

REPORT OF THE WORKING GROUP

ON

COAL & LIGNITE

For

FORMULATION OF ELEVENTH FIVE YEAR PLAN

(2007-12)



Government of India
Ministry of Coal
Shastri Bhavan
New Delhi

(November 2006)

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PREFACE

The Planning Commission has constituted a Working Group on Coal & Lignite for formulation of XI Five year Plan under the chairmanship of Secretary, Ministry of Coal. The composition of Working Group and its terms of reference is given in appendix-I. Based on that the Ministry of Coal has also constituted Five Sub-Groups to cover various aspects of the Coal Sector. The Sub-Group are:

- | | |
|----------------------|---|
| Sub-Group-I | On Integrated Energy Policy Report, Coal vision 2025, Report of the expert committee on the roadmap for coal sector reforms and review of various policy issues including the role of Foreign Direct Investment (FDI) in Coal and Lignite Sector. |
| Sub-Group-II | On Coal Demand, Supply, Movement, Quality, International trade and infrastructure development. |
| Sub-Group-III | On Coal & Lignite exploration & Coal Bed Methane. |
| Sub-Group-IV | On Information Technology, R&D, Safety, Welfare and Environment Management. |
| Sub-Group-V | On Coal Production, Mining Technologies, Productivity, Project Implementation & Resources. |

The composition and terms of reference of various Sub-Groups is enclosed in appendix – II. In order to check uniformity of the data and information in the Reports of all Sub-Groups an Editorial Committee was constituted by the Ministry of Coal as per appendix-III.

The First meeting of the Working Group was held on 20-6-2006 wherein it was decided to formulate the above Five Sub-Group. In addition, it was also emphasized consideration of the three main reports i.e. the Integrated Energy Policy Report, Report of the Expert Committee on the roadmap for coal sector reforms; and the Coal Vision 2025 document, to the extent that they are applicable to the terms of reference assigned to their respective Sub-Group and; the issues raised in the presentation made to the Steering Committee for energy sector. The final meeting of the Working Group was held on November 4, 2006 .

This report is based on the reports of the Sub-Group submitted during September, 2006 and decision taken in the final meeting of the Working Group.

Terms of Reference of Working Group on Coal & Lignite for formulation of Eleventh Five Year Plan as issued by Planning Commission vide their order No. M-12026/2/2006-Coal dated 4th May, 2006

- I. To review the Integrated Energy Policy Report and to suggest measures to make the recommendations operational during Eleventh Plan period.
- II. To review the report of the Expert Committee on roadmap for Coal Sector Reforms and to suggest measures to make the recommendations operational during Eleventh Plan Period.
- III. To review the likely achievements during the Tenth Five year Plan in meeting targets set for production, productivity and dispatch and analysis of reasons for shortfall, if any may be highlighted.
- IV. To review the Coal Vision 2025 document and opine upon the efficacy of achieving the production targets set therein for the end of XIth Plan (inclusive of emergency action plan).
- V. To review the status of various policy initiatives taken in coal & lignite sector and to make recommendations for further course of action as well as continuation of unfulfilled tasks of previous plan period.
- VI. To recommend Industry structure that would enhance number of players, promote competition, provide a consistent and transparent pricing regime and raise production, distribution, transportation and end use efficiency. In this connection, to analyze the need for de-blocking of Coal Blocks held by Coal India Ltd that would not be put into.
- VII. To estimate year-wise coal & lignite demand during 2007-12 (XI Plan) and 2012-17, based on requirement of the end users (of both coking and non-coking coal); their pattern of growth; technological improvements of the end user vis-à-vis the specific consumption, import requirements of both coking and non-coking coal; possible inter-fuel substitution etc.
- VIII. To suggest measures for accelerating exploration activities and UNFC classification of resources; to assess the capabilities of the existing exploration agencies for meeting the exploration programme and possibility of private sector participation to augment / supplement these capabilities.
- IX. To assess the potentiality of methane content of each coalfields and identify coalfields / horizons for exploiting unapproachable resources.
- X. To bring out coal and lignite production programme with related financial and economic implications vis-à-vis the projected demand and to suggest measure for dealing with the demand supply mismatch, if any.
- XI. To analyse efficacy of reviving loss making coal companies and to make specific recommendations on this account.

- XII. To establish benchmarks for different mining operations (opencast as well as underground) comparable with international standards and to suggest measures for achieving the same.
- XIII. To recommend measures for alternative technologies for extraction of resources in geologically disturbed areas and deep seated coal resources, and underground coal gasification, coal bed methane extraction, alternative system of coal transportation.
- XIV. To suggest measures for improved formulation and implementation of projects.
- XV. To suggest measures for improving the availability of coking coal from indigenous sources; improving performance of coking coal washeries; and assessing the requirement of imported coking coal on long term basis.
- XVI. To suggest measures to promote the use of washed coal in power generation; estimating the capacity requirement of non-coking coal washery and associate infrastructure.
- XVII. To suggest measures for improving the existing infrastructure for coal movement from pithead and ports to load centers.
- XVIII. To assess the requirement and to suggest measures for developing other infrastructure and resources like power, communication, land water etc.
- XIX. To assess safety and welfare requirements for workers and to suggest desired policy measures for implementation, suggest measures for developing skills of human resources; and draw roadmap for future sustainability of coal industry with world class training and education.
- XX. To assess the current status of science & technology of research and development activities in coal and lignite sector and to recommend priorities for future projects keeping in view the emerging energy scenario and externalities associated therein. Specifically the Working Group may outline the roadmap for in-situ coal/lignite gasification and carbon capture & sequestration technology.
- XXI. To make assessment of the year-wise investment including foreign, component for achieving the Eleventh Plan objectives and targets, foreign assistance/loans/bilateral collaborations etc.
- XXII. To review and assess the environmental management aspects for sustainable coal production in Eleventh Plan and beyond.

Additional Terms of reference :

- XXIII. Role of Foreign Direct Investment (FDI) in development of Coal and Lignite Sector to make it competitive out World Class Standards.
- XXIV. To review the status of information technology in Coal and Lignite Sector and to identify the areas viz. reserve modeling, Planning, Project formulation, Production, dispatch, other managerial areas like financial material, personal, safety, welfare etc. And communication coal data transmission with a view to improve overall managerial efficiencies.

Appendix-II

SUB GROUPS CONSTITUTED UNDER THE WORKING GROUP BY THE MINISTRY OF COAL VIDE ITS ORDER F.No.17014/14/2006-Plng. DATED 23RD MAY, 2006

1- SUB-GROUP ON INTEGRATED ENERGY POLICY REPORT, COAL VISION 2025, REPORT OF THE EXPERT COMMITTEE ON THE ROAD MAP FOR COAL SECTOR REFORMS AND REVIEW OF VARIOUS POLICY ISSUES INCLUDING THE ROLE OF FOREIGN DIRECT INVESTMENT (FDI) IN COAL AND LIGNITE SECTOR.

Composition:

Shri K.S.Kropha, Joint Secretary, Ministry of Coal -

Shri Krishan Kumar, C.G.M.(S & M) Coal India Limited -

Chairman

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(DIPP)
5. Representative of Ministry of Commerce
6. Representative of Industrial Development
7. Joint Advisor(Coal), Planning Commission
8. Director(PPD), Planning Commission
9. Representative of Industries & Minerals Division, Planning Commission
10. Representative of Singareni Collieries Co. Ltd, P.O.Kothagudem Collieries, Distt. Khammam, AP
11. Representative of Federation of Indian Chamber of Commerce and Industry(FICCI)

Terms of Reference:

- i) To review the Integrated Energy Policy Report and to suggest measures to make the recommendations operational during Eleventh Plan Period.
- ii) To review the report of the Expert Committee on the Road Map for Coal Sector Reforms and to suggest measures to make the recommendations operation during Eleventh Plan period.
- iii) To review the Coal Vision 2025 document and opine upon the efficacy of achieving the production targets set therein for the end of XIth Plan (inclusive of emergency action plan)
- iv) To review the status of various policy initiatives taken in coal and lignite sector and to make recommendations for further course of action as well as continuation of unfulfilled tasks of previous plan period.
- v) To recommend Industry structure that would enhance number of players, promote competition, provide a consistent and transparent pricing regime and raise production, distribution, transportation and end-use efficiency. In this connection, to analyse then need for de-blocking Coal Blocks held by Coal India Ltd. that would not be put into production even by 2016-17.

- vi) Role of Foreign Direct Investment (FDI) in the development of coal and lignite sector to make it competitive at world class standards.

2- SUB-GROUP ON COAL DEMAND, SUPPLY, MOVEMENT, QUALITY, INTERNATIONAL TRADE AND INFRASTRUCTURE DEVELOPMENT:

Composition:

Shri Rajiv Sharma, Joint Secretary, Ministry of Coal	-	Chairman
Shri I.K.Singh, C.G.M.(S&M), Coal India Limited	-	Member

Secretary

Members:

1. Representative of Ministry of Power
1. Representative of Central Electricity Authority(CEA)
2. Representative of Steel
3. Representative of Industrial Development
4. Representative of Department of Fertilizers
5. Representative of Railway Board
6. Representative of Surface Transport
7. Representative of Ministry of Commerce
8. Joint Advisor(Coal), Planning Commission
9. Director(PPD), Planning Commission
10. Representative of Transport Division, Planning Commission
11. Representative of Industries & Minerals Division, Planning Commission
12. Representative of Singareni Collieries Co. Ltd, P.O.Kothagudem Collieries, Distt. Khammam, AP
13. Representative of Central Mine Planning & Design Institute Ltd. (CMPDIL)
14. Representative of Federation of Indian Chamber of Commerce and Industry(FICCI)
15. Representative of Neyveli Lignite Corporation (for lignite)
16. Representative of Small Scale Industries Association (SSIA)

Terms of Reference:

- i) To review the likely achievements during the Tenth Plan in meeting targets set for production, productivity and dispatch and analysis of reasons of shortfall, if any may be highlighted.
- ii) To estimate year-wise coal and lignite demand during 2007-12 (XIth Plan) and 2012-17, 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-à-vis the specific consumption, import requirements of both coking and non-coking coal and possible fuel substitutions etc.
- iii) To bring out coal and lignite production programme with related financial and economic implications vis-à-vis the projected demand and to suggest measure for dealing with demand-supply mismatch, if any.
- iv) To suggest measures for improving the availability of coking coal from indigenous sources; improving performance of coking coal washeries and assessing the requirements of imported coking coal on long term basis.

- v) To suggest measures to promote the use of washed coal in power generation, estimating the capacity requirement of non-coking coal washery and associated infrastructure.
- vi) To suggest measures for improving the existing infrastructure for coal movement from pithead and port to load centers.
- vii) To make assessment of the year-wise investment including foreign exchange component for achieving the Eleventh Plan objectives and targets, including foreign assistance/loans/ bilateral collaboration.

3 - SUB-GROUP ON COAL & LIGNITE EXPLORATION & COAL BED METHANE:

Composition:

Shri S.Chaudhari, CMD, Central Mine Planning & Design Institute Ltd. (CMPDIL) -

Chairman

Shri D.N.Prasad, Director (Technical), Ministry of Coal

- Member Secretary

Members:

1. Representative of Ministry of Mines
1. Representative of Geological Survey of India
2. Joint Advisor(Coal), Planning Commission
3. Representative of Ministry of Environment and Forests
4. Representative of Department of Programme Implementation
5. Representative of Department of Fertilizers
6. Representative of Ministry of Petroleum & NG/Director General of Hydrocarbons(DGHC)
7. Representative of Coal India Limited
8. Representative of Singareni Collieries Co. Ltd, P.O.Kothagudem Collieries
9. Representative of Neyveli Lignite Corporation (for lignite)
10. Representative of Mineral Exploration Corporation
11. Representative of Confederation of Indian Industries (CII)

Terms of Reference:

- i) To suggest measures for accelerating exploration activities and UNFC classification of resources, to access the capabilities of the existing exploration agencies for meeting the exploration programme and the possibility of private sector participation to augment/supplement these capabilities.
- ii) To assess the potentiality of methane content of each coalfield and identify coalfields/horizons for exploiting unapproachable resources.
- iii) To recommend programme of exploration for lignite, evaluate technical aspects of these deposits for commercial exploitation.

