enough for investment, particularly for coking and high CV thermal coal assets which are of strategic importance, but which at prevailing rate of market borrowing do not appear to be attractive.
- 68.0 Acquisition of coal asset needs to be viewed as acquisition of strategic asset and all the guidelines and policies applicable to acquisition of oil and gas asset abroad shall be applicable to coal asset abroad. This change in the policy outlook will greatly encourage the Indian coal companies, particularly, those which are Govt. owned, and enable them to successfully complete M&A deals in coal asset and add valuable resource to the national inventory.
- 69.0 As a national policy, Indian coal companies and Indian infrastructure companies should be encouraged to work as a consortium wherever investment in coal mining and logistic projects are required to implement in a harmonious manner. This will help Indian Companies to own the entire value chain of coal mine-railway-port
- 70.0 Immediate steps should be taken for creation of new bilateral working groups in coal or activate the existing coal working groups to sensitize the foreign Govts. for allocation of coal assets to consortium of Indian coal companies on nomination basis. The Indian government owned flagship coal company, Coal India Limited, may be the lead company in the consortium and suitable arrangement can be entered into with other government owned or private companies to jointly develop the coal assets abroad. The countries will be identified by the consortium of Indian companies and handed-over to the Government for implementation of the envisaged strategy.
- 71.0 Government may envisage creation of an Indian Coal Inc., which is a consortium of Indian coal companies both government owned and private, who can hold time to time meetings under the aegis of MOC so that diverse efforts of these companies can be converged in a cohesive manner towards enhancing energy security of the nation. CIL may take leadership role in steering this Indian coal incorporate under the guidelines of MOC.
- 72.0 Following empowerments/flexibilities may be accorded to the government owned enterprises to enable them to compete in the global coal market for coal M&A deals and emerge successful:
- To acquire Greenfield/Brownfield coal assets overseas dispensing with the existing rigid bindings with regard to establishing strategic relationship with listed entities only. The current approach must get replaced by a more professional outlook with definite goal oriented process.

- Framing guidelines for evaluating coal assets, either Greenfield or Brownfield along with the criteria that should be followed for the selection of target coal assets.
- A defined framework to establish itself as a major importer of thermal coal in India by leveraging its position with the existing coal consumers.
- Tools/Guidelines related to financial parameters for quick decision making to fast track the entire Merger & Acquisition (M&A) transaction. Guidelines in respect of critical financial parameters like Enterprise valuation, IRR/ DCF or multiple approaches need to be formulated and finalized for all future acquisitions.
- There are definite risks involved in any M&A transaction, more so when the price volatility is observed to be significant due to market fluctuations. This would require an approved guideline to safeguard the potential risks involved in any Merger & Acquisition (M&A) process.
- Merchant Bankers/Investment Bankers (MB/IB) should be accepted for appointment on nomination basis so that they can develop and bring lucrative opportunities for our consideration. Fees for the MB/IB could be defined in the guidelines as event based on the success of the deal.
- Capital requirements for setting up infrastructure/logistic support would be required in some of the target countries which may have to be financed by Sovereign Fund from the Govt.
- Govt. Guidelines, if any, for acquiring strategic Oil and Gas assets abroad should also be applicable for coal assets.
- It would also be appropriate to include a suitable clause for reviewing the proposed financial powers of the Board related to foreign investment periodically, say, after 3 years or post completion of a successful transaction, whichever is earlier.

Policy initiatives on coal sector reform

73.0 Exploration and Project Formulation

- Coal exploration needs be speeded up manifold to ensure availability of more explored coal blocks for mining by private and public sector.
- Multiple technical agencies require to undertake coal exploration effort. Apart from CMPDI, MECL and State Directorates, more players should be brought in and current capability of exploration agencies should be enhanced for increasing exploration effort.
- A time-bound plan to cover the entire country by regional mapping in 10 years should be prepared by GSI.
- CMPDI's current capacity of drilling 3 lakh meters per annum must be raised to at least 15 lakh meters per annum.

- CMPDI should be asked to speed up detailed exploration by engaging institutions/companies, selected based on competitive bidding, which could take up exploration of the blocks under the Indicated and Inferred categories. The corresponding cost may be recovered from the prospective allottees for respective block
- New exploration technologies such as geo-physical logging, satellite imagery should be extensively used for this purpose
- A countrywide study needs to be carried out to classify the total coal resource in the country as per JORC / UNFCC Classification. For this purpose a high level task force should be set up to carry out this activity in a time bound manner.
- There should be no necessity for FC for exploration, provided the exploration agency commits to necessary restrictions as may be imposed by MoEF. The number of boreholes can be taken as per UNFCC guidelines.
- There is a need to strengthen the institution of RQP through greater scrutiny of their capabilities. Further, either Coal Controller's Organisation or else proposed Coal Regulator should be given the mandate for monitoring the implementation of the approved Mining Plans.

74.0 Clearances and Licenses – Environmental and Forest

- To expedite clearances a co-ordination committee at the Centre and State level should be set up (Single window concept) with representation of senior level from the concerned departments.
- A Special Task Force, be constituted under Secretary (Coal) to closely monitor the approval process. An Apex Committee of Secretaries headed by the Cabinet Secretary, consisting of the Secretaries from the Ministries of Coal, Power, Environment and Forest, Finance, Home, Railways, and Planning Commission, review the process of important matters related to environment / forest clearances, land acquisitions, possessions, law and order, etc.
- To ensure a leaner, transparent and efficient approval process, there is a need to ensure Forest and environmental clearances in a time-bound manner. Also the number of levels and stages should be reduced.

75.0 Specific recommendations in respect of forest clearances include:

- FC applications should be cleared within 6 months. DFO work – evaluation of cost / benefit and tree enumeration to be outsourced to competent private sector consultants
- Levels for granting Stage II FC clearance should be reduced, as it is only compliance to the in principal approval.
- Diversion of forestland for mining should be considered for a longer period till the exhaustion of the ore body.
- To avoid delays in FC levels at the state government be reduced to three, i.e. District Forest Officer, Nodal Officer, and Secretary, State Forest Department.

- Green credits – Coal mining agencies can be encouraged to take up afforestation in advance and given “green credits” for specific acres of new forest created to be used in lieu of compensatory afforestation when new applications are made. Green credits should be allowed to be traded openly and anyone should be allowed to undertake afforestation anywhere in the country.
- Coal companies should hand over forestlands and revenue forestlands to respective State Government Departments.
- State Governments may be directed to complete the process of determining and conferring the rights of scheduled tribe and other traditional forest dwellers in six months.
- Till 31.03.2011, applications for environmental clearances can be filed independent to the status of forestry clearance. Now for seeking environmental clearance involving forestland, in-principle approval of forestry clearance is a prerequisite. This needs to be done away with.

76.0 Specific recommendations in respect of Environmental Clearance are:

- Projects for benefit of XI & XII Plan should be taken at priority or if necessary, a Special Task Force with adequate powers may be set up to examine environmental related issues for such project. Further, environmental clearance may be sought and awarded for production at least 25% more than the initial required mine capacity.
- There is wide disparity in environmental performance of coalmines in the country. A system of third party audit or the adoption of a ‘Green Rating System’ can bring out the best practices and establish benchmarks for those not doing so well to improve.
- EC once given should be valid so long as there is no expansion or major modifications in the mine/washery; it should not be required afresh merely because lease is being renewed.

77.0 Clearances and Licenses – Land Acquisition and R&R

- Enactment of a central legislation is required to ensure uniform R&R policy and speedy land acquisition
- Delineation of coal bearing areas in each state and to put the information on the concerned State Govt website should be carried out in a time bound manner by MoC. The State Government have to obtain clearances from MoC before issuing any license for setting up any industry / infrastructure
- Necessary enactment is required to prevent habitation over coal bearing areas

78.0 Specific recommendations in respect of land acquisition process are:

- Coal companies should actively restore at least a significant part of post mining land into agricultural land with some effort and investment.

- Companies should be encouraged to take up land for mining on long term lease to be returned back on completion of mining to the land holders
- Tripartite Committee of the concerned District Collector/Special Land Acquisition Officer, representative of company official and representative of the landowners may be formed to review and resolve problems in acquisition and handing over of land.
- CBA needs to be reviewed and modified to make it more growth oriented

79.0 Captive Coal Mining

- In order to create a market mechanism for increasing coal availability from captive coal mining blocks necessary amendment may be brought in the Coal Mines Nationalization Act.
- Future blocks should be allocated on the basis of a transparent bidding process, with bidders placed on a similar platform. Multiple suggestions have been made in this respect:
- Blocks to be brought for Competitive bidding should be free from factors like presence of wild life sanctuaries etc which will stand in the way of the Clearance.
- Time allowed for commissioning should be suitably revised taking into account the ground realities in respect of prospecting license, forestry & environment clearances and time taken for land acquisition and execution of lease agreement.
- Prospecting license should be issued along with the block allocation letters.
- Time period of 2 years for completion of exploration should be counted from the date of grant of forestry clearance within a certain time limit.
- Power Projects having cost of coal, as a “Pass through” item should not be allowed to participate in the bidding process.
- A bidder’s mining experience should be considered during the qualification stage. The mining experience of the mining company will help the consortium in ensuring expeditious development of the Block
- A Member of the Consortium should be allowed the advantage of the strength of its promoter/associate company in the Group for meeting the qualification criteria.
- The bidding document should contain all available information including geological information, data on Rail and Road connectivity; Extent of Forest Cover; Presence of water bodies like River, Nalah, Lake etc.; Human Habitation; Nearness of high tension power sub station etc

80.0 Captive / MDC / Other Government Company block owners

- A substantial investment in mining activities would also be made by companies who have been allotted blocks under captive or government dispensation, as production is expected to rise substantially from these blocks in the XII Plan. One of the key challenges being faced by these block owners in development of their blocks is their inability to create / access infrastructure for evacuation of coal to

their end use plants. It is therefore, desirable that an agency should be created – Special Area Development Authority in consultation with State Governments so that Master Plans for these facilities can be prepared coalfield-wise. The committee therefore recommends creation of an institutional mechanism for planning and development of common infrastructural facilities for use by all the block owners:

- A Local area Development authority should be created with participation of block allocates, coal mining companies and respective state governments to develop comprehensive plans for infrastructural facilities and requirements in each identified coalfields areas. The authority shall award the development and operations of the said infrastructure facility on BOO basis to a developer on a PPP basis.
- The developer is expected to take defined revenues for each unit of capacity, which will be paid for by the users of the facility.
- A pre-defined (standardised) User Agreement based on capacity would be executed between the developer and the captive block owners for the same
- A Regulator may be designated to monitor the performance of the PPP Developer and also adjudicate on any dispute arising between the developer and the users
- Where CIL is also operating blocks in the same coalfield and has developed infrastructure; wherever surplus capacity is available in the infrastructure developed by CIL, the same should be made available for use by the block allocatees, through the authority against the payment of user charges fixed by the regulator. In certain situations, the capacity of CIL infrastructure can be increased by making marginal investment / modification / addition thereto. The same should be made through the authority on PPP basis and the capacity so created, can be shared by block allocatees. This will avoid creation of parallel networks and may also provide ready access to Right of Way land in many cases.

81.0 Regulation and Governance in Coal Sector – Industry structure

- The coal sector regulator should be set up on a priority basis
- National Coal Council – Advisory Board, which may be called the National Coal Council in which all stakeholders are duly represented to be set up headed by Minister for Coal.
- Infrastructure status should be extended to the coal industry. Duties on capital goods imported for coalmines must be lowered to put them at par with duties on imports for other energy sub-sectors.
- Amend the provisions of Contract Labour (Regulation & Abolition) Act, 1970 to facilitate offloading of restricted activities in coal mining for improved economics of operations.
- Coal mining should be opened to private players without the restriction of captive use. To this end, the Coal Mines (Nationalization) Bill, 2000 should be passed.

- Conservation of Coal resources – A high level task force should be set up to formulate a set of principles / rules for ensuring conservation of coal resources / maximising the exploitation of resources from opencast and underground means.
- Coal and CBM / CMM – Need for treatment of Coal and CBM exploitation in an integrated manner and not as an independent energy sources as being done currently leading to conflict situations. MoU between Coal and Petroleum Ministry to be reviewed and a comprehensive policy on CBM along with coal mining needs to be evolved
- Given the high commercial risks and large capital investment requirement even to assess the viability; UCG should be provided similar fiscal initiatives as available for CBM.
- It is recommended that either CMPDI is made an independent organization or an independent organization be created to develop and maintain the repository of all geological information in the country on the lines of CEA or DGH.
- For acquisition of coal assets outside the country, Govt. of India should create a sovereign fund out of which loans can be made available to the Indian Companies interested in acquiring overseas Coal Assets.
- For Public sector companies an empowered group should be created so that proposals for Asset acquisition abroad can be examined by this Group and decisions taken.

82.0 Development of Underground Mining:

- Coal companies should develop a comprehensive plan for improving their performance in underground mines
- Government should consider options such as cost plus pricing, cross subsidies, to improve the potential returns currently available from underground mining activities
- Government Companies should also be encouraged to create JV arrangements for exploitation of high value UG reserves such as Coking coal properties where the JV partner takes responsibility for the development and operations of the mine and CIL shares a premium based on a transparent bidding process
- For encouraging UG mining, fiscal incentives like exemption from customs / excise duty for equipment, any applicable cess and exemption from payment of NPV for forest cover should be provided.

Marketing Strategy & grievance redress mechanism

83.0 The scope of need-based product positioning strategy both for coking and non-coking coal may be evaluated to ensure effective utilization of precious natural resource.

- 84.0 Improving product features and upgrading combustion equipment may be given special emphasis.
- 85.0 Dual pricing mechanism for consumers in regulated and non-regulated sectors and gradually switching over to market driven pricing mechanism for all consumers in the non-regulated sectors have been recommended.
- 86.0 To encourage economic and efficient use of coal and facilitate entry of new entrepreneurs in coal consuming sectors, the existing distribution policy may be reviewed to bring all coal consumers of non-regulated sectors under the common platform of e-auction, as suggested by Integrated Energy Policy (IEP). This will facilitate providing level playing field to all new coal consuming entrepreneurs.
- 87.0 Tri-partite Fuel Supply & Transport Agreement, as envisaged in New Coal Distribution Policy and IEP continues to be a critical area for effective implementation for all rail-borne FSAs.
- 88.0 Rationalization of coal sources for optimization of transport capacity —both for indigenous and imported coal deserves topmost priority.
- 89.0 Coal Companies need to invest in creating logistics infrastructure in the field of railway track, rolling stock, port capacity.
- 90.0 Developing and augmenting alternate mode of transport like inland waterways, coastal shipment for easing out burden on railway system have been identified as the thrust area for XII Plan.
- 91.0 Major stakeholders in upcoming coalfields should consider promoting logistics companies through PPP Model for creating track network and transfer points with Indian Railway system. Investment in creating facilities and developing core competence in end to end logistics solution for movement of both indigenous and imported should also be considered as a priority area.
- 92.0 Facilities for computerization and bringing all weighbridges, i.e. the selling points, within the network for capturing the elementary input by recording the consumer name, invoice particulars to be cleared online by the financial transactions thereby creating an unique commercial transaction need to be developed by the end of XII Plan.
- 93.0 Considering that the daily loading end stock position is essential for optimizing the resources to despatch the coal in the minimum possible time frame, the requirement of capturing real time stock position and making the information accessible by all the stakeholders has been felt necessary. Availability of such information would automatically facilitate developing a dispatch solution through decision support system (DSS) applications.
- 94.0 In order to extend the facility of supply chain management both to the supplier and the consumer with an opportunity to monitor real-time delivery position and wagon availability, route congestion etc the entire rail dispatch system needs to be integrated with the FOIS of Railways.