4 - SUB-GROUP ON INFORMATION TECHNOLOGY, R&D, SAFETY, WELFARE AND ENVIRONMENTAL MANAGEMENT:

Composition:

Shri P.R.Mandal, Advisor(Projects), Ministry of Coal

- Chairman

Shri V.K.Rai, CGM, Central Mine Planning & Design Institute Ltd. (CMPDIL) - **Member Secretary**

Members:

Representative of Ministry of Information Technology
Representative of Ministry of Environment and Forests

Representative of Department of Science and Technology or Council of Scientific & Industrial Research (CSIR)
Representative of Central Mining Research Institute (CMRI), Dhanbad
Representative of Central Fuel Research Institute (CFRI), Dhanbad
Joint Adviser (Coal), Planning Commission
Joint Advisor(S&T), Planning Commission
Representative of Director General of Mines Safety (DGMS), Ministry of Labour & Employment
Representative of Coal India Limited
Representative of Singareni Collieries Co. Ltd, P.O.Kothagudem Collieries
Representative of Neyveli Lignite Corporation (for lignite)

Terms of Reference:

- i) To review the status of information technology in coal and lignite sectors and to identify the areas viz. Reserve modeling, Planning, Project formulation, production, dispatch, other managerial areas like financial material, personnel, safety, welfare, etc. and communication and data transmission with a view to improve overall managerial efficiencies.
- ii) To assess the requirement and to suggest measures for developing other infrastructure and resources like power, communication, land, water etc.
- iii) To assess safety and welfare requirements for workers and to suggest desired policy measures for implementation; suggest measures for improving skills of human resource and draw roadmap for future sustainability of coal industry with world class training and education.
- iv) To assess the current status of science & technology or research & development activities in the coal and lignite sector and to recommend priorities for future projects keeping in view the emerging energy scenario and externalities associated therein. Specifically the Working Group may outline the roadmap for in-situ coal/lignite gasification and carbon capture sequestration technology.
- v) To review and assess the environmental management aspects for sustainable coal production in the Eleventh Plan and beyond.

5 - SUB-GROUP ON COAL PRODUCTION, MINING TECHNOLOGIES, PRODUCTIVITY, PROJECT IMPLEMENTATION & RESOURCES:-**Composition**

Shri Sujit Gulati, Joint Secretary & Financial Advisor, Ministry of Coal - **Chairman**
Shri S.R.Ghosh, Director(Engg. Services), Central Mine Planning & Design Institute Ltd.-
Member Secretary

Members:

1. Shri P.R.Mandal, Advisor(Projects), Ministry of Coal

2. Joint Advisor(Coal), Planning Commission/Dy. Advisor(Coal), Planning Commission
3. Representative of Ministry of Mines
4. Representative of Coal India Limited
5. Representative of Singareni Collieries Co. Ltd, P.O.Kothagudem Collieries
6. Representative of Central Mine Planning & Design Institute Ltd. (CMPDIL)
7. Representative of IIT, Kharagpur
8. Representative of Indian School of Mines, Dhanbad
9. Representative of Central Mining Research Institute(CMRI), Dhanbad
10. Representative of Confederation of Indian Industries(CII)

Terms of Reference:

- i) To establish benchmarks for different mining operation (opencast as well as underground) comparable with international standards and to suggest measures for achieving the same.
- ii) To recommend measures for alternative technologies for extraction of resources in geologically disturbed areas and deep seated coal resources; and underground coal gasification; coal bed methane extraction; alternative system of coal transportation.
- iii) To analyse efficacy of reviving loss making coal companies and to make specific recommendations on this account.
- iv) To suggest measures for improved formulation and implementation of projects.

Appendix-III

Ministry of Coal Constituted Editorial Committee to assist the Working Group on Coal & Lignite for formulation of the Eleventh Five Year Plan (2007-2012) vide their letter No.17014/14/2006 dated 15th September, 2006.

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It was decided to constitute the Editorial Committee, which will go through the reports of the Sub-Groups and to check uniformity of the data and the information provided by Sub-Groups in their reports and see overlapping in the reports, if any, and references to the four main reports:-

- 1). Integrated Energy Policy Report
- 2) Report of the Expert Committee on the Road Map for Coal Sector Reforms
- 3) Coal Vision 2025 Document
- 4) Draft Approach Paper to the Eleventh Plan by the Planning Commission
- 5) Any other points which need to be highlighted for taking decision at a higher level.

The composition of the Committee will be as follows:-

1.	Shri Sujit Gulati	Chairman
	Joint Secretary & FA, Min. of Coal.	
2.	Shri M.S.Virdi, Director(CPFC), Min. of Coal	Member Secretary
3.	Shri D.N.Prasad, Director(Technical), Min. of Coal	Chief Editor
4.	Shri A.K.Jyotishi, Director(CPD), Min. of Coal	Member
5.	Shri K.C.Samria, Dy.Secretary(CA2 & Vig.)	Member
	Ministry of Coal	
6.	Sh.Krishan Kumar, CIL, New Delhi	Member
7.	Shri S.R.Ghosh, Director(Envint.)CMPDIL, Ranchi	Member
8.	Shri.I.K.Singh, CGM(S&M), CIL, Kolkotta	Member
9.	Shri V.K.Rai, CGM(Environment)CMPDIL, Ranchi	Member
10.	Shri Gautam Dhar, CME(Production), CIL, Kolkotta	Member
11.	Dr.A.Sinha, Dy.CME, CMPDIL, Ranchi	Member
12.	Shri S.K.Kakkar, Under Secretary, Min. of Coal	Member

EXECUTIVE SUMMARY

Coal Demand

- The Tenth Five Year Plan had envisaged a coal demand of 460.50 million tonnes (mt) in the terminal year 2006-07, which was revised upwards to 473.18 mt during the Mid-term Appraisal of the Plan (MTA) and moderated to 474.18 mt in the Annual Plan 2006-07. However, current trend shows that demand from power sector may not reach to the envisaged level and supply is not likely to exceed 460.00 mt implying a Compounded Annual Growth Rate (CAGR) of 5.50% against 5.55% envisaged at the time of formulation of the Plan and 3% actually achieved in the IX plan.
- The initially planned coal production of 405 mt in the terminal year of the Tenth Plan, 2006-07 has been revised upwards to 431.5 mt during Mid-Term Appraisal (MTA) of the Plan in tune with the rise in demand but the same was slightly reduced to 430.10 mt in the Annual Plan 2006-07. It is likely to achieve the targeted production implying a CAGR of 5.6% (CAGR) against 4.32% envisaged at the time of formulation of the Plan and 2.5% actually achieved in the IX Plan. While there have been delays in taking up new projects, augmentation of coal production has been possible due to increase in production from existing mines and acceleration in production build up of the ongoing projects.
- The demand-supply gap of 55.5 mt in the terminal year 2006-07 of the Tenth Five Year Plan envisaged initially has declined to 44.08 mt due to improved domestic supply of coal envisaged in 2006-07. This shortfall was planned to be met through coal imports. Coal imports reached a level of 36.87 mt in 2005-06 (coking coal 17.11 mt; thermal coal 19.76 mt). Though imports have helped power sector achieving its planned generation programme, it however, has resulted in regulating domestic off take, which in turn has resulted in stock build-up at pit heads during 2005-06.
- As against coal based thermal capacity addition programme of 18308 MW in the Tenth Plan, the likely addition is 14645 MW including 8450 MW to be added in 2006-07. Thus there has been slippage in the envisaged capacity addition programme by about 20%. Similarly, the coal based generation programme of 446 BU envisaged at the time of MTA is marginally revised downwards to 429 BU (4% decline).
- For the XI Plan, Ministry of Power/Central Electricity Authority (CEA) has indicated a coal based capacity addition plan of 42,625 MW (24,110 MW in Central Sector, 15,165 MW in State Sector and 3,350 MW in private sector) with a coal based generation programme of 733.3 BU in 2011-12. 16TH electric Power Survey projected energy requirement of 975 BU in 2011-12. This excludes generation from captive plants. After considering the likely capacity addition during XI Plan and going by the trend that around 70% of the projected energy requirement to be coal based, working group assessed that the most likely coal based generation in the terminal year 2011-12 of the XI Plan could be of the order of 690 BU. This indicates a CAGR of 10% in coal based generation programme which is in tune with the suggested growth in economy of 8%-9% in the XI Plan. Further considering the current trend of specific coal

consumption of 0.70 kg/kWh the coal requirement for power sector utilities works out to 483 mt in 2011-12.

- The estimated demand for steel is related to a hot metal production programme of 70.30 mt in 2011-12 and the corresponding coking coal requirement is 68.5 mt (after converting domestic washed coking coal availability in raw coal terms). However, Working Group on Iron and Steel in its draft document projected hot metal production of only 44.4 Mt through Oxygen Route with corresponding coal requirement of 46 Mt. In addition to this the steel sector has projected a requirement of 29.72 mt non-coking coal for captive power plants which is considered under the head Captive Power Plants (CPP).
- The envisaged cement production programme in 2011-12 is 251.23 mt and the assessed coal requirement is 31.90 mt excluding 7.4 mt of coal requirement for captive power plants which is considered under the head CPPs.
- The assessment of demand for captive power plants is based on the past trend in consumption in the absence of plant-wise details.
- The sponge iron industry is emerging as an important player. The coal demand assessed is 28.96 mt corresponding to a sponge iron production of 18.10 mt in 2011-12.
- After consultation with the major consuming sectors; two scenarios for coal demand have been worked out in the terminal year 2011-12 of the XI plan. Under **Scenario-I** the demand work out to 794.22 mt implying a CAGR of 11.5% and under **Scenario-II** the demand works out to 731.10 mt implying a CAGR of 9.7%. The difference is mainly in power utilities as projected by CEA and as assessed by the Working Group on the basis of most likely capacity addition during the Plan and the overall energy requirement as per the 16th EPS. The Working Group has adopted the coal demand projected under **Scenario-II** i.e. 731.10 mt during the terminal year of XI Plan, 2011-12. In absolute terms the demand is projected to increase from an anticipated off-take of 460.00 mt in 2006-07 to 731.10 mt in 2011-12, i.e. an incremental demand of 271.10 mt.
- Of the projected demand of 731.10 mt, the demand of power sector utilities is 483 mt which is about 66%. Including the demand for power captive at 57.06 mt, the share of power sector in the projected demand works out to about 74%. The demand of steel sector at 68.5 mt forms 9.4% of the projected demand. The share of cement sector is 4.4% and that of sponge iron sector is about 4%. The balance 8.2% is for bricks and others sectors.

Coal Production

- The coal production is envisaged to reach 680 mt in the terminal year 2011-12 of the XI Plan from the anticipated production of 432.50 mt in 2006-07 implying a CAGR of 9.47%. The incremental production in the XI Plan is envisaged to be 247.50 mt as against 104.71 mt likely to be in the X Plan.

- The incremental production envisaged in the XI Plan from CIL is 156.70 mt, SCCL 3.30 mt, and captive blocks 86.53 mt.
- The potential increase in production is envisaged from MCL (56.5 mt), SECL (22.5 mt), CCL (36.0 mt) and NCL (18 mt).
- CIL envisages taking up 114 projects with an ultimate capacity of 230 mt (to contribute 70 mt in 2011-12) and SCCL 38 projects with an ultimate capacity of 55.40 mt. (to contribute about 8 mt in 2011-12) during the XI Plan.

Washed Coal Production

- Washed coking coal supplies from CIL in 2006-07 is likely to be 5.45 mt against the envisaged production of 5.96 mt at the time of formulation of the Tenth Plan. This is planned to reach to 7.42 mt by the end of XI Plan and additional availability from other indigenous sources is expected to be 5.14 mt totaling to 12.56 mt.
- The use of washed thermal coal has been on rise during the Tenth Five Year Plan. The supply of washed thermal coal expected to increase from about 17 mt in the beginning of the Plan to about 55 mt in the end of the Plan. The installed capacity of the non-coking coal washeries is likely to reach 103 mty throughputs during the Plan. Most of this capacity (about 83 mt) is in the private sector. It is understood that washeries for a total capacity of 106.5 mt per annum are under proposal/construction stage. However, it is estimated that 243 mt per annum of thermal coal required to be washed by the end of the XI Plan.
- It is necessary to couple beneficiation of ROM coal with generation of power from the rejects and use of second stage rejects purely for reclamation of land. Considering the limited expertise of power generation in CIL, it may be appropriate to assign the combined task of coal beneficiation and power generation from the rejects to globally competitive agencies identified through the process of global tendering. This action will enable CIL to almost eliminate the quality complaints in has lived with so long.
- A decision to shift towards supply of washed thermal coal as against the present practice of ROM coal shall significantly reduce the strain on rail transportation obviating the urgency for huge investment in augmenting coal transport infrastructure to a significant extent.

Demand-Supply

- In overall terms, the gap between the projected demand of 731.10 mt and the projected domestic availability of 680 mt works out to 51.10 mt in 2011-12. This comprises of 40.85 mt of coking coal and 10.25 mt of thermal coal. This requirement would need to be met from imports. Further increasing production from captive blocks to bridge the gap also remains as a distinct possibility.

Coal Movement

- The coal movement matrix at the end of the Tenth Plan comprises 47% share of rail, 25% share of road, 23% of MGR and 5% of belt/rope. As against this the XI Plan envisages the share of rail to marginally increase to 49%, road to 27%, and a decline in MGR to 19% and belt/rope 5%.
- As against a Four Wheeler Wagon (FWW) requirement of 25300 per day by the end of the Tenth Plan, XI Plan envisages 36728 FWW per day in 2011-12 which is about 45% increase from the current level.
- It is proposed to augment rail movement of coal through independent freight corridors, matching wagon volume and matching unloading facilities at power stations etc. Power stations will have to equip themselves for handling multiple types of wagons.
- Certain critical rail links have been identified for improving the rail movement during the X Plan. However, constraints like land acquisition have delayed the same. These needs to be expedited. In addition to this, few more feeder lines have been suggested for improving rail movement in the XI Plan in potential coalfields.
- The port infrastructure needs to be strengthened in order to facilitate rise in imports as well as coastal shipment. About 110 Mt of coal is required to be handled at the end of XI Plan including coastal shipment implying a port capacity of about 120-130 Mt .by 2011-12.
- To ease out the load on rail infrastructure it is equally important to develop alternative modes of transportation of coal through inland waterways and coastal movement.