- 95.0 In order to improve the logistics of road despatch and direct trucks to the least congested stock points, coal companies should introduce GPS enabled Truck Dispatch System.
- 96.0 Since the supply and consumption of coal continues round the clock, coal companies need to extend 24x7 customer support service.
- 97.0 Suitable portal needs to be created for on line grievance registration, tracking and customer rating on the performance of the service centres.
- 98.0 A fixed tenure adjudicating/reviewing Board with adequate decision making power comprising of representatives from coal companies, Ministry of coal, Railways and ministries of important consuming sectors may be constituted for consumers' grievance redress.

**Constitution of Working Group on Coal & Lignite for formulation of the XII five Year Plan
vide Office Order No.17014/04/2011-PMS dated 10th May, 2011**

Composition:

Secretary (Coal)

Shri A.K.Bhalla, Joint Secretary, Ministry of Coal

- Chairman

- Member Secretary

Members:

1. Additional Secretary, Ministry of Coal
2. Sr. Adviser (P&E), Planning Commission
3. SMt. Anjali Anand Srivastava, JS&FA, M/o Coal
4. Shri Kailash Pati, Economic Adviser, M/o Coal
5. Chairman, Coal India Ltd.
6. CMD, Singareni Collieries Co. Ltd.
7. CMD, Neyveli Lignite Corporation
8. Representative of Ministry of Power
9. Representative of Ministry of Steel
10. Representative of Central Electricity Authority (CEA)
11. Representative of Railway Board
12. Representative of Ministry of Finance (Plan Finance)
13. Representative of Planning Commission
14. Representative of Department of Industrial Policy & Promotion
15. Representative of directorate General of Mines Safety
16. Representative of Ministry of Information Technology
17. Representative of Ministry of Environment & Forests
18. Two representatives of the Department of Science & Technology- one each from CMRI and CFRI.
19. Chairman of each Sub-Groups
20. Representative of the (FICCI)
21. Representative of Confederation of Indian Industries (CII).
22. Representative of Cement manufactures Association
23. Shri Chanakya Choudhary, Tata Steel Ltd.
24. Shri D.N.Abrol, Sr. Vice President, Jindal Power & Steel Ltd.
25. Shri U.Kumar, Adviser (Coal), Essel Mining Industries Ltd.
26. Shri M.K.Sinha, President (Mines), Monnet Ispat & Energy Ltd.

B. Terms of Reference:

- i). To review the status of reforms carried out in coal sector and make recommendations for continuation of reforms further.

- ii) To make a year-wise coal and lignite demand estimate for the period 2012–17 (XII Plan) and 2017–2022 (13th Plan), based on the requirement of the end users (of both coking and non-coking coal); their pattern of growth; technological improvements of the end users vis-a vis the specific consumption; import requirements of both coking and non-coking coal; possible inter fuel substitutions; etc.
- iii) Suggest measures to enhance acquisition of assets abroad and extent of complementing the domestic demand from these assets;
- xvi) Review the exploration programme (regional/promotional & detailed exploration) under implementation and suggest measures to enhance the pace of exploration matching with the current and long term coal and lignite demand; to assess the capabilities of the existing exploration agencies to meet this exploration programme and the possibility of private sector participation to augment/supplement these capabilities.
- xvii) To assess the potentiality of methane content of each coalfield and suggest measures for successful exploitation of this resource.
- xviii) To bring out a year wise, coal field wise and company wise coal and lignite production programme with related financial and economic implementations; to correlate this production programme in the projected demand and to suggest measures for dealing with the demand–supply mismatch, if any; study and suggest technological developments for suitable adoption in view of the large resources of untapped deep seated coal resources and resources in geologically disturbed areas, in particular.
- xix) To recommend industry structure that would enhance number of players, promote competition, provide consistent and transparent pricing regime and raise production, distribution, transportation and end use efficiency.
- xx) To establish benchmarks for different mining operations (opencast as well as underground) comparable with international standards and suggest measures to realize such levels in India.
- xxi) To suggest measures for improved formulation and implementation of projects.
- xxii) To suggest measures for improving the availability of proper quality of coking coal from indigenous sources; improving the performance of coking coal washeries; measures to enhance supply of non coking coal of 34% ash for power generation in compliance with the MOEF's directive.
- xxiii) To suggest measures for improving the existing infrastructure for coal movement from collieries to consuming centres and also from ports;
- xxiv) To suggest measure to enhance the use of emerging IT technologies in the exploration, production, distribution and transportation of coal and lignite.
- xxv) To assess safety and welfare requirements for workers; to assess the current status of research and development activities in the coal and lignite sector and to formulate and recommend schemes and programmes for research and development

in specified areas in view of the emerging energy scenario and environmental implications.

xxvi) To make assessment of year wise investment including foreign exchange component for achieving the XII Plan objectives and targets, including foreign assistance/loans/bilateral collaboration etc.

xxvii) To review and assess the environmental management aspects for sustainable coal production in the XII Plan and beyond.

2. In order to assist the Working Group in its task, separate Sub-Groups on specific aspects will be formed by the Working Group. These Sub-Groups will furnish their reports to the Working Group.
3. The Chairman of the Working Group may co-opt experts as members as and when deemed necessary.
4. The Working Group will submit its reports to the Planning Commission latest by 30th September, 2011.
5. Non-official members of the Working Group shall be entitled to payment of TA/DA by Planning Commission. The TA/DA of Government officials will be borne by their respective organizations as per the rules the establishments applicable to them.
6. Name(s) of the representative(s) of Organization(s) as mentioned in the composition of the Working Group may be communicated to the Member-Secretary of the Working Group under intimation to Dr. Arbind Prasad, Sr. Adviser (Energy), Planning Commission.
7. Shri I.A.Khan, Joint Adviser (Energy), Room No. 501, Yojana Bhawan, (Tel: 23327446) will be the Nodal Officer for this Working Group and any further query/correspondence in this regard may be made with him.

CONSTITUTION OF SUB-GROUPS OF WORKING GROUP BY MINISTRY OF COAL

Sub-Group-I – on reviewing the status of reforms carried out in coal sector and to make recommendations for continuation of reforms further.

Composition:

Shri A.K.Bhalla, Joint Secretary (Coal), Ministry of Coal – Chairman
Shri Gautam Dhar, CGM (CP), Coal India Ltd. – Member Secretary

Members:

- 1) Representative of Ministry of Power
- 2) Representative of Central Electricity Authority (CEA)
- 3) Representative of Department of Science & Technology
- 4) Representative of Department of Industrial Policy & Promotion
- 5) Representative of Ministry of Commerce
- 6) Joint Adviser (Coal), Planning Commission
- 7) Representative of Industries & Minerals Division, Planning Commission
- 8) Representative of Singareni Collieries Co. Ltd.
- 9) Representative of Federation of Indian Chamber of Commerce and Industry (FICCI)
- 10) Representative of Confederation of Indian Industries (CII).
- 11) Secretary, Captive Power Producers Association, UCO Building, Parliament Street, New Delhi-110001.
- 12) Mr. M. Rajgopal, Director & CEO, M/s. Lanco Power Company.

2. Terms of Reference:

1. To review the status of various reforms carried out in coal and lignite sector and to make recommendations for continuation of reforms further.
2. To recommend industry structure that would enhance number of players, promote competition, provide consistent and transparent pricing regime and raise production, distribution, transportation and end use efficiency.
3. To review availability of human resources in the sector and to suggest improvements.
4. To make assessment of year-wise investment including foreign exchange component for achieving the XII Plan objectives and targets, including foreign assistance/loans/bilateral collaboration etc.

Sub-Group-II – on Coal Demand, Supply, movement, quality, import and Infrastructure development.

1. Composition:

Shri R.K.Mahajan, Joint Secretary (LA), Ministry of Coal – Chairman
Shri H.K.Vaida, CGM, Coal India Limited – Member Secretary

Member:-

1. Director (Tech.) Ministry of Coal
2. Representative of Ministry of Power
3. Representative of Central Electricity Authority (CEA)
4. Representative of Ministry of Steel
5. Representative of Ministry of Environment & Forests
6. Representative of D/o Industrial Policy & Promotion
7. Representative of Department of Fertilizers
8. Representative of Railway Board
9. Representative of Ministry of Surface Transport
10. Representative of Ministry of Commerce
11. Joint Adviser (Coal), Planning Commission
12. Representative of Transport Division, Planning Commission
13. Representative of Industries & Minerals Division, Planning Commission
14. Representative of SCCL, Kothagudem
15. Representative of Central Mine Planning & Design Institute Ltd. (CMPDIL).
16. Representative of Federation of Indian chamber of Commerce and Industry (FICCI)
17. Representative of Neyveli Lignite Corporation (For Lignite)
18. Representative of Small Scale Industries Association (SSIA)
19. Representative of Confederation of Indian Industries (CII)

1. Terms of Reference:

- i) To review the likely achievement during XI Plan in meeting target set for production, productivity and dispatch and analysis of reasons of shortfall, if any, to be highlighted.
- ii) To make a year-wise coal and lignite demand estimate for the period 2012 to 2017 (XII Plan) and 2017-2022 (XIII Plan), based on the requirement of the end users (of both coking and non-coking coal); their pattern of growth, technological improvement of the end users vis-a-vis the specific consumption; import requirements of both coking and non-coking coal; possible inter fuel substitutions; etc.
- iii) To suggest/recommend a suitable platform for public grievance/customer inter Face.
- iv) To deliberate and suggest improvement in marketing strategy.
- v) To bring out a year-wise, coal field wise and company-wise coal and lignite production programme with related financial and economic implications; to correlate this production programmet in the projected demand and to suggest measures for dealing with the demand-supply mismatch, if any.
- vi) To suggest measures for improving the existing infrastructure for coal logistics from collieries to consuming centers and also from ports and also measures for expediting land acquisition.
- vii) Suggest measures to enhance acquisition of assets abroad and extent of complementing the domestic demand from these assets.

Sub-Group-III – on Coal and Lignite Exploration and use of Clean coal Technologies

Composition:

Shri A.K.Singh, CMD, CMPDIL – Chairman
Shri A.K.Debnath, Director (Technical), CMPDIL – Member –Secretary

Members:

1. Representative of Ministry of Mines
2. Representative of Geological Survey of India
3. Joint Adviser (Coal), Planning Commission
4. Representative of Ministry of Environment & Forests
5. Representative of Ministry of Statistics & Programme Implementation
6. Representative of Ministry of Petroleum & Natural Gas / Director General of Hydro Carbons (DGHC)
7. Representative of Coal India Limited
8. Representative of Singareni Collieries Co. Limited
9. Representative of Neyveli Lignite Corporation
10. Representative of Mineral Exploration Corporation
11. Representative of Confederation of Indian Industries (CII)
12. Representative of Federation of Indian chamber of Commerce and Industry (FICCI)
13. Representative of CMPDIL
14. Representative of Department of Fertilizers

2. Terms of Reference:

- i) Review the exploration programme (regional/promotional & detailed exploration) under implementation and suggest measures to enhance the pace of exploration matching with the current and long-term coal and lignite demand; to assess the capabilities of the existing exploration agencies to meet this exploration programme and the possibility of private sector participation to augment/supplement these capabilities.
- ii) To assess the potentiality of methane content of each coalfields and suggest measures for successful exploitation of these resources and to assess the potential of shale gas in coal formations.
- iii) Study and suggest technological developments for suitable adoption in view of the large resources of untapped deep seated coal resources and resources in geologically disturbed areas, in particular.
- iv) To suggest measures to enhance the use of emerging IT technologies in the exploration, production, distribution and transportation of coal and lignite.

Sub-Group-IV – on Productivity, Information Technology, Mining Technology, R&D, Safety, Welfare and Environmental Management

Composition:

Adviser (Projects), Ministry of Coal	-	Chairman
Shri D.N.Prasad, Director (Tech.), Ministry of Coal	-	Member
Secretary		

Members

1. Representative of Ministry of Information Technology
2. Representative of Ministry of Environment & Forests
3. Representative of Science and Technology or Council of Scientific & Industrial Research (CSIR)
4. Representative of Central Mining Research Institute (CMRI), Dhanbad.
5. Shri I.A.Khan, Joint Adviser (Coal), Planning Commission
6. Joint Adviser (S&T), Planning Commission
7. Representative of Director General of Mines Safety (DGMS), Ministry of Labour & Employment
8. Representative of Coal India Limited
9. Representative of Singareni Collieries Co. Limited
10. Representative of Neyveli Lignite Corporation
11. Shri R.K.Chopra, Regional Director, CMPDIL.
12. Representative of Ministry of Mines
13. Representative from the IIT, Kharagpur
14. Representative of Indian School of Mines, Dhanbad
15. Representative of Confederation of India Institute (CII)
16. Mr. M.K.Thapar, M/s. Adani enterprises Ltd.
17. Representative of Federation of Indian chamber of commerce and Industries (FICCI)

2. Terms of Reference:

- (i) To assess safety and welfare requirements for workers; To assess the current status of research & development activities in the coal and lignite sector and to recommend schemes and programmes for research and development in specified areas in view of the emerging energy scenario and environmental implications.
- (ii) To review and assess the environmental management aspects for sustainable coal production in the XII Plan and beyond.
- (iii) To suggest measures for improving the availability of proper quality of coking coal from indigenous sources; improving the performance of coking coal washeries; measures to enhance supply of non-coking coal of 34% ash for power generation in compliance with the MOEF's directive.
- (iv) To assess the existing mining technologies in coal sector and suggest measures for improving the same.

(v) To suggest measures for optimal utilization of resources; reclamation & restoration of mines out areas; and for development of environmentally benign mining and transportation.

(vi) To establish benchmarks for different mining operations (opencast as well as underground) comparable with international standards and suggest measures to realize such levels in India.

(vii) To suggest measures for improved formulation and implementation of projects.

1. The Chairman of the Sub-Group may co-opt experts as Members as and when deemed necessary.

2. The Sub-Groups will submit their reports to the Working Group on Coal and Lignite set up by the Ministry of Coal in pursuance of the Planning Commission Order by 16th August, 2011.

3. Non-official members shall be entitled to TA/DA as permissible to grade-I officers of Government of India and the expenditure will be borne by Planning Commission. The TA/DA of Government and public sector officials will be borne by their respective organizations.

4. It is requested that the name(s) of the representatives of various organizations mentioned may kindly be communicated to the Members-Secretary of the Working Group under intimation to Dr. Arbind Prasad, Sr. Adviser (Energy), Planning Commission within one week.