Lignite

- As against the estimated lignite demand of 57.79 mt (Tamil Nadu 35.86 mt; Gujarat 16.27 mt; Mt, than 5.65 mt) in the terminal year 2006-07 of the Tenth Plan the likely materialisation is about 32.40 mt. (Tamil Nadu 20.24 mt; Gujarat 11.09 mt; Rajasthan 1.07 mt).
- As against the envisaged lignite production of 55.96 mt (Tamil Nadu 33.68 mt; Gujarat 15.80 mt; Rajasthan 6.48 mt) in 2006-07 the likely materialisation is 31.57 mt (Tamil Nadu 20.40 mt; Gujarat 10.10 mt; Rajasthan 1.07 mt).
- XI Plan envisages a lignite demand of 55.59 mt (Tamil Nadu 23.59; Gujarat 23.73 mt, Rajasthan 8.27 mt) in 2011-12. The additional lignite based power generation capacity in the XI Plan is envisaged 2225 MW.
- The lignite production is projected to reach 54.96 mt (Tamil Nadu 24.23 mt; Gujarat 22.26 mt, Rajasthan 8.47 mt)).

Productivity

- Overall productivity in terms of output per man-shift (OMS) has increased from 2.45 tonnes in the beginning of the Plan to 3.22 tonnes (upto Aug.'06) in 2006-07 in CIL and from 1.88 tonnes to 2.38 tonnes in SCCL.
- In NLC the OMS has increased from 8.84 in the beginning of the Plan to 9.55 in 2006-07 (up to Aug 2006).
- The XI Plan envisages achieving a productivity level of 5.54 tonnes in CIL and 2.67 tonnes in SCCL in the terminal year of the Plan.
- The productivity norms of different heavy earth moving machinery (HEMM) have been benchmarked for both availability and utilization in different coal companies by a Committee of MoC. The productivity benchmarks for various underground mining machinery have been established by the Working group.

Coal & Lignite Exploration

- As on as on 1.1.2006, the national coal inventory stands at 253.3 Bt, out of which 96 Bt are in 'Proved' category. The inventory of lignite resources stands at 38.27Bt, as on 1.04.2006, with 4.5 Bt in 'Proved' category.
- Regional Exploration of Coal and Lignite in X Plan: 1.69 lakh metres (82%) drilling meterage against a target of 2.04 lakh metres is likely to be achieved and 11.77 Bt of coal and 1.36 Bt of lignite resources established by GSI with Ministry of Mines funding.
- Promotional Exploration for Coal and Lignite in X Plan: 6.88 lakh metres (99%) of drilling is projected to be achieved against a target of 6.90 lakh metres (revised from 6.00 lakh metres) establishing 19.78 Bt of coal and 17.53 Bt of lignite resources.
- Detailed Exploration for Coal and Lignite in X Plan: In CIL areas, 5.14 lakh metres (83%) of exploratory drilling under Detailed Exploration is expected to be achieved against a target of 6.18 lakh metres and 8.00 Bt of reserves are likely to be established under 'Proved' category. In SCCL area, 2.35 lakh metres of drilling (87%) will be achieved against a target of 2.70 lakh metres establishing 0.91 Bt of reserves under 'Proved' category. In Non-CIL areas, 2.83 lakh metres of drilling against a target of 2.13 lakh m (revised to 2.83 lakh m) is expected to be achieved, establishing 7.06 Bt of 'Proved' coal reserves. In addition 0.48Bt of resereves are envisaged to be 'Proved' by different agencies in their own blocks against exploratory drilling of 1.0 lakh m.
- The programme for Regional Exploration with 1.94 lakh metres of drilling in coal and 0.10 lakh metres of drilling for lignite by GSI has been drawn up for XI Plan to target 9.9 Bt of coal and 0.15 Bt of lignite resources.
- Under Promotional Exploration, 4.0 lakh metres of drilling in coal and 3.5 lakh metres in lignite has been envisaged to establish about 20 Bt of coal and 4.06 Bt of lignite resources.

- Detailed Exploration requirements of coal producing agencies during the XI Plan have been drawn up with 5.0 lakh metres of drilling each in CIL and SCCL areas. It is expected that 14.0 Bt of coal reserves will be established through Detailed Exploration. Similarly, a programme for Detailed Exploration for lignite involving 1.33 lakh meters of drilling has been drawn up for XI Plan.
- 10 lakh m of drilling has been assessed in 32 Non-CIL blocks to be undertaken during XI Plan targeting 10.75Bt of resources to be brought in 'Proved' category. Major part of the exploration activity will need to be outsourced.
- 41 unexplored blocks 'de-reserved' by MoC for allotment to private agencies, with around 11.5 lakh m estimated exploratory drilling and 13Bt of coal resources, are to be explored in detail by allocatees as per stipulations of MoC.
- 28 blocks identified by MoC for allocation to Govt. PSUs / State Govts, having 9.2 Bt of coal resources, will require almost 21.28 lakh m of exploratory drilling. Only around 3.36 lakh m of drilling in the blocks identified for Govt. PSUs / State Govts may be taken up by CMPDI and the rest of the drilling will have to be arranged by PSUs / State Govts from other sources.
- The Detailed Exploration in lignite in XI Plan envisages 1.33 lakh metres of drilling to meet the production requirement of the XI & XII plans. There is a need for scheme of detailed exploration in non-NLC areas. 1.0 lakh metres of drilling is proposed in 8 blocks which can be considered for immediate exploitation by agencies other than NLC.
- The enhancement of drilling activities during XI Plan will require substantial capacity build up for coal core analysis and enhancement of capacities of exploration agencies in Govt./PSUs to provide technical support for exploration to be taken up by agencies in private sector.
- The programme for XI Plan envisages CBM related test and allied studies in 15 boreholes which are spill over from the X Plan. Tests in 30 additional boreholes are envisaged for XI plan by CMPDI and 20 boreholes by GSI
- The total fund requirement of Preliminary/Regional, Promotional and Detailed Exploration in different coal, lignite and CBM prospects for XI Plan has been estimated at Rs. 3195.07 crores, out of which Rs.1200 crores will be required from MoC for Promotional, Detailed Non-CIL and other related exploration projects.
- More and more coal/lignite bearing areas remaining to be explored in future are likely to fall below forest land. There is a need to identify forest areas as 'Yes' and 'No' zones for exploration, if the nation is ready to sacrifice the coal/lignite resources lying below so called 'No' zones. The exploration in 'Yes' zones may be facilitated with faster clearances.

- CMPDI and SCCL 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.
- A policy decision needs to be taken whether Regional Exploration can be taken up in deep seated areas which are not likely to be techno-economically viable in next 10 years.
- T. L. Shankar Committee has recommended for a revolving fund of Rs 500crores for the purpose of undertaking detailed exploration in Non CIL Blocks. However considering the anticipated quantum of work, the requirement has to be much more. Moreover, the concept of revolving fund may not be practical as exploration can not be self sustaining activity. Hence, a policy decision for continuous funding for detailed exploration in Non CIL blocks is desirable.

Information Technology

- During the XI Plan, E-corporate governance for promoting transparency and productivity is proposed to be pursued.
- Introduction of enterprise resource planning (ERP) to integrate different areas of operation for improved economics and productivity.
- Introduction of IT for integrated safety, production and environmental monitoring in underground and opencast mines.

Research & Development

- Promotion of clean coal technologies including coal beneficiation, Insitu coal gasification, carbon capture and sequestration, coal bed methane/coal mine methane/abandoned mine methane, coal gasification, coal to oil etc.
- Research efforts for industry oriented projects need to be promoted. Areas like extraction of steep and thick coal seams, opencast bench slope stability, strata control etc. need special attention.
- Integrated Energy Policy has suggested for at least 0.4% of the annual turnover of energy producing companies would need to be spent on R&D activities. Coal Companies to strictly consider the recommendation.
- It is suggested that the research scholars/ academicians/ coal sector employees pursuing Ph.D. in the emmerging areas of mining and granted full financial assistance to help development of such practices in the coal and lignite sectors. This effort will supplement the reseach and development being undertaken by various agencies in coal and lignite sectors.

Environmental Management

- As coal has to continue as a major energy resource, the demand must be met through safe and clean technologies for environmental sustainability.
- Implementation of Jharia and Raniganj Action Plan for mitigating adverse impacts of fire and subsidence problems caused due to unscientific mining activities by erstwhile owners before nationalization needs to be expedited.
- Capacity building in environment related areas in coal companies including training of manpower, creating lab facilities and infrastructure need to be developed.
- Introduction of green credit system to encourage afforestation through social forestry for evolving land acquisition in Coal Companies.
- Concerted efforts for addressing the issues related to decommissioning of mines/mine closure after exhaustion of reserves are required to be made.
- Development of coalfield wise master plans for EMP to take stock of natural resource base of the area and assess the environmental and social impact due to all mining and developmental activities projected in the area.
- Eco-zoning should be carried out to facilitate identification and assessment of coal reserves occurring over the restricted areas and which cannot be mined.
- Strengthening of environmental management organization with qualified executives in environmental science and engineering.
- It is suggested that project report should be formulated considering the 15% increased capacity of the mine and EIA/EMP should be prepared accordingly. The above will take into account the marginal increase in production and fresh environmental clearance may not be required in such cases.
- Emphasis should be given on the reclamation of old workings. Builders may be encouraged to develop townships on such reclaimed lands.

Safety and Welfare

- Thrust on improving safety of mine workings through appropriate ventilation, mechanization, supervision and training etc.
- Strengthening internal safety organizations and rotation of manpower from safety department to production operations and vice-a-versa would provide incentives to persons working in safety department.
- Traceability of miners working in UG mines during accidents or otherwise needs immediate attention. For this purpose, it is suggested to provide an electronic safety device, which can be fitted in the cap lamp or helmet for online monitoring of movement & traceability of workmen in mines.

- In short term, Independent audit of safety matters of mines needs serious consideration. In medium to longterm, introduction of insurance of mines needs serious consideration for protecting property and improving safety standards of workings there by reducing accident proneness. Insurance companies may promote independent safety audits as per their requirements.
- Strengthening the manpower of statutory inspecting organizations like DGMS needs consideration.
- Online monitoring of underground environment to improve safety needs to be adopted.
- Review of rescue and emergency response systems and strengthening of rescue infrastructure needs special emphasis.
- In order to improve the Occupational Safety & Health (OSH) aspect of miners, developing proper mechanism for management of OSH may be considered. For this purpose, a national database in the field of OSH may be created. This will help in dissemination of information amongst various stakeholders for decision-making.
- Corporate social responsibility – need for evolving appropriate policy for fulfilling the aspirations of population living in and around coalfield areas and to promote environmentally sustainable mining practices.
- The schemes under Coal Conservation and Development Act 1974 have been drawn as plan schemes under two broad categorization namely stowing and protective works and road and rail infrastructure development in coalfields. However, the funding mechanism needs a review.
- Maximum possible investment should be made to ensure safety and welfare of the workers.

Mining Technologies & Project Formulation

- There is a need for adoption of latest technologies for improved productivity, safety and economics of operations.
- Benchmarking of various operations for improving productivity and optimal utilization of resources needs attention of industry. While the availability and utilization norms for HEMM have been benchmarked by a Committee of MoC, the benchmarking of productivity of various underground machinery has been suggested. Effort has been made to establish benchmarks in generalized mining conditions. It is suggested that initiative regarding conducting a comparative study on international benchmarking standards may be taken up during the XI Plan period.
- As coal and lignite reserves are capital assets of wasting nature, annual audit of reserves needs to be made a standard practice in the coal mines of the country taking into account recoverable reserves depleted during the year, reserves added through exploration/mine development during the year and reserve changes if any through recalculation in the light of additional geological data becoming available.
- There is a need to improve project formulation on the basis of thorough geo-mining investigations in order to avoid infructuous capital investments eventually. Involvement

of the equipment manufacturers in production planning process on risk/gain sharing basis has been suggested.

- Concerted efforts for rigorous monitoring are important for timely implementation of projects.
- Improved procedures for environmental and forestry clearance are a must for reducing delays in taking of new projects.
- Strengthening project planning wings of coal companies and training of manpower in various technologies are required to improve the quality of project formulation and monitoring.
- There is a need for reviewing purchase and contract procedures and to evolve new concepts (like the Bonus System or the Swiss Challenge System) for reducing time delays, ensuring cost competitiveness and improving implementation of operations.
- There is a need for developing alternative modes of coal transportation like inland waterways, coastal shipping and slurry pipelines to ease out load on railway network.
- While revival packages have been approved for the loss making ECL and BCCL, however, it is important to take certain of the measures like timely implementation of the envisaged new projects, strict monitoring, co-operation of local administration and trade unions in closing down the identified loss making mines etc. Both public and private companies need to be encouraged to enter into the Joint Ventures.
- Shortage of mining professionals in the coal industry poses a potential threat to the industry. Recruitment of mining engineers/ professionals for statutory posts in the coal/lignite mines need to be stressed upon. Their career prospects and good remuneration packages should be thought for their retention in the industry.