Annexure No.1.1

Year-wise Coal Demand and Supply : Sector-wise in X Plan

Coal Demand vis-à-vis Demand Materialisation during X Plan Period (2002-2007)

(In Million Tonnes)

Sl.No.	Major Consuming Sectors	2002-03		2003-04		2004-05		2005-06		2006-07	
		Demand	Actual	Demand	Actual	Demand	Actual	Demand	Actual	Demand	Actual
I	Coking Coal										
1	Steel / Coke Oven & Cokeries (Indigenous)		17.66	19.75	16.68	18.09	17.51	18.16	16.62	18.51	17.29
2	Import		12.95	16.41	12.99	15.89	16.93	23.89	16.89	25.19	17.88
3	Total Coking	34.40	30.61	36.16	29.67	33.98	34.44	42.05	33.51	43.70	35.17
II	Non-Coking Coal										
1	Power Utility	249.50	255.47	256.00	268.21	279.52	285.55	303.56	300.29	322.00	307.92
2	Power (Captive)	21.15	19.55	22.49	18.19	24.90	27.09	27.35	24.67	31.78	28.13
3	Cement	17.10	16.37	16.50	16.63	19.00	18.33	20.22	18.38	25.40	19.67
4	Sponge Iron	4.00	6.17	5.36	7.59	7.50	10.99	10.40	14.70	7.00	17.47
5	Others	37.15	35.18	44.39	40.62	39.29	32.39	42.07	43.70	44.30	55.51
6	Total Non-Coking	328.90	332.74	344.74	351.24	370.21	374.35	403.60	401.74	430.48	428.70
III	Grand Total	363.30	363.35	380.90	380.91	404.19	408.79	445.65	435.25	474.18	463.87

Source: Coal Controller Organisation, CEA & CMA & Demand as per Annual Plan of MOC

Annexure No.1.2

Year-wise & Sector-wise demand and supply in XI Plan

(in Million Tonnes)

Sl.No.	Major Consuming Sectors	Terminal Year X Plan (2006-07)	2007-08		2008-09		2009-10		2010-11*		2011-12
		Actual	Demand	Actual	Demand	Actual	Demand	Actual	Demand	Actual	Demand
I	Coking Coal										
1	Steel / Coke Oven & Cokeries (Indigenous)	17.29	18.00	16.99	26.20	16.58	17.26	16.45	17.92	17.83	17.23
2	Import	17.88	20.00	22.03	17.80	21.08	27.26	24.69	32.59	28.00	29.44
3	Total Coking	35.17	38.00	39.02	44.00	37.66	44.52	41.14	50.51	45.83	46.67
II	Non-Coking Coal										
1	Power Utility	307.92	330.00	332.40	373.00	362.08	401.00	364.60	442.00	383.98	460.00
2	Power (Captive)	28.13	33.60	29.31	38.00	32.74	40.00	51.33	44.00	28.99	40.00
3	Cement	19.67	28.80	21.27	25.00	20.09	25.59	21.61	30.00	27.58	28.89
4	Sponge Iron	17.47	15.10	20.92	18.00	19.78	28.80	23.10	28.80	18.76	30.47
5	Others	55.51	49.00	61.37	52.00	76.67	58.07	86.03	61.00	110.98	90.00
6	Total Non-Coking	428.70	456.50	465.27	506.00	511.36	553.46	546.67	605.80	570.29	649.36
III	Grand Total	463.87	494.50	504.29	550.00	549.02	597.98	587.81	656.31	616.13	696.03

* : As per Provisional Coal Statistics: 2010-11 of CCO; Import as per CEA for Power Utilities and CMA for Cement

Source: Coal Controller Organisation, CEA & CMA & Demand as per Annual Plan of MOC

All India Coal Production Performance in XI Plan

Year-wise achievement of all India coal production in the XI Plan Period is furnished in the table below.

(Figures in Mt)

Source	TY X Plan	XI Plan							
	06-07	07-08	08-09	09-10	10-11	2011-12			
	Actual	Actual	Actual	Actual	Actual	Ant	AP Target	Original	MTA
CIL	360.91	379.46	403.73	431.26	431.32	447.00	447.00	520.50	486.50
SCCL	37.71	40.60	44.55	50.43	51.33	51.00	51.00	40.80	47.00
Captive	17.61	21.25	30.01	35.46	34.6	36.15	38.25	104.08	80.89
Others *	14.60	15.77	14.47	14.89	15.83	17.75	17.75	14.62	15.52
All India	430.83	457.08	492.76	532.04	533.08	551.90	554.00	680.00	629.91
AG %		6.09	7.80	7.97	0.20	3.53	4.12		
CAGR %	5.62					5.08	5.16	9.56	7.89

* JKML, JSMDCL, DVC, IISCO, Tata Steel and Meghalaya

Annexure No. 2.1

Perspective Demand Analysis of XII Plan by Expert Committees

(Figures in Mt)				
		Terminal Year		
Source	Sector	XI Plan (2011-12)	XII Plan (2016-17)	XIII Plan (2021-22)
XI Plan Working Group (Oct'2006)	Steel	68.50	105	Not Furnished
	Power(U)	483.00	750	
	CPP	57.06	85	
	Cement	31.90	50	
	Sponge Iron	28.96	135	
	Others *	61.68		
	Total	731.10	1125	
Mid Term Appraisal of Planning Commission (2009-10)	Steel	68.5	Not Furnished	
	Power(U)	473		
	CPP			
	Cement	33.35		
	Sponge Iron			
	Others **	136.09		
	Total	710.94		
Coal Vision 2025 @ 9% GDP (Extrapolated on the basis of the demand projected on 8% GDP Growth taking 0.7 as energy elasticity (2005))	Steel	58.99	75.55	97.35
	Power(U)	464.54	600.91	759.65
	CPP	48.21	68.47	97.92
	Cement	42.84	66.4	103.12
	Sponge Iron			
	Others \$	70.15	89.29	114.86
	Total	684.72	900.62	1172.9
Vision 2020 CIL Corporate Plan at 9% GDP Growth prepared by KPMG, by balance energy demand model taking Integrated Energy Policy forecast as benchmark# (2011-12)	Steel	47	56	69
	Power(U)	468	675	1015
	CPP	-	-	-
	Cement##	27	35	54&
	Sponge Iron	30	41	55
	Others###	118	133	204
	Total @	690 (715)	940 (971)	1397 (1435)
Vision 2020 CIL Corporate	Steel	48	58	74

		Terminal Year		
Source	Sector	XI Plan (2011-12)	XII Plan (2016-17)	XIII Plan (2021-22)
Plan at 10% GDP Growth prepared by KPMG, by balance energy demand model taking Integrated Energy Policy forecast as benchmark# (2011-12)	Power(U)_	476	694	1082
	CPP			
	Cement	27	36	58
	Sponge Iron	31	42	59
	Others	120	137	218
	Total	702 (727)	966 (998)	1489 (1530)

* In Working Group estimates "Others" include Sponge Iron for 2016-17.

** In MTA "Others" include CPP, Sponge Iron for 2011-12.

\$ In Coal Vision 2025 document "Others" include Sponge Iron

The following are pertaining to Vision 2020 CIL Corporate Plan document of KPMG :

The coal demand is based on average GCV 4200 kcal/kg except for Steel, in which case it is coking coal demand @ average GCV of 6500 kcal/kg.

Demand for cement sector is after accounting for energy demand to be met by pet coke.

Others include CPP demand

@ Numbers in bracket indicate coal demand @ average GCV of 4200 kcal/kg

& Demand from Cement sector in FY2022 is extrapolated based on growth in coal demand as per the Coal Vision 2025 @9% GDP growth.

Annexure No. 2.2

List of coal based power plants to yield benefit in XII Plan

(A) Central Sector

A(i) Central Sector : Projects under Implementation					
Sl. No.	Name of TPP	As per CEA Estimate			
		Capacity (MW)	Energy Generation in 2016-17 (MU)	Coal Requirement in 2016-17 (Mt)	Year of Commissioning
1	Barh STPP-II, Bihar Unit-1	660	4625	3.10	2013-14
2	Barh STPP-II, Bihar Unit-2	660	4625	3.10	2014-15
3	BONGAIGAON TPP Unit-3	250	1750	1.23	2014-15
4	MAUDA TPP Unit-1	500	3500	2.45	2012-13
5	MAUDA TPP Unit-2	500	3500	2.45	2013-14
6	VINDHYACHAL ST-IV Unit-11	500	3500	2.45	2012-13
7	VINDHYACHAL ST-IV Unit-12	500	3500	2.45	2012-13
8	RIHAND-III Unit-5	500	3500	2.45	2012-13
9	RIHAND-III Unit-6	500	3500	2.45	2012-13
10	Muzaffarpur Ext. Bihar (Kanti TPP) Unit-1	195	1014	0.96	2013-14
11	Muzaffarpur Ext. Bihar (Kanti TPP) Unit-2	195	1014	0.96	2014-15
12	Barh STPP-I Unit-1	660	4625	3.10	2014-15
13	Barh STPP-I Unit-2	660	4625	3.10	2015-16
14	Barh STPP-I Unit-3	660	1388	0.93	2016-17
15	Sipat-I Unit-3	660	4625	3.10	2012-13
16	Vallur unit 3, T.N. Unit-3	500	3500	2.45	2012-13
17	Nabinagar TPP Unit-1	250	1750	1.23	2012-13
18	Nabinagar TPP Unit-2	250	1750	1.23	2013-14
19	Nabinagar TPP Unit-3	250	1750	1.23	2014-15
20	Nabinagar TPP Unit-4	250	1750	1.23	2014-15
21	Tuticorin JV Unit-1	500	3500	2.45	2013-14
22	Tuticorin JV Unit-2	500	3500	2.45	2014-15
23	Bokaro TPP A Expn.Unit-1	500	3500	2.45	2014-15
Total		10600	70291	49.00	XII Plan

A(ii) Central Sector : Source-Tied Up Projects (bulk-tendering route)					
Sl. No.	Name of TPP	As per CEA Estimate			
		Capacity (MW)	Energy Generation in 2016-17 (MU)	Coal Requirement in 2016-17 (Mt)	Year of Commissioning
1	MEJA JV Unit-1&2	1320	2776	4.03	XII Plan
2	NEW NABINAGAR Unit-1	660	1388	0.93	XII Plan
3	SOLAPUR Unit-1	660	1388	0.93	XII Plan
4	MAUDA-II Unit-1	660	1388	0.93	XII Plan
5	RAGHUNATHPUR Unit-1	660	1388	0.93	XII Plan
Total		3960	8328	7.75	XII Plan

(B) State Sector

B(i) State Sector : Projects under Implementation					
Sl. No.	Name of TPP	As per CEA Estimate			
		Capacity (MW)	Energy Generation in 2016-17 (MU)	Coal Requirement in 2016-17 (Mt)	Year of Commissioning
1	Kakatiya TPP ST -II, A.P. Unit-1	600	4200	2.94	2014-15
2	Chandrapura Extn. Mah. Unit-8	500	3500	2.45	2013-14
3	Chandrapura Extn. Mah. Unit-9	500	3500	2.45	2014-15
4	Koradi, Mah. Unit-8	660	4625	3.10	2013-14
5	Koradi, Mah. Unit-9	660	4625	3.10	2014-15
6	Koradi, Mah. Unit-10	660	4625	3.10	2015-16
7	Marwah TPP, Chatt. Unit-1	500	3500	2.45	2012-13
8	Marwah TPP, Chatt. Unit-2	500	3500	2.45	2013-14
9	Kalisindh TPS, Raj. Unit-2	600	4200	2.94	2013-14
10	Sikka TPP Extn. Guj. Unit-3	250	1750	0.82	2013-14
11	Sikka TPP Extn., Guj. Unit-4	250	1750	0.82	2013-14
12	Korba West St.III Unit-5	500	3500	2.45	2012-13
13	SATPURA EXT Unit-1	250	1750	1.23	2012-13
14	SATPURA EXT Unit-2	250	1750	1.23	2012-13
15	Shree Singaji TPP-I (Malwa) Unit-1	600	4200	2.94	2012-13
16	Shree Singaji TPP-I (Malwa) Unit-2	600	4200	2.94	2013-14
17	ANPARA-D Unit-1	500	3500	2.45	2012-13

B(i) State Sector : Projects under Implementation					
Sl. No.	Name of TPP	As per CEA Estimate			
		Capacity (MW)	Energy Generation in 2016-17 (MU)	Coal Requirement in 2016-17 (Mt)	Year of Commissioning
18	Parli TPS, Mah.Unit-8	250	1750	2.30	2012-13
19	Kalisindh TPS. Raj. Unit-1	600	4200	2.94	2012-13
20	Chhabra TPS Extn, Raj. Unit-3	250	1750	1.23	2013-14
21	Chhabra TPS Extn. Raj. Unit-4	250	1750	1.23	2014-15
22	Sri Damodaram Sanjeevaiah TPP (Krishnapattam TPP), A.P. Unit-1	800	5600	3.34	2014-15
23	Sri Damodaram Sanjeevaiah TPP (Krishnapattam TPP), A.P. Unit-2	800	5600	3.34	2015-16
Total		11330	79325	54.24	XII Plan

B(ii) State Sector : New Projects					
Sl. No.	Name of TPP	As per CEA Estimate			
		Capacity (MW)	Energy Generation in 2016-17 (MU)	Coal Requirement in 2016-17 (Mt)	Year of Commissioning
1	ANPARA-D Unit-2	500	3500	2.45	2014-15
2	DPL U-8	250	1750	1.23	2014-15
Total		750	5250	3.68	XII Plan
Note: All TPPs for which source has not yet been tied- are considered to be New Projects					

(C) Private Sector

C(i) Private Sector : Projects under Implementation					
Sl. No.	Name of TPP	As per CEA Estimate			
		Capacity (MW)	Energy Generation in 2016-17 (MU)	Coal Requirement in 2016-17 (Mt)	Year of Commissioning
1	Sasan UMPP, Unit- 1, M.P.	660	4625	3.1	2013-14
2	Sasan UMPP, Unit- 2, M.P.	660	4625	3.1	2013-14
3	Sasan UMPP, Unit-3, M.P.	660	4625	3.1	2014-15
4	Sasan UMPP, Unit-4, M.P.	660	4625	3.1	2014-15
5	Sasan UMPP, Unit-5, M.P.	660	4625	3.1	2015-16
6	Sasan UMPP, Unit-6, M.P.	660	4625	3.1	2015-16
7	DERANG TPP (JINDAL INDIA THERMAL POWER LIMITED), ORISSA Unit-2	600	4200	2.94	2013-14
8	KSK Mahanadi Power Company Ltd (Akaltara (Nariyara) TPP) Unit-4	600	4200	2.94	2014-15
9	Goindwal Sahib, PUNJAB Unit-1	270	1890	1.32	2012-13
10	Goindwal Sahib, PUNJAB Unit-2	270	1890	1.32	2013-14
11	KSK Mahanadi Power Company Ltd (Akaltara (Nariyara) TPP) Unit-1	600	4200	2.94	2013-14
12	KSK Mahanadi Power Company Ltd (Akaltara (Nariyara) TPP) Unit-2	600	4200	2.94	2014-15
13	KSK Mahanadi Power Company Ltd (Akaltara (Nariyara) TPP) Unit-3	600	4200	2.94	2014-15
14	NIGRIE, MP Unit-1	660	4625	3.1	2014-15
15	NIGRIE, MP Unit-2	660	4625	3.1	2015-16
16	Mahan THERMAL POWER PROJECT, M.P Unit-2	600	4200	2.94	2013-14
17	Malibrahmani TPP Unit-1	525	3675	2.57	2014-15
18	Simhapuri TPP Ph-II, A.P Unit-1	150	1050	0.49	2013-14
19	Simhapuri TPP Ph-II, A.P Unit-2	150	1050	0.49	2013-14
20	Mundra UMPP, Unit-2	800	5600	2.48	2012-13
21	Mundra UMPP, Unit-3	800	5600	2.48	2012-13
22	Mundra UMPP, Unit-4	800	5600	2.48	2013-14
23	Mundra UMPP, Unit-5	800	5600	2.48	2013-14

C(i) Private Sector : Projects under Implementation					
Sl. No.	Name of TPP	As per CEA Estimate			
		Capacity (MW)	Energy Generation in 2016-17 (MU)	Coal Requirement in 2016-17 (Mt)	Year of Commissioning
24	D B STPS Unit-2	660	4625	3.1	2014-15
25	Avantha Bhandar TPP Unit-1	600	4200	2.94	2013-14
26	JHAJJAR THERMAL POWER PROJECT Unit-2	660	4625	3.1	2012-13
27	CORPORATE POWER LTD, PH-I (MAITRISHI USHA TPP) Unit-1	270	1890	1.32	2012-13
28	CORPORATE POWER LTD, PH-I (MAITRISHI USHA TPP) Unit-2	270	1890	1.32	2013-14
29	India Bulls- Amravati Unit-1	270	1890	1.32	2012-13
30	India Bulls- Amravati Unit-2	270	1890	1.32	2012-13
31	India Bulls- Amravati Unit-3	270	1890	1.32	2013-14
32	India Bulls- Amravati Unit-4	270	1890	1.32	2013-14
33	India Bulls- Amravati Unit-5	270	1890	1.32	2013-14
34	India Bulls - Nasik Unit-1	270	1890	1.32	2012-13
35	India Bulls - Nasik Unit-2	270	1890	1.32	2012-13
36	India Bulls - Nasik Unit-3	270	1890	1.32	2013-14
37	India Bulls - Nasik Unit-4	270	1890	1.32	2013-14
38	India Bulls - Nasik Unit-5	270	1890	1.32	2013-14
39	DHARIWAL INFRASTRUCTURE (P) Ltd Unit-1	300	2100	1.47	2013-14
40	DHARIWAL INFRASTRUCTURE (P) Ltd Unit-2	300	2100	1.47	2014-15
41	EMCO WARORA-MAHARASHTRA Unit-1	300	2100	1.47	2012-13
42	EMCO WARORA- Ph-II MAHARASHTRA Unit-1	300	2100	1.47	2013-14
43	Bina Power SUPPLY COMPANY LTD., Unit-2, M.P	250	1750	1.23	2012-13
44	DERANG TPP (JINDAL INDIA THERMAL POWER LIMITED), ORISSA Unit-1	600	4200	2.94	2013-14
45	Ind Barath Energy Pvt. Ltd.- Orissa Unit-1	350	2450	1.72	2012-13
46	Ind Barath Energy Pvt. Ltd.- Orissa Unit-2	350	2450	1.72	2013-14
47	TALWANDI SABO, PUNJAB Unit-1	660	4625	3.1	2013-14

C(i) Private Sector : Projects under Implementation					
Sl. No.	Name of TPP	As per CEA Estimate			
		Capacity (MW)	Energy Generation in 2016-17 (MU)	Coal Requirement in 2016-17 (Mt)	Year of Commissioning
48	TALWANDI SABO, PUNJAB Unit-2	660	4625	3.1	2014-15
49	TALWANDI SABO, PUNJAB Unit-3	660	4625	3.1	2015-16
50	BARA-U P Unit-1	660	4625	3.1	2015-16
51	BARA-U P Unit-2	660	1388	0.93	2016-17
52	BARA-U P Unit-3	660	1388	0.93	2016-17
53	ROSA TPP PH-II Unit-3	300	2100	1.47	2012-13
54	ROSA TPP PH-II Unit-4	300	2100	1.47	2012-13
55	Nabha (Rajpura TPP) Unit-1	700	4900	3.43	2013-14
56	Nabha (Rajpura TPP) Unit-2	700	4900	3.43	2014-15
57	Seoni TPP (Jhabua) Unit-1	600	4200	2.94	2014-15
58	India Bulls II Nasik	270	1890	1.32	2014-15
59	India Bulls II Nasik	270	1890	1.32	2014-15
60	India Bulls II Nasik	270	1890	1.32	2014-15
61	India Bulls II Nasik	270	1890	1.32	2015-16
62	India Bulls II Nasik	270	1890	1.32	2015-16
63	India Bulls II Amravati	270	1890	1.32	2014-15
64	India Bulls II Amravati	270	1890	1.32	2014-15
65	India Bulls II Amravati	270	1890	1.32	2014-15
66	India Bulls II Amravati	270	1890	1.32	2015-16
67	India Bulls II Amravati	270	1890	1.32	2015-16
68	Vizag, Hinduja TPP Vishakhapatnam, A.P Unit-1	520	3640	2.55	2014-15
69	Vizag, Hinduja TPP Vishakhapatnam, A.P Unit-2	520	3640	2.55	2015-16
70	Lanco Babandh- Dhenkanal U1	600	4200	2.94	2013-14
71	MB Power (Madhya Pradesh) Ltd Anoppur Ph-I Unit-1	600	4200	2.94	2014-15
72	MB Power (Madhya Pradesh) Ltd Anoppur Ph-I Unit-2	600	4200	2.94	2015-16
73	Butibori TPP Ph-II Unit-1	300	2100	1.47	2012-13
74	KVK Nilanchal TPP	350	2450	1.72	2012-13
75	KVK Nilanchal TPP	350	2450	1.72	2012-13
76	KVK Nilanchal TPP	350	2450	1.72	2012-13
77	Athena Chattisgarh TPP Unit-1	660	4625	3.1	2014-15
78	SKS Ispat TPP	300	2100	1.47	2012-13

C(i) Private Sector : Projects under Implementation					
Sl. No.	Name of TPP	As per CEA Estimate			
		Capacity (MW)	Energy Generation in 2016-17 (MU)	Coal Requirement in 2016-17 (Mt)	Year of Commissioning
79	SKS Ispat TPP	300	2100	1.47	2013-14
80	SKS Ispat TPP	300	2100	1.47	2013-14
81	SKS Ispat TPP	300	2100	1.47	2013-14
82	Lanco Mahanadi TPP U-1	660	4625	3.1	2013-14
83	Maruti Clean Coal & Power, Chattisgarh Unit-1	300	2100	1.47	2014-15
84	Lanco Amarkantak U 4	660	4625	3.1	2014-15
85	Lanco Amarkantak U 3	600	4625	3.1	2014-15
86	R.K.M. POWERGEN PVT LTD-CHHATTISGARH (Uchpanda TPP) Unit-1	360	2520	1.76	2013-14
87	R.K.M. POWERGEN PVT LTD-CHHATTISGARH (Uchpanda TPP) Unit-2	360	2520	1.76	2013-14
88	R.K.M. POWERGEN PVT LTD-CHHATTISGARH (Uchpanda TPP) Unit-3	360	2520	1.76	2014-15
89	R.K.M. POWERGEN PVT LTD-CHHATTISGARH (Uchpanda TPP) Unit-4	360	2520	1.76	2014-15
90	Kamalanga TPP Unit-1	350	2450	1.72	2012-13
91	Kamalanga TPP Unit-2	350	2450	1.72	2012-13
92	Kamalanga TPP Unit-3	350	2450	1.72	2013-14
93	TIRODA TPP PH-I U2	660	4625	3.1	2012-13
94	Adhunik Power, Jharkhand Unit-1	270	1890	1.32	2012-13
95	Vandana Vidyut Unit-2	135	945	0.66	2012-13
96	Tiroda II Unit-1	660	4625	3.1	2012-13
97	D B STPS-CHHATTISGARH	600	4200	2.94	2013-14
98	Adhunik Thermal Energy Ltd.(changed to Adhunik Power & Natural Resources Ltd) Unit 2-1x270 MW	270	1890	1.32	2012-13
99	Mutiara TPP, Tuticorin Unit-1	600	4200	2.38	2012-13
100	Mutiara TPP, Tuticorin Unit-2	600	4200	2.38	2013-14
101	Meenakshi Energy Private Limited, A.P Unit-3	300	2100	1.19	2012-13

C(i) Private Sector : Projects under Implementation					
Sl. No.	Name of TPP	As per CEA Estimate			
		Capacity (MW)	Energy Generation in 2016-17 (MU)	Coal Requirement in 2016-17 (Mt)	Year of Commissioning
102	Meenakshi Energy Private Limited, A.P Unit-4	300	2100	1.19	2013-14
103	Bhavanpadu TPP EAST COAST-AP Unit-1	660	4625	2.79	2014-15
104	Bhavanpadu TPP EAST COAST-AP Unit-2	660	4625	2.79	2014-15
105	Thermal Powertech Corporation Ltd. Unit-1	660	4625	2.79	2013-14
106	Thermal Powertech Corporation Ltd. Unit-2	660	4625	2.79	2014-15
107	Ind Barath TPP	660	4625	2.79	2014-15
108	MUNDRA TPP PH-III U-2,3	1320	9250	5.58	2012-13
Total		50390	346821	228.83	XII Plan

C(ii) Private Sector : New Projects					
Sl. No.	Name of TPP	As per CEA Estimate			
		Capacity (MW)	Energy Generation in 2016-17 (MU)	Coal Requirement in 2016-17 (Mt)	Year of Commissioning
1	Lanco Mahanadi TPP U-2	660	4625	3.10	2014-15
2	D B Power TPP Unit-1	660	4625	3.10	2014-15
3	Athena Chattisgarh TPP Unit-2	660	4625	3.10	2015-16
Total		1980	13875	9.30	XII Plan
Note: All TPPs for which source has not yet been tied- are considered to be New Projects					

Additional list of coal based thermal power plants					
S.No.	Name	State	Sector	Capacity (MW)	Remarks
I	Projects where order for main plant placed but certain clearances awaited				
1	Raigarh TPP, Chhattisgarh	Chhattisgarh	P	2400	Coal Linkage Available for 1200 MW, Consent to establish awaited
2	Karchana TPP, U.P	U.P.	P	1980	site being shifted, Linkage available, Case -II
3	TRN Energy Private Limited 2x300, Chhattisgarh	Chhattisgarh	P	600	Linkage Available, Consent to establish awaited
4	Malibramani TPP U-2	Orissa	P	525	Coal linkage not available
5	Navabharat Power Pvt. Ltd. 3x350 MW	Orissa	P	1050	Coal Block/tapering linkage available. Land yet to be acquired.
6	Nagarjuna Construction Company Ltd. Phase-I (2x660)	A.P.	P	1320	Linkage available (domestic : imported -70:30) Notice to proceed (NTP) yet to be given.
7	Krishnapatnam UMPP Unit-1-6 6x660 MW	A.P.	P	3960	Imported coal, Developer stopped work . He has requested for additional tariff for increase in cost of imported coal.

Additional list of coal based thermal power plants					
S.No.	Name	State	Sector	Capacity (MW)	Remarks
8	Yermarus TPP	Karnataka	S	1600	No coal linkage but recommended by MoP
9	Edlapur TPP	Karnataka	S	800	No coal linkage but recommended by MoP
10	Bellary Unit-3	Karnataka	S	700	No coal linkage but recommended by MoP
11	Sagardighi	W.B.	S	1000	No coal linkage but recommended by MoP
12	Barauni TPP	Bihar	S	500	No coal linkage but recommended by MoP
13	Raigarh TPP (600 MW+660 MW)	Chhattisgarh	P	1260	No coal linkage
14	Lalitpur	U.P.	P	1980	No coal linkage, EC received on imported coal
15	Avantha Bhandar Unit-2	Chhattisgarh	P	600	No coal linkage
16	Corporate Power Phase-II	Jharkhand	P	540	No coal linkage
17	Raikheda (2x685 MW)		P	1370	No coal linkage, EC received on imported coal
18	Pipavav TPP	Gujarat	P	600	Imported coal ,. Domestic coal required to supplement the fuel supply
19	Lanco Babandh U-2 Dhenkanal	Orissa	P	660	Coal block allocated , but there is delay in development of coal block
20	Tori TPP , 2x600	Jharkhand	P	1200	Captive coal blocks in No Go area
21	KSK Mahanadi Power Company Ltd. (Akaltara) (Nariyara) TPP) Unit 5&6- 2x600 MW	Chhattisgarh	P	1200	No Coal Linkage
22	DB Power Sidhi U-2	M.P.	P	660	No Coal Linkage, CWC Clearance awaited
	Sub Total			26505	

II	Projects having coal tied up but order for Main Plant not placed				
Sl.No	Name	State	Sector	Capacity (MW)	Remarks
1	Aparna Infraenergy	Maharashtra	P	250	
2	Jinbhuvish Power Generation Power Ltd.-2x250	Maharashtra	P	500	
3	Central India Power Co. Ltd.	Maharashtra	P	660	
4	NSL Power Pvt. Ltd.	Tamil Nadu	P	1320	
5	BPL Power Projects(AP) Limited	Andhra Pradesh	P	600	
6	PEL Power Ltd. Tirumalai TPP	Tamil Nadu	P	500	
7	PEL Power Ltd. Tirumalai TPP	Gujarat	P	500	
8	Gupta Energy Ltd.	Maharashtra	P	540	
9	TPP of M/s Videocon Industries Ltd.	Chhattisgarh	P	660	
10	Dheeru Power Gen Pvt. Ltd.	Chhattisgarh	P	1050	
11	Haldia TPP	West Bengal	P	600	Order for main plant placed on 14th September, 2011
12	Rayalseema U-6 , APGENCO	A.P	S	600	
13	Obra Extn U-1, UPRVUNL	UP	S	660	
14	Tilaiya UMPP Reliance Power Ltd. 6x660	Jharkhand	P	3960	
	Sub Total			12400	
	Total			38905	

Annexure No.3.1

Coal Production Programme Field-wise

(Figs in Mt)

Sub.	Coalfields	2011 – 12	2016 – 17
ECL	Ranigunj	16.27	17.42
	Rajmahal / Deogarh / Mugma- Salanpur	16.73	23.58
	SUB – TOTAL	33.00	41.00
BCCL	Raniganj	1.68	1.50
	Jharia	28.32	34.50
	SUB – TOTAL	30.00	36.00
CCL	Giridih	0.65	0.65
	West Bokaro	6.46	12.25
	East Bokaro	13.66	16.99
	Ramgarh	1.25	3.20
	South Karanpura	4.41	7.24
	North Karanpura	24.58	42.68
	SUB – TOTAL	51.00	83.00
NCL	Singrauli	68.50	80.00
	SUB – TOTAL	68.50	80.00
WCL	Wardha – Valley	30.65	25.72
	Kamptee	4.86	6.41
	Umrer – Bander	2.90	5.25
	Pench – Kanhan	4.11	5.13
	Pathakhhera	2.98	2.50
	SUB – TOTAL	45.50	45.00
SECL	CIC*	24.04	32.41
	KORBA	82.39	86.74
	MAND RAIGARH	5.57	10.85
	SUB – TOTAL	112.00	130.00
MCL	IB VALLEY	38.71	51.21
	TALCHER	67.29	88.79
	SUB – TOTAL	106.00	140.00
NEC	Assam / Makum	1.00	1.00
	SUB – TOTAL	1.00	1.40
CIL	TOTAL	447.00	556.40
SCCL	Godavari Valley	51.00	57.00

Movement matrix of indigenous coal for XII Plan (2016–17)
Annexure – 5.1

Company	Field	Raw Coal Production		Raw Coal Offtake other than Rail				Available for Despatch by Rail			Wagon Loading	Grand Total	Colliery Consumption	Total Raw Coal Offtake
			Road (including Internal feed to Washeries)	MGR	Coastal Shipping (Rail-Sea)	Others	Total	Raw Coal	Coal Products	Total	(Rakes/Day)			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8) (4+5+7)	(9)	(10)	(11) (6+9+10)	(12)	(13) (8+11)	(14)	(15) (6+8+9+14)
ECL	Raniganj	17.420	5.360		1.800		5.360	3.932	7.140	12.872	9.3	18.232	0.380	11.472
	Rajmahal/Deogarh/Mugma/Salanpur	23.580	7.750	14.000			21.750	7.758		7.758	5.6	29.508	0.020	29.528
	Total	41.000	13.110	14.000	1.800	0.000	27.110	11.690	7.140	20.630	14.9	47.740	0.400	41.000
BCCL	Total	36.000	13.460	0.000	0.000	0.000	13.460	22.380	7.560	29.940	21.6	43.400	0.160	36.000
CCL	South Karanpura	7.240	3.992				3.992	3.245	0.642	3.886	2.8	7.879	0.003	7.240
	North Karanpura	42.670	23.546				23.546	19.124	20.894	40.019	28.9	63.564	0.000	42.670
	East Bokaro	16.990	9.368				9.368	7.615	2.528	10.142	7.3	19.511	0.007	16.990
	West Bokaro	12.250	6.760				6.760	5.490	1.245	6.735	4.9	13.495	0.000	12.250
	Giridih	0.650	0.359				0.359	0.291	0.000	0.291	0.2	0.650	0.000	0.650
	Ramgarh	3.200	1.766				1.766	1.434	1.232	2.666	1.9	4.432	0.000	3.200
	Total	83.000	45.790	0.000	0.000	0.000	45.790	37.200	26.540	63.740	46.0	109.530	0.010	83.000
NCL	Total	80.000	11.440	45.020		0.150	56.610	23.390	3.400	26.790	19.3	83.400	0.000	80.000
WCL	Wardha Valley	25.720	10.667	1.100		2.200	13.967	12.243		12.243	8.8	26.209	0.010	26.219
	Umrer-Bander	5.250	2.179			0.000	2.179	2.499	1.600	4.099	3.0	6.278	0.000	4.678