Policy initiatives

The following policy initiatives envisaged during the Tenth Five Year Plan have been initiated/ addressed but some of them would need to be pursued during the XI Plan as well:

- Pending the passage of the Coal Bill 2000, the number of players in coal mining through captive mining has been increased. So far 123 coal blocks with 27.25 Bt of coal reserves have been allotted to 68 public sector and 55 private sector companies and process of allotment of 20 coal blocks is under process. In addition to this 81 coal blocks have been identified with geological reserves of about 20 Bt. Further, 7 lignite blocks have so far been allocated to agencies other than NLC out of which 4 blocks have been allocated under commercial/government dispensation and 3 for power companies. Allocation of 8 lignite blocks is under process. (Details are available on MOC Web site, <http://coal.nic.in>).
- Offering of coal and lignite blocks to potential entrepreneurs through competitive bidding is under consideration.
- Restructuring of CIL - The issue has been examined by various committees at various times. The Expert Committee on the Road Map for Coal Sector Reforms is also addressing the issue and is likely to come with recommendations.

- The Department of Consumer Affairs in the Ministry of Civil Supplies proposes for review of the list of essential commodities under the Essential Commodities Act, 1955. The Ministry of Coal has suggested that coal could be deleted from the list of essential commodities as the Government, has no control over the price and distribution of coal with the notification of the Colliery Control Order 2000. Since deletion of any commodity from the list of essential commodities requires amendment of the Essential Commodities Act, 1955; the Department of Consumer Affairs is taking appropriate steps in the direction.
- Promoting e-marketing of coal – upto 20% of the domestic production is to be made available through e-marketing open to traders and actual users.
- Action to promote additional thermal coal imports under long term supply contracts has been initiated by Ministry of Power.
- Since CIL has necessary infrastructure, expertise and experience in supplying coal, they can leverage the same for meeting the demand of imported coal by entering into trade for import of coal either independently or in association with other entity.
- The resources for investment for mining operations as well as for new areas such as beneficiation of thermal coal, Coal Bed Methane, Underground Coal Gasification etc. needs to be mobilized, for which the pricing policy has to be made pragmatic. Inflationary pressure on costs needs to be neutralized from time to time through price adjustment in order to generate sufficient resources for investment after contributing significantly to the exchequer in the form of taxes and dividends, . The Fuel Supply Agreement with the power sector should provide for long term price adjustment formula.
- Modernisation of underground mines, cross-subsidising the underground mining from opencast mining on grounds environmental and social sustainability of mining operations etc. needs to be closely looked into.
- Changing grading and pricing of thermal coal from the existing Useful Heat Value system to the international practice of Gross Calorific Value system is under consideration of MOC. A pilot study on migration from UHV to GCV based gradation of coal has been carried out and completed by Central Fuel Research Institute. The draft report is being over-viewed by a Committee comprising of members from Ministry of Coal, CEA, NTPC, CIL and CFRI.
- Action for amending the provisions of Contract Labour (Regulation and Abolition) Act 1970 to facilitate offloading of certain activities in coal mining for improved economics of operations is being addressed by Group of Ministers.
- The Energy Coordination Committee has recommended that high quality coking and non-coking coals which are exportable may be sold at export parity price as determined by import price at the nearest port minus 15%.
- Market determined price should be based on e-auction upto 20% of production.
- The remaining coal to be sold under long term FSTAs. Regulated utilities to be allowed upto 100% of their certified requirement through FSTAs.

- Action initiated for replacing coal linkage with Fuel Supply Agreement - Consumers and suppliers are being encouraged to enter into long term FSAs and a number of consumers have already entered into the same with the coal companies.
- Promoting in-situ coal gasification and tapping of Coal Bed Methane - Coal blocks for commercial extraction of Coal Bed Methane have been allocated through competitive bidding and modalities for addressing development of in-situ coal gasification are being worked out. A R&D project in this regard is prepared by CMPDIL and the same is under consideration of CIL R&D Board.
- Rationalizing rail freight rate for coal transport – While the issue is flagged by various committees and the Planning Commission to do away with the cross subsidy of passenger fares with freight rates, Railways are to initiate action in the matter.
- Extending infrastructure status to the coal industry, lower duties on capital goods imported for coal mines- While the issue has been flagged, Ministry of Finance has to respond in a positive manner.
- Considering the increase in demand for coal and lignite and since exploration and mining activities are subject to sector approvals/regulations, the Government has reviewed the policy on FDI and increased the cap to 100% and permitted it under the automatic route.
- Coal and Lignite resources are depleting assets of capital nature and coal companies need to increase significant resources to explore new deposits. In order to incentivise the system it is important to introduce depletion allowance to reduce the tax burden of coal companies in line with International practices.
- The loss making coal companies are exploring the possibilities of setting up joint venture units to mobilize resources for fresh investments to augment their coal production.
- Instituting an independent regulatory mechanism for the coal sector - Different committees have recommended the need for a regulator for the coal sector to bring in transparency in coal price fixation, to promote competition, to issue guidelines, to evolve benchmarks etc. The issue is under consideration of the Government.
- Reviewing the royalty on coal and lignite and consider switching to an advalorem basis - The issue of coal and lignite royalty is under review by a committee of Ministry of Coal and the rates of royalty are likely to be based mostly on advalorem basis.
- From energy security point of view action has also been initiated for acquiring coal equity abroad and the proposal of CIL to form a subsidiary company namely Coal Videsh Ltd. is under consideration of Government.
- National Rehabilitation Policy is under revision at Government level.

- The R&R policy is under discussion for quite sometime. In the meeting of the Standing Committee a view had emerged that R&R policy for coal mining or for that matter mining in general needs to be different from the R&R policy for land acquisition in other sectors. A final view needs to be taken on the matter. The absence of an acceptable R&R policy is proving to be a major impediment in acquisition of land in most of the coal companies. It is imperative that a consensus view in the matter emerges at the earliest.
- It was also suggested that land should be taken on annual lease and some incentives may be given to the farmers with the promise to hand over the land back to them as is being done by NCL and NTPC.
- The Ministry of Coal had entrusted the Tariff Commission with a study on Mechanism for Coal Pricing. The Tariff Commission had submitted its report with certain recommendation for pricing of coal. In the Energy Coordination Committee meeting, headed by Prime Minister, it was decided that Planning Commission will prepare a transition path in order to operationalise the pricing mechanism for coal sector.
- The Planning Commission has not supported the recommendations of the Tariff Commission and suggested to operationalise recommendations of the Energy Coordination Committee.
- The Integrated Energy Policy Committee of the Planning Commission has stated that coal shall remain India's most important energy source till 2031-32 and possibly beyond.
- For sustaining 8% to 10% economic growth rate India's commercial energy supply would need to grow from 5.2% to 6.1% per annum while its total primary energy supply would need to grow at 4.3% to 5.1% annually.
- By 2031-32 power generation capacity must increase to nearly 8, 00,000 MW from the current capacity of around 1, 60,000 MW inclusive of all captive power plants. Similarly requirement of coal, the dominant fuel in India's energy needs will need to expand to over 2 billion tones per annum based on domestic quality of coal.

Investment requirements

- The proposed Public Sector investment for the XI Plan for supporting their production plans is Rs. 34.259 Crore (CIL Rs.15, 875 crore; SCCL Rs.3340 crore; NLC Rs. 15,044 crore (including Rs. 176.00 Crs. for the ongoing projects – NLC Mines Rs.2993 crore; NLC Power Rs. 12,051 crore). The outlay proposed for coal PSUs for the XI Plan is about 115% more than the X Plan outlay (MTA) of Rs.15835.15 crore.
- Against the estimated IEBR position of Rs. 69926.77 crore (CIL Rs.51542.55 crore; SCCL Rs.3340.30 crore; NLC Rs.15043.92 crores), the proposed plan outlay of PSUs is Rs.34259 crore. While the resource position of SCCL and NLC is just sufficient to meet the plan outlay there is a huge surplus in the resource position of Coal India Ltd. and CIL has to consider productive investment of the surplus resources through feasible diversification plans.

- The proposed outlay for departmental schemes to be supported through domestic budgetary support is Rs. 7702 crore (Promotional Exploration Rs.383.50 crore; Detailed Drilling in non-CIL blocs Rs.780 crore; Detailed Drilling in non-NLC blocks Rs.33 crore; Coal Core Analysis Capacity Creation Rs.3.5 crore; (total exploration outlay Rs.1200 crore); R&D Rs.214.40 crore; EMSC/Jharia Action Plan Rs.4622 crore; and schemes under CCDA Rs 1665.60 crore - comprising of Rs. 692.95 crore for stowing and protective works and Rs. 972.65 crore for road and rail infrastructure).
- Thus the total plan outlay proposed for MOC for the XI Five Year Plan is Rs. 41961 crore which is 125% more than the X Plan outlay (MTA) of Rs. 18652.20 crore.

Chapter - 1

COAL DEMAND

- 1.1 The compounded annual growth rate (CAGR) in supply of coal in IX Plan was 2.98% and this has gone up to 5.38 % in the first four years of X Plan. Considering the supply for 2006-07 to be at the level of envisaged demand (474.18 Mt), the CAGR for X Plan works out to 6.17%. However, current trend shows that demand from power sector may not reach to the envisaged level and supply is not likely to exceed 460.00 Mt implying a Compounded Annual Growth Rate (CAGR) of 5.50%.

Summarised demand-supply performance is as below:

Sector	Million Tonnes					
	T.Year VIII Plan		T.Year IX Plan		X Plan	T.Year X Plan
	1996-97		2001-02		2005-06	2006-07
	Demand	Supply (Actual)	Demand	Supply (Actual)	Supply (Actual)	Demand
Indigenous Scenerio						
• POWER(U)	194.00	199.00	239.96	245.68	289.45	307.35
• STEEL	41.00	24.38	34.12	18.73	16.69	20.27
• CEMENT	17.50	8.78	17.00	11.85	15.22	15.27
• OTHERS	58.50	58.21	63.21	55.10	75.30	89.50
TOTAL	311.00	290.37	354.29	331.36	396.66	432.39
GAP (Against Ind. Supply)		20.63		23.35		41.79
Import		13.18		20.55	36.87	41.79
Total Supply		303.55		351.91	433.53	474.18
Net Gap		7.45		2.38		Nil
CAGR in respective Plan period				3.00%	5.38%	6.16%
CAGR for Power Sector-domestic supply				4.30 %	4.18 %	4.58 %
CAGR for Power Sector-(Incl. Import) Total supply				4.60 %	4.73 %	5.25 %

- 1.2 The shortfall in materialisation in coal demand in last fiscal in power sector has been mainly due to better availability of hydroelectric power resulting in less demand of thermal power in southern India and large-scale import in the later part of the year. This has led to a situation of unprecedented accumulation of stock at power plants to the extent of 18 million tonnes at the beginning of 2006-07. Power stations resorted to self-regulation in supplies from the later part of 2005-06 leading to lesser materialization as against allocated quantity. Slippage in addition of new coal based thermal power capacity also truncated the envisaged demand. Against an envisaged coal-based Capacity Addition **18308MW** (CAGR of 5.82 %) during X Plan, CEA is expecting to achieve **14645 MW** in X Plan (CAGR of 4.65%). However, considering

actual capacity addition of only **6195 MW** (CAGR 2.3 % only) till end of August'06, the expectation of adding **8450 MW in seven months** appears to be highly ambitious.

1.3 Methodology:

End-users' requirement projection has been used as the benchmark to assess sector-wise coal demand for XI Plan. Power sector is the single largest consuming sector in the country, accounting for about 70 % of total coal consumption of the country. Its requirement largely impacts the overall coal demand and supply position. Other important sectors are cement, Steel and Captive Power Plants. Sponge Iron units, of late, have been emerging as another important sector. Wherever details in respect of end-users' assessments are not available, the trends of earlier years in consonance to other economic factors have been considered to arrive at demand projections. Projections given in reports of various Expert Committees, including Draft Coal Vision Document-2025 were also taken into consideration for assessing demands. Current trend of technological improvements, track records and buying behaviour of the consuming sectors have also been taken into perspective to arrive at different demand modules.

- 1.4. Different perspective demand scenarios arising out of reports of the Expert Committee on coal sector reform, Integrated Energy Policy and Draft Coal Vision Document for 2025 are detailed as under:

		Fig in Million Tonnes		
Source	Sectors	Terminal Year		
		X-Plan (2006-07)	XI-Plan (2011-12)	XII-Plan (2016-17)
X-Plan Document-Working Group/ Mid-term Appraisal		MTA	WG	WG
	Steel	42.70	40.00	40.00
	Power (U)	322.00	469.00	617.00
	Power (C)	28.26	32.00	37.00
	Cement	25.40	24.00	25.00
	Fertilizer	3.52	5.00	5.00
	Others	51.30	50.00	56.00
	Total	473.18	620.00	780.00
Coal Vision 2025 @ 7 % GDP		X-Plan (2006-07)	XI-Plan (2011-12)	XII-Plan (2016-17)
	Steel	42.7	53.14	66.57
	Power (U)	322	412.69	517.31
	Power (C)	28.26	43.26	59.89
	Cement	25.4	38.44	58.18
	Fertilizer	3.52		
	Others	51.3	63.52	79.57
	Total	473.18	611.05	781.52
Coal Vision		X-Plan (2006-07)	XI-Plan (2011-12)	XII-Plan (2016-17)
	Steel	42.7	54.24	69.47

2025 @ 8 % GDP	Power (U)	322	427.16	552.56
	Power (C)	28.26	44.33	62.96
	Cement	25.4	39.39	61.06
	Fertilizer	3.52		
	Others	51.3	64.51	82.11
	Total	473.18	629.63	828.16
Expert Committee on Coal Sector Reform		X-Plan (2006-07)	XI-Plan (2011-12)	XII-Plan (2016-17)
	Steel	42.7	51.53	NA
	Power (U)	322	502.91	
	Power (C)	28.26	45.00	
	Cement	25.4	30.81	
	Fertilizer	3.52		
	Others	51.3	80.00	
	Total	473.18	710.25*	

*In terms of indigenous coal

1.5 Analysis of Demand Estimates:

1.5.1 Power Sector (Utilities)

The energy perspective of Tenth Five Year Plan stipulated substantial addition to capacity and generation in energy sector. Since private participation in power development was encouraged in a big way, it was expected that the private sector achievements would form a significant, if not decisive element in the power development during the Tenth Plan. However, the performance of the private sector in thermal power generation has not been up to the mark. The reasons for slippage in capacity addition by the private sector are mainly due to delay in financial closure and finalisation of fuel supply agreement with the coal companies.

In the XI Plan, the massive capacity creation and corresponding increase in thermal power generation is envisaged by giving emphasis on central power utilities and state sector. CEA has projected a coal based capacity addition target (excluding lignite based) of 42,625 MW. (24110 MW in Central sector, 15165 MW in State sector and 3350 MW in Private sector) and increase in generation from a level of 429 BU (Antic 06-07) to 733.3 BU in 2011-12 with a projected CAGR of 11.3%. CAGR likely to be achieved during X Plan is however 4.6%.

The Central Electricity Authority has given the following indicative assessment of coal based generation and coal requirement, the details of which are enclosed in **Annexure-1.5 to 1.12A**.

The trend of coal based capacity addition during IX, X, XI and XII Plan as projected by CEA are as under:

	Installed* capacity (MW)	Target Cap Addn. (MW)	Actual Capacity Addn (MW)
Beginning of IX Plan (1.4.97)	49,955		
TOTAL - IX Plan :		15,102	7930
Beginning of X Plan (1.4.02)	57,885		
X Plan as on 31.10.06			6405
Expected X Plan (Nov – Mar 06)			8240
TOTAL X Plan		18,308	14,645
Expected at beginning of XI Plan (1.4.07)	72,380		
XI Plan Period		42,625	
2007-08		2520	
2008-09		4370	
2009-10		10195	
2010-11		12050	
2011-12		13490	
Expected at beginning of XII Plan (1.4.12)	1,15,005		
XII Plan : 2016-2017		50,000	

* Mulajore (120MW) and Nellore (30 MW) TPSs are retired.

- In the XI Plan, coal based power projects capacity creation envisaged at 42,625 MW i.e. an increase of 59% over the installed capacity of 72,380 MW at the beginning of the XI Plan. However, actual coal-based capacity addition in IX Plan was only 7930 MW and for X Plan, anticipated capacity addition is 14,645 MW. (Actual addition in X Plan till October'06 has been only 6405 MW and 8240 MW is expected to come up in remaining five months of 2006-07).
- The regional distribution of the above creation as given by CEA is as under:

FIG IN MW

Region	Projected Capacity		Capacity Addition MW	% Increase
	End of XI Plan 31.3.12	Beginning of XI plan 1.4.07		
Northern	26883	18378	8505	46.3%
Western	33307	22917	10390	45.3%
Southern	18932	11882	7050	59.3%

Region	Projected Capacity		Capacity Addition MW	% Increase
	End of XI Plan 31.3.12	Beginning of XI plan 1.4.07		
Eastern	35883	19203	16680	86.9%
Total	115005	72380	42625	58.9%

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

- Corresponding to the above capacity creation, the regional projection for generation and coal consumption, furnished by CEA at the end of Eleventh Plan is detailed below:

Region	Projected Generation (BU)		Projected Coal Demand (Mt)	
	At the end of X Plan (2006-07)	At the end of XI Plan (2011-12)	At the end of X Plan (2006-07)	At the end of XI Plan (2011-12)
Northern	118.7	170.3	89.0	133.0
Western	134.8	222.3	104.0	165.0
Southern	83.5	130.0	60.0	91.0
Eastern and N.E.	91.8	210.7	69.0	153.0
Total	428.8	733.3	322.0	542.0

The above requirement of coal given by CEA for the coal based power projects in the XI Plan is based on the following assumptions:

- The coal demand/requirement has been arrived at by taking PLF at 85%. For new capacity the PLF has been taken at 40% in the first year.
- Normative coal requirement has been indicated as 5000 Tonne per MW/Year.

A power station-wise analysis of all new projects to be commissioned during XI plan has been done. The list of power plants identified by CEA, which will yield benefit in the XI Five Year Plan, is given in the table below. These projects have been grouped into different categories based on the status as (i) Ongoing, (ii) Accorded Long Term linkage/LOA or allocated coal block for captive mining and (iii) new projects.

A) CENTRAL SECTOR

(i) On-going projects

		As per CEA estimate			
S.N.	Name of Power Plant	Cap (MW)	Energy Gen (MU)	Coal Req (Mt) 2011-12	Remarks
1	Dadri Ext Unit -5	490	3649	2.5	Linkage to be accorded
2	Sipat – I	1980	14743	9.9	
3	Bhilai JV	500	3723	2.5	
4	Barh-I	1980	14743	9.9	
5	Chandrapura	500	3723	2.5	

(ii) Accorded Long Term linkage/LOA or allocated coal block for captive mining

		As per CEA estimate			
S.N.	Name of Power Plant	Cap (MW)	Energy Gen (MU)	Coal Req (Mt) 2011-12	Remarks
1	Korba III	500	3723	2.5	
2	Mohuda	1000	3504	2.4	
3	Barh-II	1320	4625	3.2	
4	Nabinagar	1000	5475	3.7	
5	Integ. Proj. Daripali	800	2803	1.9	Out of 3200 MW, only one unit of 800 MW considered
6	North K. Pura	1320	4625	3.2	Out of 1980 MW, only two units of 1320 MW considered
7	Farakka St. III	500	3723	2.7	
8	Bongaigaon	500	3723	2.5	
9	Maithon RB	1000	7446	5.0	
10	Tuticorin JV	1000	5475	3.7	
11	Mejia Phase-II	1000	7446	5.0	

(iii) New projects

		As per CEA estimate			
S.N.	Name of Power Plant	Cap (MW)	Energy Gen (MU)	Coal Req (Mt) 2011-12	Remarks
1	Dadri Ext Unit-VI	490	3648	2.4	
2	Badarpur Extn	980	7297	5.0	
3	Ennore JV	1000	5475	3.7	

4	Simhadri Ext.	1000	5475	3.7	
5	Jhajjar	1500	7227	7.5	
6	Bokaro Repl.	500	3723	2.5	
7	Kodarma	1000	7446	5.0	
8	Raghunathpur	1000	3504	2.4	
9	Durgapur Steel	1000	5475	3.7	
10	Biongaigaon	250	876	0.6	

B. STATE SECTOR

(i) On-going projects

		As per CEA estimate			
S.N.	Name of Power Plant	Cap (MW)	Energy Gen (MU)	Coal Req (Mt) 2011-12	Remarks
1	Choturam (Y-nagar)	600	4468	3.0	
2	Chabra TPS	500	3723	2.5	
3	Kota U- 7	195	1452	1.0	
4	Suratragh Ext.	250	1862	1.3	
5	Amarkantak	210	1564	1.1	
6	Korba West Extn	600	4468	3.0	
7	Bhopalapalli	500	3723	2.5	
8	Vijayawada Ext.	500	3723	2.5	
9	Raichur U- 8	250	1862	1.3	
10	BakreshwarU-5	210	1564	1.1	
11	Paricha Extn	500	3723	2.5	
12	Harduganj Extn.	500	3723	2.5	
13	Parli Extn Unit 2	250	1862	1.3	
14	Paras Extn U 2	250	1862	1.3	

(ii) Accorded Long Term linkage/LOA or allocated coal block for captive mining

		As per CEA estimate			
S.N.	Name of Power Plant	Cap (MW)	Energy Gen (MU)	Coal Req (Mt) 2011-12	Remarks
1	Malwa	1000	3504	2.4	
2	Bhusawal Ext.	1000	7446	5.0	
3	Khaparkheda Ext.	500	3723	2.5	
4	Koradih Repl	500	3723	2.5	
5	Kothagudem U 5	500	3723	2.5	
6	Bakreshwar Extn	500	1752	1.2	

		As per CEA estimate			
S.N.	Name of Power Plant	Cap (MW)	Energy Gen (MU)	Coal Req (Mt) 2011-12	Remarks
7.	Sagardighi Extn	1000	5475	3.7	
8	Santhaldih Extn	250	1862	1.3	
9	DPL Unit 7 A&B	800	5957	4.8	

(iii) New projects

		As per CEA estimate			
S.N.	Name of Power Plant	Cap (MW)	Energy Gen (MU)	Coal Req (Mt) 2011-12	Remarks
1	Hissar	1000	5584	3.7	
2	Sikka Ext.	500	3723	1.7	Imported coal
3	Krishnapatna	800	2803	1.9	Out of 1600 MW, only one unit of 800 MW considered
4	Mettur Ext.	500	1752	1.2	
5	N. Chennai Ext.	500	1752	1.2	
6	Bakreshwar Ext.	500	1752	1.2	

B) PRIVATE SECTOR

(i) On-going projects

		As per CEA estimate			
S.N.	Name of Power Plant	Cap (MW)	Energy Gen (MU)	Coal Req (Mt) 2011-12	Remarks
1	Pathadi U 2&2	600	4468	3.0	
2	Trombay Extn	250	1862	0.9	Imported Coal
3	Raigarh	750	5586	3.8	
4	Budge Budge Extn	250	1862	1.3	

(ii) Accorded Long Term linkage/LOA or allocated coal block for captive mining

		As per CEA estimate			
S.N.	Name of Power Plant	Cap (MW)	Energy Gen (MU)	Coal Req (Mt) 2011-12	Remarks
1	Anpara C	1000	3504	2.4	Linkage accorded to one unit only
2	Chola, Bulandsahar	500	5475	3.7	Out of 1000 MW only one unit of 500 Mw considered

(iii) New projects - **NIL**

The coal based capacity addition, energy generation, & coal requirement in the XI plan :

Sl.No.	Sector	Capacity (MW)	Energy Generation (BU)	Inc. Coal Req. (2011-12) (MT)
1	Central Sector	24110	143.29	99.6
2	State Sector	15165	94.11	63.7
3	Private Sector	3350	22.76	15.1
	Total	42625	260.16	178.4

Status	Central Sector	State Sector	Private Sector	Total
Ongoing Projects	5450	5315	1850	12615
Accorded L.T. linkage/LOA or allocated C.Block	9940	6050	1500	17490
New Projects	8720	3800	-	12520
Total	24110	15165	3350	42625

The year-wise coal requirement (for power generation) in the XIth Five Year Plan as projected by CEA is as under:

(Figure in Mt)

	Year	Existing Plants (as on 31.3.07)	New Plants (in XI Plan)	Total
	XIth Plan			
XII Plan	2007-08	359	10	369
	2008-09	365	25	390
	2009-10	385	44	429
	2010-11	423	60	483
	2011-12	467	75	542

Additional coal requirement as indicated by CEA is 220.0 Million tonnes during XI Plan period. However, projected coal requirement for new plants would be 75.0 Million tonnes during XI Plan period. As compared to 2005-06 (299.89 Mt), projected requirement at the terminal year of XI Plan (542.0 MT) envisages a CAGR of 10.4%.