Compan y	Field	Raw Coal Production		Raw Coal Offtake other than Rail				Available for Despatch by Rail			Wagon Loading	Grand Total	Colliery Consump tion	Total Raw Coal Offtake
			Road (including Internal feed to Washeries)	MGR	Coastal Shipping (Rail-Sea)	Others	Total	Raw Coal	Coal Product s	Total	(Rakes/ Day)			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
							(4+5+7)			(6+9+10)		(8+11)		(6+8+9+14)
	Pathakhera	2.500	1.038			1.100	2.138	1.190		1.190	0.9	3.328	0.000	3.328
	Pench-Kanhan	5.130	2.120			0.000	2.120	2.442	1.260	3.702	2.7	5.821	0.010	4.571
	Kamptee	6.400	2.657			0.500	3.157	3.046	0.900	3.946	2.8	7.103	0.000	6.203
	Total	45.000	18.660	1.100	0.000	3.800	23.560	21.420	3.760	25.180	18.2	48.740	0.020	45.000
SECL	Korea-Rewa	32.410	12.540	1.080			13.620	12.114	2.543	14.657	10.6	28.277	0.020	25.754
	Korba	86.740	33.615	25.250		4.700	63.565	32.421	6.806	39.226	28.3	102.792	0.000	95.986
	Mand-Raigarh	10.850	4.205	0.000			4.205	4.055	0.851	4.907	3.5	9.111	0.000	8.260
	Total	130.000	50.360	26.330	0.000	4.700	81.390	48.590	10.200	58.790	42.4	140.180	0.020	130.000
MCL	Ib Valley	51.210	22.554	2.700	0.000	0.000	25.254	21.450	9.949	31.399	22.6	56.653	0.000	46.704
	Talcher	88.790	39.106	15.300	18.150	1.700	56.106	19.040	17.251	54.441	39.3	110.547	0.000	93.296
	Total	140.000	61.660	18.000	18.150	1.700	81.360	40.490	27.200	85.840	61.9	167.200	0.000	140.000
NEC	Total	1.000	0.290				0.290	1.110	0.000	1.110	0.8	1.400	0.000	1.400
CIL	Total	556.000	214.770	104.450	19.950	10.350	329.570	206.270	85.800	312.020	225.0	641.590	0.610	556.400
SCCL		57.000	10.510	10.050	0.000	0.500	21.060	35.880	0.000	35.880	25.9	56.940	0.060	57.000
Captive Blocks		102.000	42.000	0.000	0.000	18.000	60.000	41.600	0.000	41.600	30.0	101.600	0.000	101.600
Grand Total		715.000	267.280	114.500	19.950	28.850	410.630	283.750	85.800	389.500	280.8	800.130	0.670	715.000
Quantity for 1 Rake has been considered as 3800 Tonnes in line with prevalent Carrying Capacity rules of Railways														

Movement matrix for imported coal in 2016–17 (In Mt)

Demand–Indigenous Supply Gap for 2016–17 to be met through Imports			
Port/Mode	Coking Coal	Non–Coking Coal	Total
East Coast Ports	35.50	138.00	173.50
By non–Rail	5.50	6.50	12.00
By Rail	30.00	131.50	161.50
<i>Requirement in Rakes/Day)</i>	<i>21.6</i>	<i>94.8</i>	<i>116.4</i>
West Coast Ports	0.00	92.00	92.00
By non–Rail	0.00	23.82	23.82
By Rail	0.00	68.18	68.18
<i>Requirement in Rakes/Day)</i>	<i>0.0</i>	<i>49.2</i>	<i>49.2</i>
Total	35.50	230.00	265.50
By non–Rail	5.50	30.32	35.82
By Rail	30.00	199.68	229.68
<i>Requirement in Rakes/Day)</i>	<i>21.6</i>	<i>144.0</i>	<i>165.6</i>
Notes : Coking Coal Import indicated by RINL has been considered to be through Non–Rail mode as it is located near port; Similarly, requirement of all existing & proposed import–based TPPs are considered to be through Non–rail mode			

List of on-going Railway projects for augmenting coal routes

(Rs.Cr.)

S. No.	Rly.	Year of sanction	Plan Head	Name of the project	Length (in Km)	Cost 2011-12	Exp. upto Mar' 11	Outlay 2011-12	Throw forward as on 1st April 2011	Expected Throw forward as on 1st April 2011	Remarks
1	ECOR	2002-03	DL	Sambalpur-Rengali	22.7	113.55	92.91	20	20.64	0.64	Strengthening of route for movement of coal from Talcher area to Western India
2	ECOR	2005-06	DL	Jharsuguda-Rengali	25.6	150	109	33.5	41.00	7.50	
3	ECOR	2009-10	DL	Brundamal-Jharsuguda flyover connection to join DN Line		88.02	0.75	10	87.27	77.27	
4	ECOR	2006-07	DL	Sambalpur-Titlagarh*	182	95.84	39.74	60	56.10	-3.90	
5	ECOR	2007-08	DL	Raipur-Titlagarh* incl. NL between Mandi Hasaud-Naya Raipur(20 KM) and new MM for conversion of Raipur(Kendri)-Dhamtari& Abhnapur-Rajim branch line(67.20 km) GC	270.2	691.67	67.05	2.51	624.62	622.11	
6	ECOR	2010-11	DL	Sambalpur-Talcher	174.11	679.27	2	66	677.27	611.27	Augmenting capacity for Coal

S. No.	Rly.	Year of sanction	Plan Head	Name of the project	Length (in Km)	Cost 2011-12	Exp. upto Mar' 11	Outlay 2011-12	Throw forward as on 1st April 2011	Expected Throw forward as on 1st April 2011	Remarks
											movement from Talcher
7	ECR	2008-09	DL	Chandrapura-Rajabera-Chandrapura-Bhandaridah	10.6	34.87	20.12	10	14.75	4.75	Augmenting capacity for Coal movement
8	ER	2003-04	DL	Barharwa-Tinpahar	16.49	74.61	41.23	20	33.38	13.38	Augmenting capacity for Coal movement from Pakur area
9	ER	2009-10	DL	Tinpahar-Sahibganj as PH-I of doubling of Tinpahar-Bhagalpur	37.81	167.84	25.93	25	141.91	116.91	
10	ER	2010-11	DL	Sahibganj-Pirapainti	10.45	129.45	0.01	30	129.44	99.44	
11	ER	2005-06	DL	Chinpai-Sainthia**, Prantik-Siuri	31.61	595.91	149.41	40	446.5	406.50	
12	ER	2002-03	DL	Kajra-Kiul	15.85	47.55	30.46	15	17.09	2.09	
13	ER	2011-12	NL	Hansdiha -Godda	30	267	0	1	267	266.00	
14	SCR	2011-12	NL	Bhadrachalam Rd - Sattupalli	56.25	337.5	10	0.01	327.5	327.49	
15	SECR	2004-05	DL	Bilaspur-Salka Road	39.4	144.19	126.86	10	17.33	7.33	Augmenting capacity for Coal movement from IB/Korba

S. No.	Rly.	Year of sanction	Plan Head	Name of the project	Length (in Km)	Cost 2011-12	Exp. upto Mar' 11	Outlay 2011-12	Throw forward as on 1st April 2011	Expected Throw forward as on 1st April 2011	Remarks
16	SECR	2005-06	DL	Salka Road-Khongsara Patch Doubling*	26	143.87	83.87	60	60	0.00	Augmenting capacity for Coal movement from IB/Korba
17	SECR	2006-07	DL	Khodri-Anuppur with flyover at Bilaspur*	61.6	385.54	196.5	60	189.04	129.04	
18	SECR	2007-08	DL	Byepass at Annupur (work completed)							
19	SECR	2007-08	DL	Byepass at Champa	14	37.64	10.84	17	26.8	9.80	
20	SER	2011-12	DL	Bhojudih-Mohuda	23	134.19	0	5	134.19	129.19	
21	WCR	2008-09	DL	Guna-Ruthiyai	20.5	66.5	5.22	5	61.28	56.28	Augmenting capacity for movement of Coal to Rajasthan
22	WR	2008-09	DL	Udhna-Jalgaon with electrification	306.93	714.6	62.55	200	652.05	452.05	Capacity enhancement work for movement of coal to Western India
23	ECR	1998-99	NL	Koderma - Ranchi (deposit work)	189	1157.82	749.66	70	408.16	338.16	Augmentation of capacity for coal movement to new thermal power
24	ECR	2001-02	NL	Koderma-Tilaya (Deposit work)	68	418.17	73.31	75	344.86	269.86	

S. No.	Rly.	Year of sanction	Plan Head	Name of the project	Length (in Km)	Cost 2011-12	Exp. upto Mar' 11	Outlay 2011-12	Throw forward as on 1st April 2011	Expected Throw forward as on 1st April 2011	Remarks
25	ECR	2001-02	NL	Rajgir-Hisua-Tilaiya & Islampur- Natesar	67	303.6	283.6	3	20	17	plants in Bihar
26	ECR		NL	Tori- Shivpur (Deposit work)							
27	NR	2007-08	DL	Kukrana - Panipat	6.5	36.08	35.58	0.17	0.5	0.33	Augmentation of capacity for coal movement to new thermal power plants in Haryana and Rajasthan
28	NWR	2007-08	DL	Alwar- Harsauli	34.86	91.59	89.59	2	2	0.00	
29	NWR	2007-08	DL	Harsauli - Rewari	39.35	113.74	109.74	4	4	0.00	
30	SECR	2010-11	DL	Champa - Jharsuguda	165	872.12	33.33	50	838.79	788.79	Capacity augmentation work for movement of coal for the Thermal Power houses in Maharashtra and Gujarat
31	SECR	2011-12	DL	Durg - Rajnandgaon 3 rd Line		157.85	11.00	20	146.85	126.85	

Railway projects for port connectivity

i) ONGOING PROJECTS							
Sl. No.	Name of Port to be connected	Scope of work	Length (in Kms)	Project cost (Rs. in crore)	Year of commencement	Expected Completion Date	Present Status
1	Paradip	Haridaspur-Paradip new line.	82	791.18	1996-97	May 2010	Project being executed by RVNL. FLS completed. SHA signed on 11.10.2006 and SPV incorporated. Private land of 472.34 ha in 74 villages has been taken possession out of total requirement of 558.46 ha involved in 86 villages. Work in progress on Luna Bridge and Mahanadi Bridge. Work delayed due to law & order issues on account of higher compensation being sought by people whose land has been acquired.
2	Mumbai	Dedicated freight line between Wadala and Kurla	5.66	104 (incl 55 cr. for hutment removal)		Dec 2012	MOU has been signed between Railways and MbPT on 20 th Jan, 2009 for undertaking work as deposit work of MbPT. The targeted time for completion of the project is within one and half year after completion of R&R of project affected persons.

i) ONGOING PROJECTS							
Sl. No	Name of Port to be connected	Scope of work	Length (in Kms)	Project cost (Rs. in crore)	Year of commencement	Expected Completion Date	Present Status
3	Ennore	The new Chord line. (Puttur – Attipattu)	144	435			Project is sanctioned in Budget 2008–09 on 50% cost sharing between Ennore Port and Min of Railways. FLS completed. Cost sharing is not finalized by Ennore port. Limited.
4	Haldia	Doubling of 1) Panskura–Haldia section (Phase-II) Rajgoda to Tamluk (13.5 km) has been sanctioned as Railway project. and from 2) Tamluk to Basulya Sutahata (24.4 km) has been planned on PPP mode.	37.9	1) Rs 86.91 cr 2) Rs 171.02 cr	1) 2009–10 2) 2010–11	1) March 2012 2) March 2013	1) FLS work of Rajgoda–Tamluk (Jn cabin) has been completed. Yard plans is under approval of SER HQ. 2) Detailed Estimate has been sanctioned of Tamluk (Jn cabin) – Basulya Sutahata.
5	Krishn	Obulavarpalle–	113.12	732.81	2006–07		Phase-I, Venkatachalam–

i) ONGOING PROJECTS							
Sl. No .	Name of Port to be connected	Scope of work	Length (in Kms)	Project cost (Rs. in crore)	Year of commencement	Expected Completion Date	Present Status
	apattanam.	Krishnapattanam new line					Krishnapattanam section completed. Land acquisition is in progress in Ph-II (Obulavaripalle-Venkatachalamc – 93 km)

PROJECTS COMPLETED AND COMMISSIONED							
Sl. No.	Name of Port to be connected	Scope of work	Length (in Kms)	Project cost (Rs. in crore)	Year of commencement	Scheduled Completion Date	Present Status
1	Haldia	Doubling of Panskura-Haldia section (Phase-I)	14	26	2000-01	March 2006	Completed and commissioned.
2	New Mangalore	Aresikere-Hassan-Mangalore rail link	236	357	1994-95	December 2005	Complete section has been commissioned for goods traffic.
3	Kandla	Gandhidham-Palanpur Gauge Conversion	313	550	1998-99	March 2007	Completed and commissioned.
4	JN Port	Doubling of Panvel-Jasai section	28.5	69	2000-01	March 2006	Project completed and commissioned on 25.8.2006.
5	Paradip	Second bridge over Mahanadi	3	140	1996-97	June 2008	The bridge has been opened for traffic on 18.7.2008.
6	Tuticorin	Doubling of Madurai-Dindigul section	62.06	126	2003-04	March 2009	The construction work of doubling of Kodaikanal Road- Madurai has been completed and is now awaiting CRS inspection. The project has been commissioned in July 2009.
7	Kandla Port	Bhildi-Samdhari Gauge Conversion	223	490	1990-91	Dec. 2009	Section has been opened for Goods traffic on 28.12.09. and opened for passenger traffic from 28.07.10.

PROJECTS COMPLETED AND COMMISSIONED							
Sl. No.	Name of Port to be connected	Scope of work	Length (in Kms)	Project cost (Rs. in crore)	Year of commencement	Scheduled Completion Date	Present Status
8	Cochin	Vallarpadm-Idapally-New Line	8.86	246.50	2006	Nov 2009	Project being executed by RVNL. Trial run conducted on March 2010.
9	Dahej	Gauge conversion of Bharauch-Samni-Dahej	62.33	200.8	2005-06	2010-11	Work completed. Engine rolled on 31.03.11

Annexure No. 6.1

State wise projected lignite based power generation capacity XII plan and XIII Plan (TY).