Region-wise year-wise break-up of coal requirement by power utilities as furnished by CEA for XI Plan is as under:

(Figure in Mt)

Year	Northern Region	Western Region	Southern Region	Eastern & North East Region	Total
XI Plan					
2007-08	94.0	124.0	63.0	88.0	369.0
2008-09	98.0	134.0	66.0	92.0	390.0
2009-10	109.0	146.0	72.0	102.0	429.0
2010-11	123.0	155.0	79.0	124.0	483.0
2011-12	133.0	165.0	91.0	151.0	542.0

Trend of electricity generation and coal consumption for consecutive plan periods are given in table below:

Year	Power demand projected by TERI (BU)	Actual/ projection Generation (BU)	Coal demand projected by TERI (MT)	Consumption/ requirement projected by CEA (MT)	Specific Coal Consumption Kg/Unit	
					TERI projection	Actual/ projctn
2001-02	373.45	341.3	266.70	240.4	0.714	0.704
2005-06	511.44	405.37	335.50	279.53	0.656	0.689
2006-07	544.03	428.8	356.82	322.0	0.656	0.751
2011-12	738.15	733.3	462.25	542.0	0.626	0.739

Following points emerge out from the above table:

1. Actual generation had been invariably less than the demand projected by TERI, CEA has been envisaging generation at XI Plan almost at the level of demand projected by TERI.
2. CEA projects CAGR of 11.3% in generation during XI Plan period against actual CAGR of 4.6 % expected during X Plan.
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.
4. Out of the projected capacity addition of 42,625 MW, about 30 % power plants consuming 29% 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 3 % capacity addition would be on the basis of imported coal. Specific coal consumption of these capacity additions would be substantially less than the national average. Mix of capacity addition and coal requirement is given in the table below:

Particular	Capacity Addition		Total Coal reqmt including capacity addition in 2011-12	
	MW	Contribution in total addition	MTA	% contribution
>1000Kms	12735	30 %	158.0*	29%
< 1000 KMS	10600	25 %	134.0	24%
Total Rail	23335	55 %	290.0	54%
Pithead	17790	42 %	244.0	45%
Import	1500	3 %	6.0	1%
Total	42625		542.0	

* Requirement of 158.0 Mt of coal includes requirement of existing MOEF Plants.

As per the Planning Commission, the overall projected energy requirement considering the **16th Electric Power Survey Report is 975 BU**. This excludes generation from captive plants. After considering the likely capacity addition during XI Plan and going by around 70% of the projected energy requirement to be coal based, working group assessed that the most likely coal based generation in the terminal year 2011-12 of the XI Plan could be of the order of **690 BU**. This indicates a CAGR of 10% in coal based generation programme, which is higher than the growth in power sector as of 8%-9% suggested in the Approach Paper of Planning Commission for XI Plan. Considering the current trend of specific coal consumption of 0.70 kg/kwh, coal requirement for power sector utilities for generating **690BU** works out to **483 Mt** in 2011-12, i.e 9.27% CAGR in coal consumption.

Scenario	Basis	Quantity (Mt.)
SCN-I	Requirement projected by CEA (Capacity Addition for 46840 MW (Sp.Coal Consumption rate 0.723 Kg/Unit)	540.00
SCN-II	Requirement derived on the basis of current specific coal consumption of 0.70 Kg/Unit for generation of 690 BU.	483.00
Requirement projected by Coal Vision –2025 Document at 8% GDP growth		427.16
Requirement projected by Expert Committee on coal sector Reform adjusting in respect of indigenous coal		502.91

1.5.2. Steel Sector

Demand of coking coal in XI Plan

Various economic reports and projections of Chambers of Commerce have predicted healthy growth of steel sectors in the coming years. The national steel policy has envisaged 7.3% annualised growth till 2019-20, projecting a requirement of 70 million tonnes coking coal in 2019-20 from a level of 27 million tonnes in 2004-05. Thus

annualised growth of coking coal requirement of steel sector works out to 6.6%. At this growth rate, year-wise requirement of coking coal in XI Plan would be as under:

Year	Qty. (MTPA)
2007-08	32.67
2008-09	34.81
2009-10	37.09
2010-11	39.52
2011-12	42.12

Ministry of Steel had furnished coal requirement projection of certain Steel Plants. Details of which are compiled in Annexure-1.13.

Year-wise requirement of indigenous washed coking coal and imported coking coal during XIth Plan period is given below:

Requirement of indigenous coking coal (Mt.)* in washed coal terms projected by Steel Plants

(in Million Tonnes)

Company	XI Plan				
	2007-08	2008-09	2009-10	2010-11	2011-12
SAIL	4.00	4.00	5.00	5.00	5.00
VSP	0.58	0.58	0.70	0.88	0.88
TATA STEEL LTD (TSL)	2.30	3.02	3.02	3.02	3.02
Total ISP	6.88	7.60	8.72	8.90	8.90
Others	1.00	1.00	2.00	2.00	2.00
Total	7.88	8.60	10.72	10.90	10.90

* Requirement indicated in “Others” category is a/c M/s. Ispat Industries and is not linked to existing coking coal sources.

SAIL and VSP are presently taking indigenous coal from CIL sources, while TSL is sourcing washed coal from their captive mines and washery. All the projection for requirement of indigenous coal is given in terms of washed coal. Going by the current trend of average washery yield of 54 % in the country, indigenous coking coal requirement in terms of raw coal in the terminal year of XI Plan works out to 20.18 million tonnes.

Requirement of imported coking coal

(In Million Tonnes)

Company	XI Plan				
	2007-08	2008-09	2009-10	2010-11	2011-12
SAIL	10.80	11.50	10.60	13.90	15.30
VSP	3.31	3.30	3.98	5.00	5.02
TSL	1.73	2.27	2.27	2.27	4.20
Others	4.89	6.35	15.10	20.20	20.20
Total	20.73	23.42	31.95	41.38	44.72

From the two tables above, it is seen that total coking coal requirement of steel plants works out to 55.62 Mt in terms of washed coal (10.90 Mt indigenous washed coal & 44.72 Mt imported coal). Considering average yield of washeries at 46% to maintain quality, projection in terms of raw coal for indigenous source works out to about 23.78 million tonnes. Thus the total requirement works out to 68.50 million tonnes in the terminal year 2011-12 of the XI Plan corresponding to a hot-metal production plan of 70.3 mt.

Coal Vision Document-2025 has projected requirement of 54.24 million tonnes of coal for steel plants at 8% GDP growth at the terminal year of XI Plan. Expert Committee on Coal Reform has projected a requirement of 51.53 million tonnes of coal for steel sector at the end of XI Plan.

From above analysis following emerges:

Steel Sector Coal Requirement (MT)		CAGR in XI Plan
2005-06 : Actual	33.80	
2011-12 : Expert Committee	51.53	7.3%
2011-12 : Coal Vision :2025 (8% GDP)	54.24	8.2%
2011-12 : National Steel Policy	42.12	3.7%
2011-12 : Demand compiled as per MOS documents	68.50	12.5%

Against coking coal requirement projection of 68.50 by Working Group on Coal and Lignite, draft document of Working Group on Iron and Steel, however, projected coal requirement of 46 Mt for likely hot metal production of 44.4 Mt through Oxygen Route. The additional requirement projected here would be taking care of new capacity additions in steel sector during XI Plan.

Considering the mammoth construction and other infrastructure activities, Sub-group feels that the projection given by MOS may be considered as it is. The projected requirement of 29.72 mt of non-coking coal for captive power plants of steel sector is considered under Captive Power. Similarly, the requirement of sponge iron sector is considered separately.

1.5.3 Cement Sector

The domestic cement industry witnessed an appreciable growth in demand and production during Tenth Five Year Plan. By virtue of producing about 142 Mt in the year 2005-06 India became one of the largest cement producers in the world. During the Tenth Five Year Plan, the Ministry of Industries (Dept. of Industrial Development) indicated the average annual growth in cement production of about 3.5 %. Against this projected growth, the performance of the cement sector appears to be good and is expected to achieve an average annual growth of about 8.8 % during Tenth Five Year Plan period. Considering the boom in the infrastructure and housing sectors the trend is likely to continue in XI Plan Period as well.

Cements sector has undergone substantial technological changes. With more emphasis now on dry process by cement plants, the specific coal consumption in cement plants during Tenth Plan Period has shown immense improvement. The average specific consumption which was 0.154 tonne in the beginning of X plan (2001-02) has been 0.127 tonne in 2005-06. Improvement is 18 %.

Trend of capacity build-up, cement production, coal consumption in cement sector and projection during XIth Five Year Plan is given below:

Year	Capacity (Mty)	Cement Prod (Mt)	Coal Req/ consumption (Mt)
VIII Plan (1996-97)	92.00	76.20	11.34
IXth Plan (2001-02)	129.76	102.4	15.81
Xth Plan (Actual)			
2002-03	140.07	111.35	15.31
2003-04	146.64	117.50	15.63
2004-05	154.29	127.57	17.58
2005-06	160.23	141.81	18.05
2006-07 (Antic)	163.88	155.99	Not furnished
XIth Plan (Projection)			
2007-08	186.10	171.59	25.97
2008-09	219.30	188.75	28.56
2009-10	241.23	207.62	31.42
2010-11	265.35	228.39	34.56
2011-12	291.90	251.23	38.02
Annualised Growth %		8.26	
Note : Coal requirement for XI Plan is indicated in terms of indigenous coal			

Note: The cement production and the coal requirement given by the Ministry of Industry do not include the cement production and coal requirement of mini cement plants.

The XI Plan envisaged capacity creation of 128.02 Mts, thereby increasing cement production capacity from 163.88 Mts at the beginning of Plan to 291.9 Mts at the end of the Plan. During XI Plan, incremental increase of cement production projection is 95.24 Mts (from 155.99 Mts--likely 2006-07 to 251.23 Mts. by 2011-12).

Requirement of coal for cement industry, as projected by Ministry of Industry, is 38.02 Mts in terms of indigenous coal in the terminal year of XI Plan (2011-12). Actual requirement, however, would be less as Cement Units have been regularly importing coal, superior than indigenous coal. Import Plan has not been furnished by CMA/DIPP. The break-up of requirement is as follows:

Fig. In Million Tonnes

	Capacity	Cement Production	Coal Req.
• Existing plants (Likely by the end of X Plan)	163.86	155.99	
• New Plants (Proposed in XI Plan)	128.02	95.24	
Total	291.90	251.23	38.02

The year-wise import of coal in X Plan by cement sector is as under:

Year	Quantity (Mt)
2002-03	3.66
2003-04	3.18
2004-05	3.63
2005-06	3.11

CAPTIVE POWER PLANTS OF CEMENT INDUSTRY

In addition to above requirement of coal for cement production, there is requirement of coal for captive power plants of cement industries. The requirement for the terminal year of XIth Plan (2011-12) has been projected at 7.40 Mts. Year-wise projection is as under:

Fig in Mt.

	2007-08	2008-09	2009-10	2010-11	2011-12
Coal (Mt)	5.06	5.56	6.20	6.73	7.40

Thus year-wise total demand as projected by CMA for Cement Plants including Cement CPP works out as under:

Fig in Mt.

	2007-08	2008-09	2009-10	2010-11	2011-12
Kilns	25.97	28.56	31.42	34.56	38.02
CPP	5.06	5.56	6.20	6.73	7.40
Total	31.03	34.12	37.62	41.29	45.42

Assessment of coal requirement for Cement sector:

Capacity build-up, cement production, coal consumption for VIII, IX and X Plans and requirement projected for XI Plan is given in the table below:

Period	Capacity (Mty)	Cement Production (MT)	Coal Consumption (MT)	Specific Consumption (Kg/tonne)
VIII Plan (1996-97)	92.00	76.20	11.34	0.149
IX Plan (2001-02)	129.76	102.4	15.81	0.155
X Plan				
2002-03	140.07	111.35	15.31	0.137
2003-04	146.64	117.50	15.63	0.133
2004-05	154.29	127.57	17.58	0.137
2005-06	160.23	141.81	18.05	0.127
2006-07	163.88	155.99	Not furnished	
XI Plan Projection	Capacity	Cmt. Prodctn	Coal Reqmnt	Sp.Consmpn
2007-08	186.10	171.59	25.97	0.151
2008-09	219.30	188.75	28.56	0.151
2009-10	241.23	207.62	31.42	0.151
2010-11	265.35	228.39	34.56	0.151
2011-12	291.90	251.23	38.02	0.151
Coal requirement for XI Plan is indicated in terms of indigenous coal				

It may be seen from the above that specific coal consumption in cement plants during X Plan period had been averaging at 0.133 Kg/Tonne, whereas projection for XI Plan has been made keeping specific coal consumption at much higher level at 0.151 kg/tonne. Of course, it is mentioned by CMA that the projection is made on the basis of indigenous coal and therefore,

On using imported coal, which Cement Plants have been regularly resorting to, requirement would be lowered down substantially. Even if, specific coal consumption is kept at the level of penultimate year of X Plan, requirement works out to:

XI Plan Projection	Capacity (Mty)	Cement Production(Mt)	Coal Requirement (Mt)	Sp. Consumption (Kg/Tonne)
2007-08	186.10	171.59	21.79	0.127
2008-09	219.30	188.75	23.97	0.127
2009-10	241.23	207.62	26.37	0.127
2010-11	265.35	228.39	29.01	0.127
2011-12	291.90	251.23	31.90	0.127

Coal procurement pattern of X Plan by Cement Plants as indicated by CMA is given in the table below:

Figures in Million Tonnes

Source / Year	2002-03	2003-04	2004-05	2005-06
Against Linkage	12.35	13.32	14.84	15.03
Open Market	0.77	1.03	1.27	2.16
Indigenous Coal	13.12	14.35	16.11	17.19
Imported Coal	3.66	3.18	3.63	3.11
Pet Coke	1.05	1.41	1.87	1.74
Lignite	0.05	0.11	0.76	0.76
Other than Indigenous	4.76	4.70	6.26	5.61
Total	17.88	19.05	22.37	22.80
% Indigenous	73.4	75.3	72.0	75.4
% Others	26.6	24.7	28.0	24.6

Cement Plants have been importing coal since mid-nineties. In fact, the coastal cement plants started importing coal-taking advantage of location-specific competitive landed cost even when import duty was substantially higher (35%) than present level (5%). These apart, alternative fuels like lignite, pet-coke etc also being used for more than a decade in Gujarat & Rajasthan based cement plants. Taking these into consideration, it can be reasonably presumed that coastal cement plants (both in Southern & Western regions) would be sourcing imported coal and a few cement plants of Gujarat and Rajasthan would continue with alternate fuels.