(Figs in MW)

	XII PLAN					XIII PLAN
Projects	2012-13	2013-14	2014-15	2015-16	2016-17	2021-22
Tamilnadu						
NLC	2990	2990	2990	3540	3390	5990
Private (ST-CMS)	250	250	250	250	250	250
Total Tamilnadu	3240	3240	3240	3790	3640	6240
Gujarat						
GEB	290	290	290	290	290	290
GMDC	500	500	500	500	500	500
GIPCL	500	500	500	500	500	500
GPCL	0	0	250	500	500	500
GHCL	26	26	26	26	26	26
NLC-GOG	0	0	0	0	0	1000
Total Gujarat	1066	1066	1316	1566	1566	2566
Rajasthan						
RVUNL	850	850	1515	1785	1785	1785
NLC	250	250	250	250	500	500
Total Rajasthan	1100	1100	1765	2035	2285	2285
Total India	5406	5406	6321	7391	7491	11091

Sector wise State-wise Projected Lignite Demand

(Fig. in Mt)

	XII PLAN						XIII PLAN
Sector	2012-13	2013-14	2014-15	2015-16	2016-17	Total XII Plan	2021-22
Power	38.98	40.18	46.21	50.22	53.86	229.45	81.19
Others	10.54	12.08	13.83	16.30	18.10	70.85	29.30
Total	49.52	52.26	60.04	66.52	71.96	300.30	108.62

The State wise Lignite Demand

(Figs. In Mt)

	XII PLAN						XIII PLAN
State	2012-13	2013-14	2014-15	2015-16	2016-17	Total for XII Plan	2021-22
Tamilnadu	24.43	24.93	24.66	25.25	27.34	126.61	45.48
Gujarat	16.24	17.48	20.33	23.60	25.20	102.85	43.60
Rajasthan	8.85	9.85	15.05	17.67	19.42	70.84	19.54
Total	49.52	52.26	60.04	66.52	71.96	300.30	108.62

**State-wise projected lignite production during XII Plan
and at terminal year of XIII Plan**

(Figs. in Mt)	XII PLAN						XIII PLAN
	12-13	13-14	14-15	15-16	16-17	Total XII Plan	2021-22
Tamil Nadu	24.23	24.23	24.23	25.08	27.20	124.97	45.75
Gujarat	16.24	17.48	18.53	20.00	21.60	93.85	39.00
Rajasthan	8.89	9.89	15.09	17.67	19.80	71.34	19.80
Total	49.36	51.60	57.85	62.75	68.60	290.16	104.55

Projected lignite Production for Tamilnadu (Mine-wise)
(For XII Plan and at the terminal year of XIII Plan)

(Fig. in Mt)

Sl.No.	Mine	Capacity MTPA	2012-13	2013-14	2014-15	2015-16	2016-17	XIII Plan
1	Mine I	10.50	8.93	8.93	8.93	8.93	8.50	6.80
2	Mine IA	3.00	2.55	2.55	2.55	2.55	4.25	5.95
3	Mine II	15.00	12.75	12.75	12.75	12.75	12.75	13.02
4	Devangudi	2.00	0.00	0.00	0.00	0.85	1.70	1.70
5	Jayamkondam	13.50	0.00	0.00	0.00	0.00	0.00	11.48
6	Mine III	8.00	0.00	0.00	0.00	0.00	0.00	6.80
5	Total		24.23	24.23	24.23	25.08	27.20	45.75

Projected lignite Production for Gujarat (Mine- wise)
(For XII Plan and at the terminal year of XIII Plan)

Fig in Mt								
Sl.No	Mine	Capacity MTPA	2012- 13	2013- 14	2014- 15	2015- 16	2016- 17	XIII Plan
1	Panandhro	3.00	3.00	3.00	3.00	2.00	1.00	0.00
2	Akrimota	3.00	0.00	0.00	0.00	1.00	2.00	3.00
3	Umarsar	1.00	1.00	1.00	1.00	1.00	1.00	1.00
4	Surka-North	5.00	2.00	3.50	4.00	4.50	4.50	4.50
5	Amod-Rajpardi	1.00	1.00	1.00	1.00	1.00	1.00	1.00
6	Tadkeshwar	2.50	2.50	2.50	2.50	2.50	2.50	2.50
7	Lakhpatt	1.50	0.00	0.00	0.50	1.00	1.50	1.50
8	Matona Madh	4.80	2.84	2.58	2.63	3.10	3.20	3.50
9	Damlai Padal	2.50	0.00	0.00	0.00	0.00	1.00	2.50
10	Vatsan	1.00	1.00	1.00	1.00	1.00	1.00	1.00
11	Mangrol-Valia	2.60	2.60	2.60	2.60	2.60	2.60	2.60
12	Alapar (Khadsalia)	0.30	0.30	0.30	0.30	0.30	0.30	0.30
13	Panandhro North	2.00	0.00	0.00	0.00	0.00	0.00	2.00
14	Ghala	2.50	0.00	0.00	0.00	0.00	0.00	2.50
15	Hamla Ratadia	0.50	0.00	0.00	0.00	0.00	0.00	0.50
16	Jhulrai Saran	1.00	0.00	0.00	0.00	0.00	0.00	1.00
17	Padvania	1.00	0.00	0.00	0.00	0.00	0.00	1.00
18	Dungra	1.40	0.00	0.00	0.00	0.00	0.00	1.40
19	Valia	7.20	0.00	0.00	0.00	0.00	0.00	7.20
20	Total	43.80	16.24	17.48	18.53	20.00	21.60	39.00

Projected lignite Production for Rajasthan (Mine- wise)
(For XII Plan and at the terminal year of XIII Plan)

(Fig in Mt)

Sl.No.	Mine	Capacity MTPA	2012- 13	2013- 14	2014- 15	2015- 16	2016- 17	XIII Plan
1	Giral	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2	Matasukh Kasnau	0.50	0.30	0.30	0.50	0.50	0.50	0.50
3	Sonari	1.00	1.00	1.00	1.00	1.00	1.00	1.00
4	Gurah East	1.00	1.00	1.00	1.00	1.00	1.00	1.00
5	Gurah West	1.00	0.50	1.00	1.00	1.00	1.00	1.00
6	Mokhla	1.00	0.00	0.50	1.00	1.00	1.00	1.00
7	Shivkar	1.00	0.00	0.00	0.50	1.00	1.00	1.00
8	Kaphurdi	3.00	3.00	3.00	3.00	3.00	3.00	3.00
9	Jalipa	6.00	0.00	0.00	4.00	6.00	6.00	6.00
10	Sacha-Sauda	0.30	0.30	0.30	0.30	0.30	0.30	0.30
11	Barsingsar	2.10	1.79	1.79	1.79	1.87	1.87	1.87
12	Hadla	1.90	0.00	0.00	0.00	0.00	1.62	1.62
13	Palana	0.60	0.00	0.00	0.00	0.00	0.51	0.51
14	Total	22.65	8.89	9.89	15.09	17.67	19.80	19.80

Annexure No. 6.4

State-wise, sector-wise & agency-wise investment proposal

Investment Proposed during XII Plan (Rs. Crores)							
State		Mine Sector	Power Sector				Total
			Lignite Based	Coal Based	Non-renewable	Total Power	
Tamil Nadu	On-going Projects	187.51	450.83	3586.00	0.00	4036.83	4224.34
	New Projects	2607.50	5127.04	6740.00	1047.44	12914.48	15521.98
	Total	2795.01	5577.87	10326.00	1047.44	16951.31	19746.32
Gujarat	NLC	0.50	4.75	0.00	0.00	4.75	5.25
	Others	1401.24	4135.00	0.00	0.00	4135.00	5536.24
	Total	1401.74	4139.75	0.00	0.00	4139.75	5541.49
Rajasthan	NLC	480.50	1718.44	0.00	0.00	1718.44	2198.94
	Others	707.64	9205.00	0.00	0.00	9205.00	9912.64
	Total	1188.14	10923.44	0.00	0.00	10923.44	12111.58
Orissa, MP & UP -NLC		115.00	0.00	9000.00	0.00	9000.00	0.00
Completed Projects, Geo. Investigation, Science & Technology, etc. - NLC		90.00	36.00	0.00	0.00	36.00	126.00
Grand Total		5589.89	20677.06	19326.00	1047.44	41050.50	46640.39

Agency wise Requirement for XII Plan (Rs in Crores)

SECTOR		NLC	GUJARAT	RAJASTHAN	TOTAL
MINE SECTOR		3481.01	1401.24	707.64	5589.89
POWER SECTOR	Lignite-based	7337.06	4135.00	9205.00	20677.06
	Coal-based	19326.00	0.00	0.00	19326.00
	Non-renewable	1047.44	0.00	0.00	1047.44
	Total	27710.50	4135.00	9205.00	41050.50
Grand total		31191.51	5536.24	9912.64	46640.39

Annexure – 7.1

Performance of coking coal washeries in operation in the XI plan period

Sl. No.	Company / washery	Capacity (Mty)	Washed coking coal production (Mt.)				
			2007-08	2008-09	2009-10	2010-11	2011-12 (Target)
1	CIL:Dugda-II	2.00	0.330	0.347	0.199	0.178	0.26
2	Bhojudih	1.70	0.480	0.485	0.312	0.333	0.41
3	Patherdih	1.60	0.100	0.089	0.069	0.116	0.10
4	Sudamdih	1.60	0.210	0.185	0.202	0.228	0.30
5	Moonidih	1.60	0.440	0.330	0.286	0.388	0.40
6	Madhuban	2.50	–	0.070	0.130	0.133	0.17
7	Mahuda	0.63	0.110	0.098	0.127	0.174	0.21
8	Kathara	3.00	0.469	0.321	0.139	0.143	0.25
9	Swang	0.75	0.287	0.257	0.236	0.208	0.30
10	Rajrappa	3.00	0.616	0.610	0.559	0.571	0.68
11	Kedla	2.60	0.468	0.513	0.458	0.531	0.57
12	Nandan	1.20	0.331	0.366	0.246	0.191	0.27
	Sub Total	22.18	3.841	3.671	2.960	3.194	3.89
13	SAIL :Chasnala	2.04	0.514	0.577	0.526	0.537	0.54
	Sub Total	2.04	0.514	0.577	0.526	0.537	0.54
14	TISCO:Jamadoba	0.90	2.82	2.925	3.048	2.642	2.6
15	West Bokaro-II	1.80					
16	West Bokaro-III	2.10					
17	Bhelatand	0.86					
	Sub Total	5.66					
	TOTAL	29.88	7.175	7.173	6.534	6.373	7.03

Performance of non-coking coal washeries in operation in the XI plan period

Sl.No	Washery / Company	Capacity (Mty)	Washed non-coking coal production (Mt.)				
			07-08	08-09	09-10	10-11	11-12 (Target)
1	Dugda-I,CIL	1.00	0.327	0.261	0.301	0.314	0.25
2	Madhuban,CIL *	–	0.734	–	–	–	–
3	Gidi,CIL	2.50	0.394	0.364	0.321	0.352	0.51
4	Piparwar,CIL	6.50	5.564	5.934	6.388	7.176	5.95
5	Kargali,CIL	2.72	0.717	0.540	0.709	0.535	0.87
6	Bina,CIL	4.50	2.581	3.578	3.521	3.339	3.40
	(A) CIL	17.22	10.317	10.677	11.24	11.716	11.30
7	Dipka washery, Aryan coal beneficiation Pvt. Ltd	12.00	2.232	30.442	27.71	20.93	25.00
8	Chakabura Washery, –do–	6.00					
9	Panderpauny Washery, –do–	3.00					
10	Binjhari –do–	0.79					
11	Gevra –do–	5.00					
12	Talcher Washery, Aryan Energy private Ltd.	2.00					
13	Indaram Washery, –do–	0.60					
14	Wani, Kartikay Coal washeries Pvt. Ltd.	2.50					
15	Korba, ST-CLl Coal washeries Ltd.	5.20					
16	Ramagundam, Gupta coalfield & washeries Ltd.	2.40					
17	Sasti, –do–	2.40					
18	Wani, –do–	1.92					
19	Ghugus, –do–	2.40					
20	Gondegaon –do–	2.40					
21	Majri, –do–	2.40					
22	Talcher, Global coal Mining Pvt. Ltd.	2.50					
23	Ramagundam, –do–	1.00					
24	IB Valley, –do–	1.50					
25	Wani, Bhatia International Ltd.	2.00					
26	Ghuggus, –do–	4.00					
27	Nagpur, Indo Unique Flame Ltd.	0.60					
28	Wani, –do–	2.40					
29	Punvat, –do–	2.40					
30	Jindal Steel & Power Ltd.	6.00					
31	BLA Industries Pvt. Ltd.	0.33					

Sl.No	Washery / Company	Capacity (Mty)	Washed non-coking coal production (Mt.)				
			07-08	08-09	09-10	10-11	11-12 (Target)
32	Saristatali, CESC	1.5					
33	KDH, PSEB	3.5					
	(B) Others	78.74	2.232	30.442	27.71	20.93	25.00
	TOTAL (A+B)	95.96	12.58	41.119	38.952	32.64	36.3

* Madhuband washery converted to coking coal washery in 2007- 08, thus total no. is 32.

Projected washed coking coal production in XII plan from existing & proposed washeries

Existing washeries

Company	Washery & Capacity, Mty	2012-13		2013-14		2014-15		2015-16		2016-17	
		CC	Midling	CC	Midling	CC	Midling	CC	Midling	CC	Midling
Coking coal (Existing washery)											
CCL	Kathara, 3.0	0.3	0.33	0.3	0.33	0.35	0.38	0.37	0.4	0.4	0.44
	Sawang, 0.75	0.32	0.31	0.32	0.31	0.33	0.32	0.34	0.33	0.35	0.34
	Rajrappa, 3.0	0.7	0.29	0.8	0.33	0.82	0.34	0.85	0.35	0.9	0.37
	Kedla, 2.6	0.68	0.49	0.78	0.56	0.8	0.57	0.84	0.6	0.85	0.6
	Total, 9.35	2.00	1.42	2.2	1.53	2.3	1.61	2.4	1.68	2.5	1.75
BCCL	Dugda-II,2.0	0.18	0.34	0.182	0.342	0.19	0.345	0.195	0.35	0.271	0.355
	Bhojudih, 1.7	0.425	0.42	0.418	0.45	0.421	0.46	0.429	0.465	0.433	0.47
	Patherdih, 1.6	0.11	0.089	0.109	0.99	0.112	0.1	0.115	0.105	0.12	0.108
	Sudamdih,1.6	0.246	0.25	0.255	0.27	0.335	0.275	0.342	0.28	0.352	0.29
	Moonidih, 1.6	0.436	0.213	0.455	0.22	0.461	0.22	0.465	0.225	0.475	0.23
	Mohuda, 0.63	0.238	0.07	0.242	0.071	0.255	0.075	0.26	0.079	0.272	0.08
	Madhuban,2.5	0.155	0.418	0.164	0.421	0.181	0.425	0.183	0.43	0.189	0.45

	Total, 11.63	1.79	1.8	1.825	1.873	1.955	1.9	1.989	1.934	2.112	1.983
WCL	Nandan, 1.2	0.187	0.137	0.197	0.144	0.197	0.144	0.221	0.162	0.248	0.18
CIL, 22.18		3.977	3.357	4.222	3.547	4.452	3.654	4.61	3.776	4.86	3.913
SAIL & TISCO	Chasnala, Jamadoba, WB-II, WB-III, Bhelatand	3.2	–	3.4	–	3.6	–	3.8	–	4.0	–
SAIL & TISCO, 7.7		3.2	–	3.4	–	3.6	–	3.8	–	4.0	–
Total coking (Existing), 29.88		7.177	3.357	7.622	3.547	8.052	3.654	8.41	3.776	8.86	3.913

Proposed washeries

Company	Washery & Cap , Mty	2012-13		2013-14		2014-15		2015-16		2016-17	
		CC	Midling	CC	Midling	CC	Midling	CC	Midling	CC	Midling
Coking coal (Proposed washery)											
CCL	Dhori, 2.5	-	-	0.09	0.36	0.375	1.00	0.38	1.00	0.38	1.00
BCCL	Madhuband,5.0	-	-	1.68	0.8	2.0	1.0	2.0	1.0	2.0	1.0
	Patherdih, 5.0	-	-	0.75	1.7	1.12	2.57	1.12	2.57	1.12	2.57
	Dugdā, 2.5	-	-	0.17	0.34	0.5	1.0	0.5	1.0	0.5	1.0
	Dahibari, 1.6	-	-	0.07	0.1	0.4	0.6	0.4	0.6	0.4	0.6
	Patherdih, 2.5	-	-	-	-	0.44	0.66	0.66	1.0	0.66	1.0
CIL, 19.1		-	-	2.76	3.30	4.835	6.83	5.06	7.17	5.06	7.17
Total coking (existing & Proposed), 48.98		7.177	3.357	10.382	6.847	12.887	10.484	13.47	10.946	13.92	11.083

Envisaged washed non-coking coal production during XII plan from existing & proposed washeries:

Sl. No	Washery / Company	Capacity (Mty)	Washed non-coking coal production (Mt.)				
			2012-13	2013-14	2014-15	2015-16	2016-17
Non coking coal (Existing washery):							
1	Dugda-I, BCCL	1.00	0.346	0.371	0.379	0.385	0.4
2	Gidi, CCL	2.50	0.51	0.51	0.51	0.51	0.51
3	Piparwar,CIL	6.50	5.95	5.95	5.95	5.95	5.95
4	Kargali,CIL	2.72	0.87	-	-	-	-
5	Bina,CIL	4.50	3.5	3.5	3.5	3.6	3.6
	CIL	17.22	11.176	10.331	10.339	10.445	10.46
7	Dipka washery, Aryan coal beneficiation Pvt. Ltd	12.00					
8	Chakabura Washery, -do-	6.00					
9	Panderpauny Washery, -do-	3.00					
10	Binjhari -do-	0.79					
11	Gevra -do-	5.00					
12	Talcher Washery, Aryan Energy private Ltd.	2.00					
13	Indaram Washery, -do-	0.60					
14	Wani, Kartikay Coal washeries Pvt. Ltd.	2.50					
15	Korba, ST-CLl Coal washeries Ltd.	5.20					
16	Ramagundam, Gupta coalfield & washeries Ltd.	2.40					
17	Sasti, -do-	2.40					
18	Wani, -do-	1.92					
19	Ghugus, -do-	2.40					
20	Gondegaon -do-	2.40					
21	Majri, -do-	2.40					
22	Talcher, Global coal Mining Pvt. Ltd.	2.50					
23	Ramagundam, -do-	1.00					
24	IB Valley, -do-	1.50					
25	Wani, Bhatia International Ltd.	2.00					
26	Ghuggus, -do-	4.00					
27	Nagpur, Indo Unique Flame Ltd.	0.60					
28	Wani, -do-	2.40					
29	Punvat, -do-	2.40					
30	Jindal Steel & Power Ltd.	6.00					

31	BLA Industries Pvt. Ltd.	0.33					
32	Saristatali, CESC	1.5					
33	KDH, PSEB	3.5					
	Others	78.74	27.00	30.00	33.00	36.00	39.00
	TOTAL Non coking (Existing)	95.96	38.176	40.331	43.339	46.445	49.46
Non coking coal (Proposed washery):							
1	Ashoka, CCL	10.00	–	1.33	8.00	8.00	8.00
2	Konar, CCL	3.50	–	1.2	1.6	2.00	2.80
3	Karo, CCL	2.50	–	1.2	1.6	1.76	2.00
4	Sonepurbazari, ECL	8.00	–	–	–	2.50	6.00
5	Chitra, ECL	2.50	–	–	–	–	1.50
6	Kusmunda, SECL	10.00	–	–	3.00	8.00	8.00
7.	Baroud, SECL	5.00	–	–	–	2.00	3.70
8.	Basundhara, MCL	10.00	–	–	–	4.00	7.5
9.	Jagannath, MCL	10.00	–	–	–	4.00	7.5
10.	IB Valley, MCL	10.00	–	–	–	5.00	7.5
11	Hingula, MCL	10.00	–	–	–	5.00	7.5
12	Kolarpimpri, WCL	5.00	–	–	–	–	3.0
	CIL (Non coking) Total	79.00	–	3.73	14.20	42.26	65.00
	Total Non coking (Existing & proposed)	174.96	38.176	44.06	57.539	88.70	114.46

Note: The washed coal production projection from proposed washeries is subject to MoEF clearance for construction of the washeries as per schedule.

Annexure –8.1

Programme and Progress of Exploration Work during XI Plan

Exploration Stage	Agency		Area Coverage (Sq km)		Projected Drilling in 11 th Plan (Lakh m)		Resources Established in 11 th Plan (Bt)	
			Program med	Achieved	Program med	Achieved	Progra mmed	Achieved Regional/ Promotional
Preliminary	GSI		No resource established as per nature of work					
Regional	GSI	Coal	758.00	998	1.94	1.14	9.90	7.07
	GSI	Lignite						
	DMGR			453.58		0.064		0.032
	CGMG			159.60		0.98		1.816
Promotional	GSI	Coal	1717	296.5	4	0.68	20	8.17
	MEC			1175.5		2.12		10.10
	CMPDI			114		0.15		1.78
	Total Coal		1717	1586	4	2.95	20	20.05
	GSI	Lignite	2606	980.00	3.50	0.27	4.06	0.92
	MEC			4170		2.47		2.28
	Total Lignite		2606	5150	3.50	2.74	4.06	3.20
Total Regional + Promotional		Coal	2475.00	2584.00	5.94	4.09	29.90	27.12
		Lignite		6148	3.5	3.78	4.06	5.04
Detailed (Coal)	CMPDI	CIL Areas	409.00	717.00	5.00	10.04	11.78	8.52
	CMPDI/MEC					1.24		
	CMPDI/Pvt							
	State Govts.	Coal		83.69		1.44		0.55
	SCCL	SCCL Areas	166.30	116.00	5.00	2.34	1.77	0.50
	Allottees	Blocks dereserved	416.00		11.48		13.00	
	CMPDI	Non-CIL	405.00	549.00	13.50	3.67	10.75	5.22
	CMPDI/MEC			73.00		1.49		
	CMPDI/Pvt			82.00		2.99		
	CMPDI/St Govt.	Identified for State Govt.	404.00		21.28			
	NTPC, State Govts & Pvt Pty	Own areas						
Total Detailed Coal			1800.3	1620.69	56.26	23.21	37.30	14.79
Detailed (Lignite)	NLC	Own areas	195.00	189.28	0.611	0.54		1.985
	RSMML	Own areas	137.18	137.18	0.277	0.28		0.37
	GMDC	Own areas	465.84	465.84	0.475	0.48		0.099
	GHCL	Own areas	1.71	1.71	0.018	0.02		0.004
Total Detailed Lignite			799.73	794.01	1.381	1.31		2.46
Development	CIL Areas				1.22	1.16		

Exploration Stage	Agency		Area Coverage (Sq km)		Projected Drilling in 11 th Plan (Lakh m)		Resources Established in 11 th Plan (Bt)	
			Program med	Achieved	Program med	Achieved	Progra mmed	Achieved Regional/ Promotional
al	SCCL Areas				1.00	1.24		
	NLC,GMDC,GH CL,RSMML,VS Areas		9.521	9.521	1.475	1.32		
CBM Studies (Promotional Scheme)	CMPDI				30 BHs	30 BHs		
	GSI				20 BHs	20 BHs		
2D HRSS (Promotional Scheme)	NGRI	Coal				31 Lkm		
		Lignite				94 Lkm		

Updated details of Coal Resources as on 1.4.2011

Sl.No	Coalfield	Resource (Million Tonnes)			Total
		Proved	Indicated	Inferred	
1	RANIGANJ (W.Bengal Part)	11638.27	7750.71	4443.91	23832.89
2	RANIGANJ (Jharkhand Part)	1538.19	466.56	31.55	2036.30
	Total Raniganj	13176.46	8217.27	4475.46	25869.19
3	BARJORA	114.27	0.00	0.00	114.27
4	BIRBHUM	0.00	5380.98	611.78	5992.76
5	DARJEELING	0.00	0.00	15.00	15.00
6	JHARIA	15077.57	4352.49	0.00	19430.06
7	EAST BOKARO	3351.87	3929.57	863.32	8144.76
8	WEST BOKARO	3629.03	1349.04	34.42	5012.49
9	RAMGARH	446.27	545.15	58.05	1049.47
10	NORTH KARANPURA	9499.42	5708.86	1864.96	17073.24
11	SOUTH KARANPURA	2748.09	2048.56	1480.22	6276.87
12	AURANGA	213.88	2279.82	503.41	2997.11
13	HUTAR	190.79	26.55	32.48	249.82
14	DALTONGANJ	83.86	60.10	0.00	143.96
15	DEOGARH	326.24	73.60	0.00	399.84
16	RAJMAHAL (Jharkhand Part)	2655.52	11751.26	1715.28	16122.06
17	RAJMAHAL (Bihar Part)	0.00	0.00	160.00	160.00
	Total Rajmahal	2655.52	11751.26	1875.28	16282.06
18	JOHILLA	185.08	104.09	32.83	322.00
19	UMARIA	177.70	3.59	0.00	181.29
20	PENCH-KANHAN	1405.24	789.61	316.78	2511.63
21	PATHAKHERA	290.80	88.13	68.00	446.93
22	GURGUNDA	0.00	47.39	0.00	47.39
23	MOHPANI	7.83	0.00	0.00	7.83
24	SOHAGPUR (M.P Part)	1725.91	4926.55	190.36	6842.82
25	SOHAGPUR (Chattisgarh Part)	94.30	10.08	0.00	104.38
	Total SOHAGPUR	1820.21	4936.63	190.36	6947.20
26	SINGRAULI (Part of M.P)	5078.75	6232.36	1454.73	12765.84
27	SINGRAULI (Part of U.P)	866.05	195.75	0.00	1061.80
	Total SINGRAULI	5944.80	6428.11	1454.73	13827.64
28	SONHAT	199.49	2463.86	1.89	2665.24
29	JHILIMILI	228.20	38.90	0.00	267.10
30	CHIRIMIRI	320.33	10.83	31.00	362.16
31	.BISRAMPUR	849.15	765.55	0.00	1614.70
32	EAST OF BISRAMPUR	0.00	164.82	0.00	164.82
33	LAKHANPUR	455.88	3.35	0.00	459.23

		Resource (Million Tonnes)			
34	PANCHBAHINI	0.00	11.00	0.00	11.00
35	HASDO-ARAND	1369.84	3425.01	384.50	5179.35
36	SENDURGARH	152.89	126.32	0.00	279.21
37	KORBA	4980.58	5936.50	838.58	11755.66
38	MAND-RAIGARH	4177.90	17041.44	2552.72	23772.06
39	TATAPANI-RAMKOLA	50.43	2392.72	202.19	2645.34
40	WARDHA VALLEY	3426.98	1405.46	1424.07	6256.51
41	KAMPTEE	1276.14	1204.88	505.44	2986.46
42	UMRER-MAKARDHOKRA	308.41	0.00	0.00	308.41
43	NAND-BANDER	468.08	483.95	0.00	952.03
+	BOKHARA	10.00	0.00	20.00	30.00
45	IB-RIVER	8057.54	8611.31	5847.64	22516.49
46	TALCHER	16434.17	25375.65	4832.57	46642.39
47	GODAVARI VALLEY	9296.85	9728.37	3029.36	22054.58
48	SINGRIMARI	0.00	2.79	0.00	2.79
49	RANGIT VALLEY	0.00	58.25	42.98	101.23
50	MAKUM	432.09	20.70	0.00	452.79
51	DILLI-JEYPORE	32.00	22.02	0.00	54.02
52	MIKIR HILLS	0.69	0.00	3.02	3.71
53	NAMCHIK- NAMPHUK	31.23	40.11	12.89	84.23
54	MIAO BUM	0.00	0.00	6.00	6.00
55	WEST DARANGGIRI	65.40	0.00	59.60	125.00
56	EAST DARANGIRI	0.00	0.00	34.19	34.19
57	BALPHAKRAM-PENDENGURU	0.00	0.00	107.03	107.03
58	SIJU	0.00	0.00	125.00	125.00
59	LANGRIN	10.46	16.51	106.19	133.16
60	MAWLONG-SHELLA	2.17	0.00	3.83	6.00
61	KHASI HILLS (MINOR CF)	0.00	0.00	10.10	10.10
62	BAPUNG	11.01	0.00	22.65	33.66
63	JAYANTI HILLS (MINOR CF)	0.00	0.00	2.34	2.34
64	BORJAN	5.50	0.00	4.50	10.00
65	JHANZI-DISAI	2.00	0.00	0.08	2.08
66	TUEN SANG	1.26	0.00	2.00	3.26
67	TIRU VALLEY	0.00	0.00	6.60	6.60
68	DGM NAGALAND REPORT	0.00	0.00	293.47	293.47
	Grand Total	114001.60	137471.10	34389.51	285862.21

STATE-WISE LIGNITE RESOURCES (AS ON 01.04.2011)

(Figs. In Mt)				
State/Field & District	Proved	Indicated	Inferred	Total
Tamilnadu				
Nayveli Lignite field	3735.23	2833.24	1080.85	8249.32
Mannargudi Lignite field	–	19897.98	4304.36	24202.34
Ramanathpuram Lignite field	–	168.83	272.43	441.26
Sub Total	3735.23	22900.05	6257.64	32892.92
Pondicherry Neyveli Lignite field	–	405.61	11.00	416.61
Total for Tamilnadu/Pondichery	3735.23	23305.65	6268.64	33309.53
Rajasthan				
Bikaner	558.73	226.59	295.66	1080.98
Barmer	495.23	610.00	487.55	1592.78
Nagunda (East)	–	21.69	–	21.69
Barmer	–	1229.87	586.17	1816.04
Jaismer	–	–	13.80	13.80
Jalura	–	–	76.08	76.08
Nagaur & Pali	113.00	60.57	60.35	233.92
Sub-Total for Rajasthan	1166.96	2148.72	1519.61	4835.29
Gujarat				
Kachch	300.61	91.40	33.09	425.10
Bhavnagar	–	–	299.17	299.17
Bharuch	724.76	118.59	491.23	1334.58
Surat	218.28	108.71	336.21	663.20
Sub Total	1243.65	318.70	1159.70	2722.05
J&K	–	20.25	7.30	27.55
Sub Total	–	20.25	7.30	27.55
Kerala	–	–	9.65	9.65
Sub Total	–	–	9.65	9.65
West Bengal	–	0.93	0.86	1.79
Sub Total	–	0.93	0.86	1.79
Grand Total for all States	6145.84	25794.26	8965.76	40905.86
Depth-wise Lignite Resource on 1.4.2011				
(M.Tonnes)				
Depth Range (m)	Proved	Indicated	Inferred	Total
0–150	5258.43	2062.99	1602.40	8923.82
150–300	887.41	9459.60	2812.37	13159.38
>300	0.00	14271.67	4550.99	18822.66
Grand Total	0.00	0.00	0.00	0.00
	6145.84	25794.26	8965.76	40905.86

**Master Plan for dealing with fire, subsidence, rehabilitation
and diversion of surface infrastructure in Jharia and Raniganj coalfields**

MAJOR COMPONENTS OF MASTER PLAN

Sl. No.	Components of Master Plan	RCF (ECL) (April '08)	JCF (BCCL) (March '08)
A	Dealing with fire		
1	Total no. of existing fires	7	67 (Under 45 fire projects)
2	Estimated Cost (₹crore)	40.28	2311.50
B	Rehabilitation		
1	No. of sites to be Rehabilitated.	139	595
2	Area affected in sq km	8.62	25.69
3	No .of houses to be Vacated/ Rehabilitated		
i)	BCCL (Taking into account superannuation)		44155/ 25000*
ii)	Private (Authorized)		29444
iii)	Encroachers (Un-authorized)		23847
iv)	Others		868
	Total No.	33196	98314/ 79159
	Population covered	180263	395795
4	Land required for rehabilitation (Ha)	896.29	1504.99
5	Estimated Cost (₹crore)	2610.10	4780.60
C 1	Diversion of Railway line/ Road/OC pipeline	7 sites	Planning and survey with an outlay of ₹20 crore
2	Estimated Cost (₹crore)	11.35	20.00
D	Implementing Agency for fire projects & rehabilitation of BCCL/ ECL houses	ECL	BCCL
E	Implementing Agency for rehabilitation of Non-BCCL / ECL houses-Private & Encroachers	Asansol Durgapur Develop Authority (ADDA), Govt. of WB	Jharia Rehabilitation & Development Authority (JRDA) of Govt. of Jharkhand
F	Implementation Schedule, years	2 (Pre-implementation phase for BCCL only) + 10 (in two Phases each of 5 years)	
G	Estimated Capital Requirement for fire projects, rehabilitation & diversion of rail/road/ pipeline etc.	₹2661.73 crore	₹7112.11 crore

Annexure- 12.2

Year wise phasing of Capital expenditure

(₹ in crore)