Therefore, total coal requirement of cement plants excluding CPP works out to 31.90 Million tonnes and the requirement of CPP is considered under Captive Power.

3.5.4 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 coming up with CPP units. The anticipated consumption in the year 2006-07 is expected to be about 30 Mt excluding fertiliser and many other CPP plants. Coal as feedstock to fertiliser sector has stopped completely. Coal, which is being sent to this sector, is for captive power generation only. Indicative figures on coal

demand for captive power sector have been furnished by a few ministries viz. steel, cement, and fertiliser .However, demand estimates of major CPP's from industries like Aluminium, Paper, Chemical & Textiles and others are not available.

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%. The Expert Committee on coal sector reforms has indicated another scenario of coal demand for CPP units. Coal Consumption for CPP units has registered an annualised growth of about 10.78% during first four years of X Plan period (from 16.02 Mt in 2001-02 to 24.13 Mt in 2005-06). Planning Commission in the Approach Paper for XI Plan has especially emphasised the need for giving stress on captive generation. Taking this in view, the requirement of CPPs is projected to grow at 14%. However, the comparative recommendation of various committees is tabulated below:

FIGURES IN MILLION TONNES

	2007-08	2008-09	2009-10	2010-11	2011-12
Projection-Coal Vision 2025 @7% GDP	33.80	35.95	38.24	40.67	43.26
Projection-Coal Vision 2025 @ 8% GDP	33.97	36.31	38.81	41.48	44.33
Projection in Expert Committee on Coal sector reforms	30.50	32.66	35.00	40.00	45.00
Projection on the basis of 14% growth rate* (Present CAGR)	34.2	38.99	44.45	50.67	57.06

* The projection includes requirement for CPPs of cement, steel, fertilizer etc.

3.5.5 Sponge Iron:

During X Plan period there had been a phenomenal growth in sponge iron sector. Both in terms of number of units and quantum of consumption the industry was so small that in X Plan document it did not get separate entity in sector-wise demand. However, during recent years there had been a spurt of demand of coal from this sector.

Supply in raw coal terms for sponge iron sector in the country, rose from a level of 4.40 Mt in 2001-02 to 14.00 Mt in 2005-06. As in 2006-07, sponge iron plants with capacity of 8.034 Mt with long-term linkage of 12.308 Mt are drawing coal from CIL sources. Further, some plants like Jindal Sponge Iron and Monnet Ispat are sourcing coal from their captive mining blocks.

Therefore, Sub-group-II decided to separately estimate its requirement of coal to assess overall demand of the country. Accordingly, Sponge Iron Manufacturers' Association was requested to furnish their views on coal demand for XI Plan period. Year-wise demand of coal as projected by SIMA is given in the table below:

FIGURES IN MILLION TONNE

Year	Installed Capacity	Sp.Iron Production	Coal requirement
2007-08	11.2	9.45	15.12
2008-09	13.0	10.95	17.52
2009-10	16.0	13.65	21.84
2010-11	18.3	15.4	24.64
2011-12	21.4	18.1	28.96

Sponge-Iron plants are clustered mostly in Chattisgarh, followed by Orissa, West Bengal, Jharkhand, Andhra Pradesh & Karnataka.

3.5.6 Fertilizer:

Fertilizer Industry Co-ordination Committee (FICC), Ministry of Fertilizer & Chemical has indicated that an endeavour is going on to bring back some of the closed coal-based urea manufacturing Fertilizer units in operation during XI Plan, like units of Hindustan Fertilizer at Durgapur & Haldia and FCI, Sindri. Since the proposals are yet to take any firm shape, no concrete projection for their demand of coal could be taken at present planning stage. However, in consideration to the total quantities involved in demand and supply scenario, the requirement of those units, if any, would be negligible. As such accommodation of such demand at later stage would not be a problem.

3.5.7 Others

There are large numbers of units consuming comparatively small quantity of coal at present. These groups of consumers account for about 12 % of total coal demand and are placed under "other industries category". The industries whose demand is aggregated under this category are mainly bricks, aluminium, paper, newsprint, textile, domestic use etc. An indicative figure is generally attributed to this group of industries/sector in the total demand scenario. Different projections for XI Plan Period for this category are given as under:

	(in Million Tonnes)				
	2007-08	2008-09	2009-10	2010-11	2011-12
Projection-Coal Vision 2025 @7% GDP	53.49	55.80	58.23	60.8	63.52
Projection-Coal Vision 2025 @ 8% GDP	53.65	56.14	58.77	61.56	64.51
Demand as per trend analysis *	36.92	39.20	41.63	44.22	46.96 *

Note: * Coal Vision Document included Sponge Iron sector as part of Others Sector. Now, demand of Sponge Iron is separated out at 28.96 Mt, demand for Others Sector is reduced to that extent.

Apart from organized industrial units, a plethora of medium and small units including seasonal consumers are categorized in other sector. Brick kilns are also one of the most important consuming segments within this category. Special thrust has been put for infrastructure and housing development in XI Plan to ensure inclusive growth. Therefore, a boom is expected in the XI Plan period for brick making. This apart, a large number of units, those who were hitherto depending upon petroleum-based fuel for steam generation, have been facing difficulty due to escalating price of oil products and may be inclined to come back to coal for energy security. In fact, steps have been taken to improve the distribution network so that small and medium scale consumers including brick kilns could procure coal in hassle-free manner. As such, keeping parity with the projected growth in coal consumption for other infrastructure sectors like Cement, steel or CPP the growth for other sector is envisaged at 12%. **This works out to a requirement of 61.68 MT, which is 25.13 Mt more than what was projected by Coal Vision-2025 document at 8% GDP growth.**

3.6 Summary of coal demand scenario for XI Plan

Considering the projection given by CEA, past trend of performance, goal set by Planning Commission in the approach paper and the 16th Electric Power Survey Report, demand for power utilities is assessed at 483.00 Mt in 2011-12.

CMA has indicated capacity addition of 128 Mt in cement sector, as against present capacity of 163.88 Mt. Moreover, coal requirement for per tonne cement production has been projected in excess to current level. Based on the current rate of specific coal consumption and continuance of import at current level, coal requirement is assessed as 31.90 Mt excluding the requirement of Cement CPPs. Requirement of Cement CPPs is 7.40 Mt.

High growth is also envisaged in the Sponge Iron sector. Capacity is likely to grow from a level of 11.2 Mt at 2007-08 to 21.4 Mt at the end of 2011-12. With this projection of capacity addition coal requirement increases by about 12 % (CAGR) in XI plan period to 28.96 Mt.

Steel sector has projected plant specific coal requirement of 68.50 Mt, which incidentally is more by 15 Mt at the end of the Plan period than what have been projected by different expert committees including National Steel Policy. However, bulk of the total requirement is projected to be sourced from import.

So far, Coal requirement has been indicated by these four sectors. However, these sectors together account for about 82-84% of total raw coal off-take of the Country. Therefore, for planning purpose, these inputs could be construed as quite indicative.

Figures in Million Tonnes

Sector	IX Plan (Actual)	2005- 06 Actual	X Plan 2006-07		Demand XI Plan (2011-12)			
	2001-02 Actual		Target	Antic.	As indicated by user Agencies	Assessed by WG	Coal Vision- 2025 @ 8% GDP	Expert Commnt. on Coal reform
					SCN - I	SCN - II		
Steel & Coke oven	29.84	33.80	43.70	43.00	68.50	68.50	54.24	51.53
Power(Utility)	249.23	299.89	322.00	310.00	540.00	483.00	427.16	502.91
Power Captive	16.02	24.13	28.26	31.50	49.66 \$	57.06	44.33	45.00
Cement*	15.22	18.33	25.40	25.00	45.42	31.90	39.39	30.81
Sponge Iron	41.60	57.38	54.82	50.50	28.96	28.96	64.51	80.00
Others					61.68	61.68		
Non-coking – Total	322.07	399.73	430.48	417.00	725.72	662.60	575.39	658.72
Grand total	351.91	433.53	474.18	460.00	794.22	731.10	629.63	710.25

- **Note:** XI plan demand of CPP includes demand of Fertilizer & Cement CPP (7.40 Mt); consumption pattern for cement includes CPPs of cement sector.

From the analysis as given above, overall coal demand for the terminal year of XI Five Year Plan is derived as under:

Sector	Figures in Million tonnes		
	2006-07: Anticipated	2011-12: Assessed demand	CAGR (%) of coal requirement
Power Utilities	310.00	483.00	9.27. %
Power Captive *	31.50	57.06	9.50 %
Cement	25.00	31.90	
Sponge Iron & Others	50.50	90.64	12.41 %
Total Non-coking	417.00	662.60	9.70 %
Coking –Steel	43.00	68.50	9.76 %
Total	460.00	731.10	9.71 %

- Demand of CPP includes demand of Fertilizer & Cement CPP (7.40 Mt); anticipated despatch (2006-07) for cement includes despatch to cement CPPs.

3.7 Coal Demand for XII Plan :

CEA has assessed coal based power generation capacity addition 50,000 MW in XII plan period as against envisaged capacity addition of 14,645 MW in X Plan and projected addition of 46,840MW in XI Plan. CEA has projected tentative coal requirement of 764 million tonnes at the terminal year of XII Plan. Other user agencies have not indicated their likely coal requirement for XII Plan.

Projections of coal demand for terminal year of XII Plan is being made on the basis of following assumptions:

- a) Requirement as projected by CEA for power sector and likely requirement of other sectors through trend analysis of growth, keeping demand projections of them for XI Plan as benchmarks.
- b) Considering same growth trend that has been projected for XI Plan for all sectors including power assessed for XI Plan.

Million Tonnes				
	X Plan	XI Plan		XII Plan
Sector	2006-07:	2011-12:	CAGR (%) of	2016-17
	Anticipated	Assessed		Projected
Power Utilities	310.00	483.00	9.27.%	750.00
Power Captive *	31.50	57.06	9.50%	85.00
Cement	25.00	31.90		50.00
Sponge Iron & Others	50.50	90.64	12.41%	135.00
Total Non-coking	417.00	662.60	9.70%	1020.00
Coking –Steel	43.00	68.50	9.76%	105.00
Total	460.00	731.10	9.71%	1125.00

This demand is arrived extrapolating growth in line of growth envisaged for XI Plan. However, in the coming ten years, lots of technological development is expected to come in energy sector through large-scale commercialisation in Coal bed methane and natural gas sector supplementing coal energy, and therefore, minor adjustments have been made to project the demand of XII Plan, which works out to 1125 Mt (1020Mt for non-coking and 105 Mt for coking coal).

3.8 Observation:

While, in order to ensure availability of plenty of raw material, all manufacturing sectors are prone to project optimistic demand, nonetheless taking input from user industries to prepare the basic framework of demand pattern is an age old practice in the industry. Since approaching a feasible demand situation is a prerequisite for subsequent planning, starting from production to manpower, Working-group deliberated to estimate demand scenario considering demands projected by different expert committees, including 16th Electric Power Survey report and macro-economic target set by the Approach Paper of Planning Commission.

Chapter- 2

PRODUCTION

2.1 Coal Production Trend

In the terminal year of Xth Plan (2006-07), all India coal production is likely to be 432.50 Mts. as against original target of 405 Mts (projected at the time of preparation of Xth Plan document). Expected growth in coal production is 5.70 % per annum during the plan period as against original projection of 4.46%. This is a considerable improvement over the 2.53% growth achieved in the IXth Plan. Despite delay in commissioning of many new mines due to delay in obtaining environmental and forest clearance, land acquisition, rehabilitation etc., this substantial increase in production in CIL mines has been possible due to improvement of operational efficiency. Again growth of production of captive mines is also remarkable. Production from Captive mines/Tata Steel/IISCO etc. is now expected to reach 31.20 Mt in 2006-07 as against original projection of 18.87 Mt.