Phase	Year	RCF (ECL) (April'08)				JCF (BCCL) (March'08)			
		Fire Projects	Rehab. Projects	Divers-ion of Rail/ roads	Total	Fire Projects	Rehab. Projects	Diver-sion of Rail/ roads	Total
Pre-Impl.	I					2.69	81.89	10.00	94.58
	II					2.24	81.90	10.00	94.14
						4.93	163.79	20.00	188.72
I	1st	8.056	293.21	2.269	303.54	191.52	448.66		640.18
	2nd	8.056	267.02	2.269	277.35	211.51	509.75		721.26
	3rd	8.056	293.74	2.269	304.06	267.76	509.75		777.51
	4th	8.056	288.02	2.269	298.35	216.36	515.05		731.41
	5th	8.056	282.85	2.269	293.17	214.04	515.05		729.09
Phase I		40.28	1424.84	11.35	1476.47	1101.19	2498.26		3599.45
II	6th	-	232.46	-	232.46	262.68	423.71		686.39
	7th	-	239.26	-	239.26	259.11	423.71		682.82
	8th	-	241.15	-	241.15	250.67	423.71		674.38
	9th	-	239.29	-	239.29	252.43	423.71		676.14
	10th	-	233.10	-	233.10	180.50	423.71		604.21
Phase II		-	1185.26	-	1185.26	1205.39	2118.55		3323.94
Total		40.28	2610.10	11.35	2661.73	2311.51	4780.60	20.00	7112.11
Grand Total		9773.84							

Pre-Implementation Activity Chart for rehabilitation projects of JCF (BCCL)										
Sl. No.	Activities	Duration (months)	1st Year				2nd Year			
			I	II	III	IV	I	II	III	IV
1	Socio-Economic survey and valuation of properties for Non BCCL houses	24								
			For Phase I Houses				For Phase II Houses			
2	Identification of land for phase I Township	3								
3	Acquisition of land for Phase I Township (859.66 Ha)	15								
4	Tendering for surveying of land, Township planning and award of work	12								
5	Surveying of land	6								
6	Township planning for the houses to be resettled in phase -I	3								
7	Tendering and award of work for house construction for Phase - I	3								
Total Capital (Rs. in Crores)		163.79	81.89				81.9			

Phase-wise Rehabilitation Schedule for JCF (BCCL)												
Sl. No.	Activities	Duration n	Year									
			3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
1	Construction of houses for Phase - I (BCCL- 12462, Non BCCL- 33333)	48										
2	Shifting of houses for Phase- I	36										
3	Demolition of existing houses of Phase-I	36										
4	Identification of land for Phase -II	12										
5	Acquisition of land for Phase- II	18										
6	Tendering for surveying of land, Township planning and award of work for Phase -II houses	6										
7	Surveying of land	6										
8	Township planning for the houses to be resettled in phase II	6										
9	Tendering and award of work for house construction for Phase -II houses	6										
10	Construction of houses for Phase - II (BCCL-12538, Non BCCL - 20826)	48										
11	Shifting of houses for Phase- II	36										
12	Demolition of existing houses of Phase-II	36										

Annexure-16.1

Statement for overall Welfare Expenditure

For the year 2007-08, 2008-09 and 2009-10

(Amount in Crore Rs.)

Name of the Company	2007-08 (Capital + Revenue)	2008-09 (Capital + Revenue)	2009-10 (Capital + Revenue)
ECL	306.01	335.37	351.00
BCCL	294.65	341.29	369.28
CCL	196.93	221.40	217.10
WCL	266.19	279.84	293.00
SECL	449.95	520.21	495.04
MCL	137.00	136.77	157.00
NCL	195.60	231.00	223.63
NEC	24.10	35.77	30.96
CMPDIL	15.82	20.03	33.18
TOTAL	1886.25	2121.68	4169.19 + 83.98* = 4253.17

* Capital

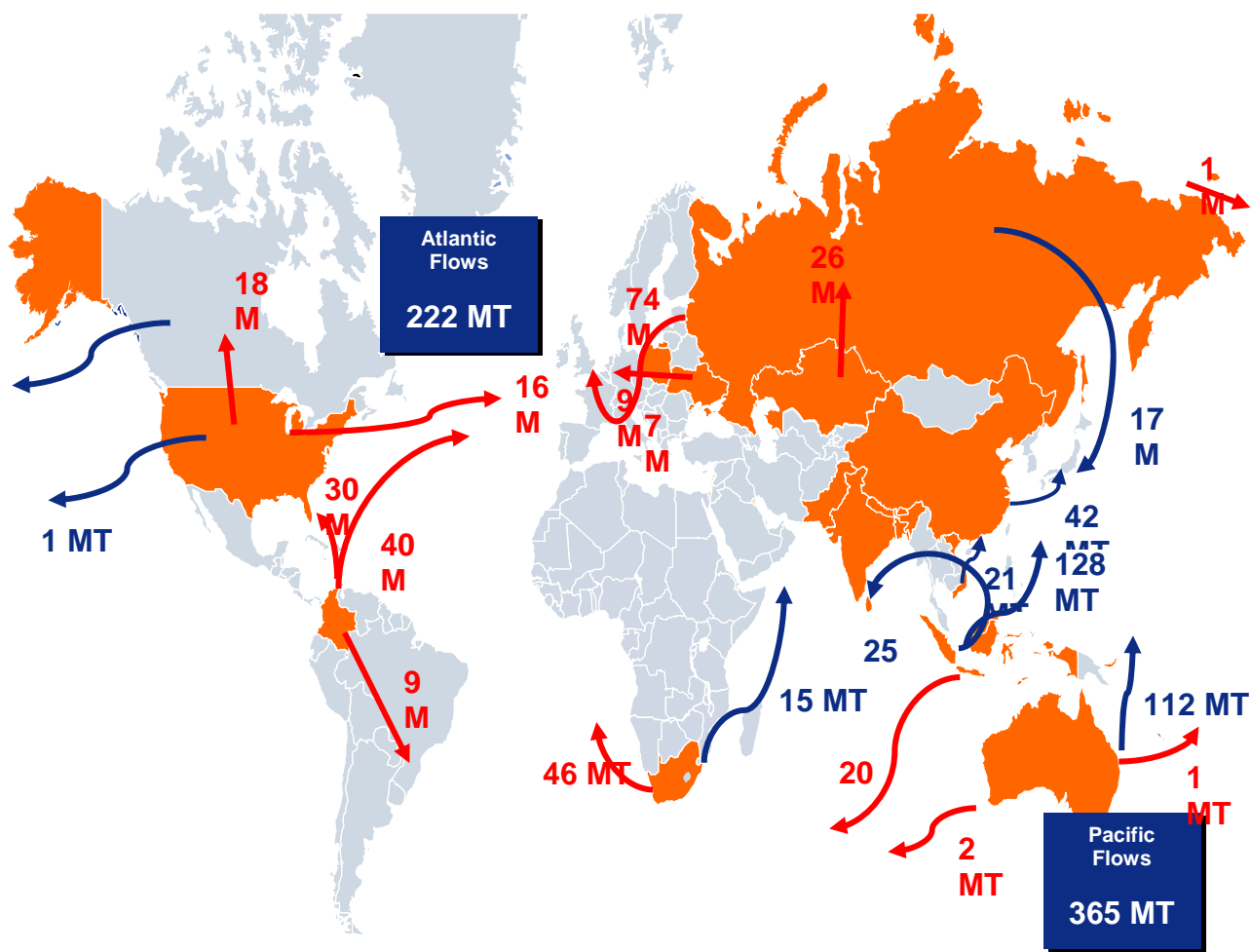
N. B. Social Overhead expenditure includes Welfare Salary/Wages, LTC/LLTC/RRF Electricity, Depreciation on welfare Assets etc.

Country-wise coal reserve and coal reserve–production ratio

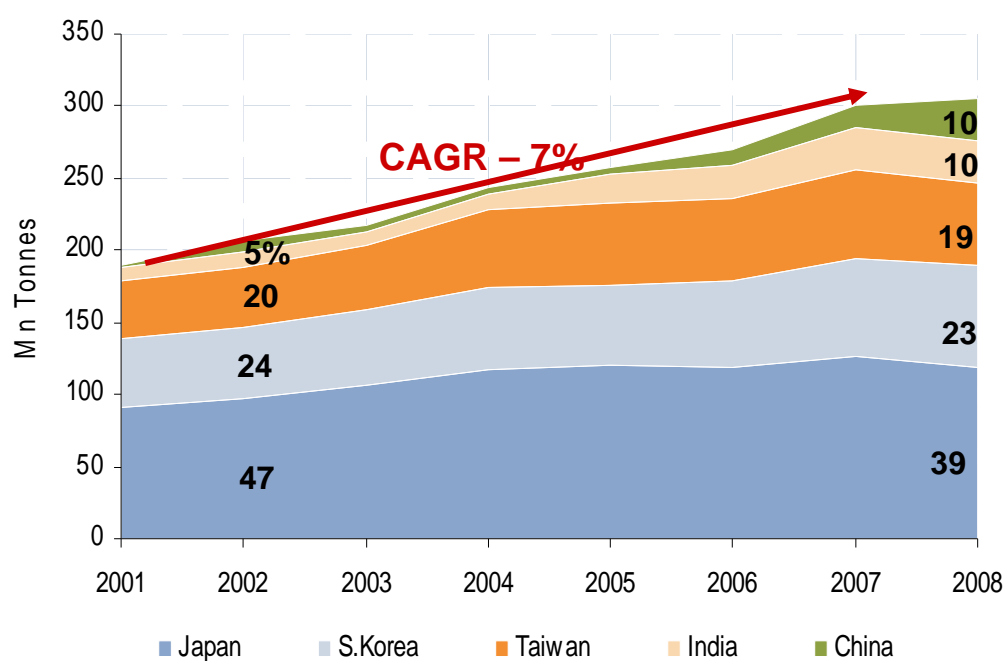
The list of countries which could be potential source for import of coal into India along with their reserve to production ratio (wherever applicable) is tabled below:

Sl.No.	Name of the Country	Reserve (Billion Tonnes)	Reserve to Production ratio (Yrs.)
1.	Australia	76	190
2.	USA	238	224
3	Columbia	6.8	92
4	South Africa	30	121
5	Russia	157	481
7	China	114	41
8	Indonesia	4.3	19
9.	Mozambique	6.7	Not applicable as production has just started

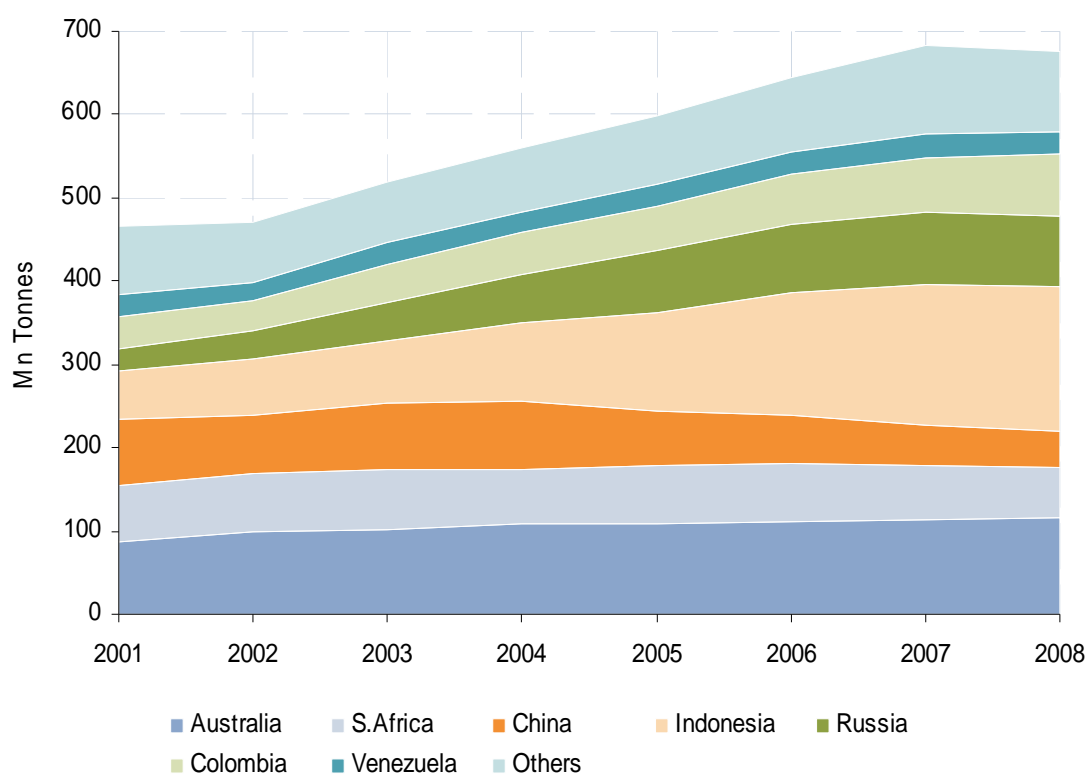
Global Trade-flow chart



Trend of Import of coal by Asian Countries



Trend of export of coal by major exporting countries



ANNEXURE 19.1

Company-wise fund allocation & actual expenditure in X and XI Plans

(In Rs. Crores)

Company	X Plan		XI Plan		
	Approved Outlay	Actual Expenditure	Approved Outlay	Revised in MTA	Anticipated
CIL	14310.00	7208.22	17390.07	16090.68	13400.00
SCCL	2113.00	1450.59	3340.00	3802.07	5070.00
NLC – Mines	6125.84	1251.90	2826.00	2334.39	1510.71
NLC – Power	8007.64	1063.32	12218.00	6140.61	6393.49
NLC Total	14133.48	2315.22	15044.00	8475.00	7904.20
Dept. Schemes	1034.52	922.95	1326.00	4255.80	1500.00
Total MOC	31591.00	11896.98	37100.07	32623.55	27874.20

ANNEXURE 19.2

Fund allocation & actual expenditure in X and XI Plans with subsidiary-wise break-up for CIL

(In Rs. Crores)

Company	X Plan		XI Plan		
	Approved Outlay	Actual Expenditure	Approved Outlay	Revised in MTA	Anticipated
ECL	1460.00	609.53	1849.68	1503.67	950.00
BCCL	1300.00	677.54	1250.00	1424.98	1320.00
CCL	1250.00	1290.66	1990.00	1832.68	1500.00
NCL	2750.00	1399.53	4000.78	3071.23	2100.00
WCL	1435.00	955.13	1374.50	1623.97	1225.00
SECL	3520.00	1389.29	4600.11	3316.40	3370.00
MCL	2500.00	828.46	2125.00	2547.42	2300.00
NEC of CIL / Others*	95.00	58.08	200.00	770.33	335.00
Master Plans– Jharia & Ranigunj**	–	–	–	–	300.00
CIL	14310.00	7208.22	17390.07	16090.68	13400.00
SCCL	2113.00	1450.59	3340.00	3802.07	5070.00
NLC – Mines	6125.84	1251.90	2826.00	2334.39	1510.71
NLC – Power	8007.64	1063.32	12218.00	6140.61	6393.49
NLC Total	14133.48	2315.22	15044.00	8475.00	7904.20
Dept. Schemes	1034.52	922.95	1326.00	4255.80	1500.00
Total MOC	31591.00	11896.98	37100.07	32623.55	27874.20

*CIL (HQ), DCC, IICM, CMPDIL, Exploration through out-sourcing and R&D

** At the time of formulation of XI Plan & MTA Budget of Master Plan was not considered.

ANNEXURE 19.3

Capital Outlay for XII Plan for CIL

(In Rs. Crores)

Company	Total XII Plan outlay
ECL	2050.00
BCCL	2200.00
CCL	2500.00
NCL	4500.00
WCL	2200.00
SECL	4900.00
MCL	4700.00
NEC of CIL/ Others*	600.00
Master Plan (Jharia/Ranigunj)	1750.00
Overall CIL	25,400.00 + 35,000 **
** Note – Additional ad hoc provision of Rs.25, 000 Cr. has been made for acquisition of coal assets abroad and Rs 10,000 Crs for development of coal blocks in Mozambique.	

*CIL (HQ), DCC, IICM, CMPDIL, Exploration through out-sourcing and R&D