The company-wise coal production trend is given below :

Fig. in Million Tonnes

	1991-92	VIII Plan (96-97)	IX Plan (2001-02)	X Plan (06-07)	Growth		XI Plan (2011-12)	Growth	
	Actual	Actual	Actual	Antic	Abs	%	Projected	Abs	%
CIL	204.15	250.62	279.65	363.80	84.15	5.40	520.50	156.70	7.43
SCCL	20.58	28.73	30.81	37.50	6.69	4.01	40.80	3.30	1.70
Others	8.09	9.97	17.33	31.20	13.87	12.45	118.70	87.50	30.63
TOTAL	232.82	289.32	327.79	432.50	104.71	5.70	680.00	247.50	9.47

2.2 Production Projection – XI Plan & XII Plan.

At the time of preparation of Annual Plan 06-07, production projection for terminal year of XI plan (2011-12) has been envisaged to 504.10 million tonnes. Subsequently, in view of excess demands from user industries, CIL upwardly revised the production plan to 520.50 Mt Subsidiary-wise break-up of CIL is as under:

COAL PRODUCTION PROGRAMME FOR XI & XII PLAN - CIL									
Million Tonnes									
Company	X PLAN		XI PLAN						XII PLAN
	06-07	Growth	07-08	08-09	09-10	10-11	11-12	Growth	16-17
	Antic	Abs	Projection						Abs
ECL	33.00	4.45	33.41	39.76	43.74	45.08	46.00	13.00	48.00

BCCL	24.20	-1.05	25.20	26.50	27.50	28.50	30.00	5.80	35.00
CCL	42.00	8.19	44.00	47.00	55.00	65.00	78.00	36.00	115.00
NCL	52.00	9.54	58.00	60.50	65.00	68.00	70.00	18.00	80.50
WCL	42.00	4.99	42.40	42.95	43.65	44.50	45.00	3.00	45.00
SECL	88.50	24.38	91.50	93.65	101.10	106.30	111.00	22.50	140.00
MCL	80.50	32.69	88.00	99.00	111.00	122.00	137.00	56.50	197.00
NEC	1.60	0.96	2.00	2.00	2.50	3.00	3.50	1.90	3.50
CIL	363.80	84.15	384.51	411.36	449.49	482.38	520.50	156.70	664.00

Of the estimated incremental production of 156.70 Mts during XIth Plan, significant contributors would be MCL (56.50Mt.), SECL (22.50Mt.), CCL (36.00Mt.) & NCL (18.00Mt) and ECL (13.00Mt). Further, the incremental production comprises of about 59 mt production from 16 proposals under emergency coal production plan .

SCCL envisaged a production of 40.80 Mts in the terminal year of XIth Plan (2011-12) as against likely achievement of 37.50 Mts in '06-07, terminal year of X plan.

Out of 123 captive coal blocks allotted so far, indications as received by Coal Controller's Organisation from about 60 blocks owners leads to a projected production of 104 Mt in 2011-12. Indications from remaining block holders are to be received. As such, production from Captive blocks and sources other than CIL & SCCL has been projected at 118.70 Mt & 346.0 Mt for XI & XII Plan respectively. Company-wise coal production projection for XI & XII Plans is given below:

Company	X Plan 06-07 Anticipated	XI PLAN						XII PLAN
		07-08	08-09	09-10	10-11	11-12	Growth	16-17
		Projection					Abs	
CIL	363.80	384.51	411.36	449.49	482.38	520.50	156.70	664.00
SCCL	37.50	38.04	38.30	39.00	40.00	40.80	3.30	45.00
Other Public Sector	1.91	1.92	2.02	2.32	2.52	2.52	0.61	2.52
Pvt Sector (TSL)	6.24	6.50	6.50	6.50	6.50	6.50	0.26	6.50
Captive Mining	17.55	23.93	36.22	47.09	73.00	104.08	86.53	331.38
Meghalaya	5.50	5.60	5.60	5.60	5.60	5.60	0.10	5.60
All India	432.50	460.50	500.00	550.00	610.00	680.00	247.50	1055.00
							Growth	375.00

Production projection for captive blocks for XII Plan has been made on the basis of perspective demand assessment for 2016-17. There is every chance that actual demand may vary from the projection, which in turn would determine actual production requirement from captive blocks. Since these blocks will have additional production capacity, they are capable of taking care of increasing demand accordingly. In addition of 123 blocks those have already been allotted, more blocks will be allotted in coming years. In the event of retarded demand, Captive blocks would be adjusting their production facilities in accordance to coal demand/requirement. Therefore, by the end of XII Plan no gap between demand and indigenous supply for non-coking coal is envisaged.

2.3 Break up of Metallurgical Coking & Non Coking coal, including coking used for Non-metallurgical purpose is shown below:

(In Million Tonnes)

Type of Coal	X Plan (Antic)	XI Plan Period				
	06-07	07-08	08-09	09-10	10-11	11-12
Metallurgical Coking	17.90	18.29	20.34	23.70	25.55	27.65
Non Coking+Non Met.	414.60	442.21	479.66	526.30	584.45	652.35
Total	432.50	460.50	500.00	550.00	610.00	680.00

2.4 Fieldwise break-up

Coal fieldwise details of coal production are given in Annexure- 2.2.

From the Annexed table it may be seen that significant growth in production comes from following coalfields/areas :

Coal Field	Growth In XI Plan
Rajmahal	8.50
North Karanpura	23.80
Singrauli	18.00
Korba	11.42
IB Vally	20.00
Talcher	36.71
New Captive Blocks	86.53
Total in 6 fields & Captive Blocks	204.96

Major growths are envisaged in six coalfields in CIL and captive blocks. XI Plan envisages growth of 205 Mt from these coalfields/areas out of total growth of 247.50 Mt with contribution of 83 %.

2.5 Group-wise break-up

Envisaged group-wise break-up of coal production projection of CIL & SCCL are as under:

(Fig in Million Tonnes)

Company	Group	2006-07 (Antic)	XI Plan 2011-12	XII Plan 2016-17
CIL	Existing Mines & Completed Projects	241.82	185.97	151.49
	Ongoing Projects	102.41	165.31	181.59
	New Projects	19.57	169.22	320.92
	TOTAL	363.80	520.50	664.00
		2006-07 (Antic)	XI Plan 2011-12	XII Plan 2016-17

SCCL	Existing Mines & Completed Projects	29.641	18.855	6.98
	Ongoing Projects	7.859	13.615	6.34
	New Projects		8.33	31.68
	Total	37.50	40.80	45.00

CIL envisages taking up about 114 new projects during XI Plan with an ultimate capacity of around 230 Mt. and expected to contribute about 70 Mt in the terminal year of XI Plan from these new projects. SCCL projected to take up 39 new projects in XI plan envisaged to build-up ultimate capacity of around 60 Mt.

Company wise details of Group wise production is given in attached **Annexure- 2.1**

2.6 Availability of coking coal:

2.6.1 Coking Coal Reserves:

Out of 253.30 Billion Tonnes of total geological coal reserves (as on 1.1.2006), the proven reserves are only about 96 Billion tonnes (73.8 billion tonnes are within 300 m depth and 22.2 billion tonnes are within 300-1200 m depth). The balance is under indicated and inferred category. Further, coking coal geological reserves are only about 32.1 billion tonnes. Out of this, proven reserve is about 16.5 billion tonnes. Recoverable reserves are about 4 billion tonnes. The prime coking coal resources are restricted to Jharia coalfield only. The medium coking coal is available in Jharia, Raniganj, Bokaro, Ramgarh, Karanpura, Sohagpur and Pench-Kanhan coalfields and the semi-coking coal is available in Raniganj, Ramgarh and Sonhat coalfields.

The average depth of operation in coking coalmines is about 150-200m. Going by the current mining technologies, reserves up to the depth of 300m are being successfully exploited economically. Exploitation of the reserves beyond 300m depths does not appear to be economically viable at this stage. Available coking coal reserves up to the depth of about 300m are to be reviewed for economic exploitation.

2.6.2 Measures to improve the availability of coking coal from the indigenous source:

During X plan period, coking coal production in the country is found to be almost standstill. However, only about 60 - 65% of the coking coal produced could be used for metallurgical purpose due to quality reason and the balance is used for non-metallurgical purpose. Details of coking coal produced and used for metallurgical steel sector during X plan period are furnished in the Table given below:

(Fig. in Mt)

Source/Company	X Plan period - Performance				
	2002-03	2003-04	2004-05	2005-06	2006-07 (Antc.)
ECL	0.06	0.06	0.06	0.04	0.06
BCCL	5.05	4.30	4.13	4.23	4.30
CCL	6.01	6.40	6.10	4.79	5.50
WCL	0.59	0.70	0.76	0.93	0.75
SECL	0.15	0.15	0.15	0.15	0.17
CIL	11.86	11.61	11.19	10.15	10.78
TSL	5.92	6.14	6.36	6.36	6.24
IISCO	0.57	0.51	0.63	0.62	0.88
ALL INDIA	18.35	18.27	18.19	17.13	17.90

2.6.3 Company-wise Metallurgical Coking coal production during XI Plan period as projected is as under:

(Fig. in Mt)

COMPANY	COAL PRODUCTION (MT)				
	2007-08	2008-09	2009-10	2010-11	2011-12
ECL	0.06	0.06	0.06	0.06	0.06
BCCL	4.40	4.50	4.60	4.80	5.00
CCL	5.70	7.65	10.30	11.40	12.30
WCL	0.76	0.66	0.67	0.72	0.72
SECL	0.17	0.17	0.17	0.17	0.17
CIL	11.09	13.04	15.80	17.15	18.25
TSL	6.50	6.50	7.00	7.50	8.50
IISCO	0.70	0.80	0.90	0.90	0.90
ALL INDIA	18.29	20.34	23.70	25.55	27.65

From the above table, it may be seen that there is increase in coking coal availability / production from the mines of BCCL & CCL. The availability / production from the mines of WCL will decline marginally due to depletion of limited coking coal reserve. Production from TSL also expected to increase in later stage due to projected opening of a new block.

Company wise details of coking coal augmentation programme is appended below:

BCCL:

BCCL's area of operation is mainly confined in Jharia coalfield which is only the store house of prime coking coal in this country. Coking coal in Jharia coalfield is available in seams IX – XVIII. In BCCL, prime-coking coal of Steel Grade I & II is also being produced in mines of Chanch Victoria area such as Begunia UG mine. The production programme in XI Plan Period is as follows:

SL. NO.	SCHEME / GROUP	COAL PRODUCTION (MT)				
		2007-08	2008-09	2009-10	2010-11	2011-12
1.	Existing mines.	1.195	0.990	0.790	0.840	0.84
2.	Completed projects	1.425	1.436	1.700	2.150	2.030
3.	Ongoing Projects	0.450	0.750	0.910	1.230	1.280
4.	Hired HEMM Patches	1.330	1.324	1.200	0.580	0.400
5.	Future Projects	-	-	-	-	0.450
	Total	4.40	4.50	4.60	4.80	5.00

The reasons for increase or decrease in coal production from the mines / projects of BCCL are appended below:

- Production from the existing mines will decrease due to closure of highly loss making coking coal underground mines such as Balihari 5&6, Bhagabhand, Bhowra South & North, Gopalichak, Jealgora, Jogidih, Joyrampur, Kankanee, Mudidih, North Tisra etc. in phased manner.
- In case of completed projects, production increases from Moonidh, Murlidih and Block-II OCP etc. However there is drop in production from Kusunda OCP by 2011-12, closure of some OC mines, Katras Choitudih UG, Sudamdih, etc.
- Coal production increases due to coming up of projects like Damoda BJ OCP, Chaptoria OCP and rising production from PB project.
- Coal production from Hired HEMM Patches increases during first 2-3 years of the plan period and then drops due to depletion in coal reserves of the patches.
- In case of future projects, coal production will commence from the terminal year of the plan period from Moonidih xv seam, Kapuria UG, Madhuband and Phularitand expansion etc.

The availability of coking coal can be further improved by taking the following measures:

- Augmenting coking coal production in existing 12 mines i.e. Begunia u/g, Bhalgora / Simlabad / Burragarh / Burragarh / Huriladih u/g, Kharkharee u/g, Katras Choitudih u/g, Loyabad u/g, Pootkee u/g, Pootkee Balihari u/g, Moonidih u/g, North Amlabad u/g, Block IV (Coking) OCP, Godhur OCP / Block VII (Coking) and Bhatdee u/g.
- Release of reserve standing on pillars due to various constraints like surface structure, land problem, water logging etc.
- Beneficiation of Coking coal Washery Slurries by re-washing the same through fine coal beneficiation system for mixing with Clean Coking Coal.

CCL:

There is no prime coking coal available in CCL. Only medium coking coal is produced from the mines of its East Bokaro & Ramgarh coalfield. The production programme of CCL in XI Plan period is as follows:

SCHEME/GROUP	COAL PRODUCTION (MT)				
	2007-08	2008-09	2009-10	2010-11	2011-12
Existing Mines	0.71	0.81	0.79	0.42	0.42
Completed projects	3.72	4.94	5.93	5.98	4.73
Ongoing projects	1.27	1.90	3.58	4.00	3.87
Future projects	-	-	-	1.00	3.28
Total	5.70	7.65	10.30	11.40	12.30

The following new coking coal projects are scheduled to come up in the XI Plan Period and its production programme is as given below:

S.N	Project	Capacity (Mty)	Production (MT)				
			2007-08	2008-09	2009-10	2010-11	2011-12
1	DRD OC	2.00	-	-	-	0.50	1.00
2	Chano-Rikba OC		-	-	-	-	0.10
3	Godo OC	2.00	-	-	-	-	0.50
4	Gose-Parsabera Integrated OC	2.00	-	-	-	-	0.28
5	Kedla EPR OC	2.00	-	-	-	-	0.30
6	Parej West OC	1.00	-	-	-	0.50	0.50
7	Pichri/Pichri Extn OC	3.00	-	-	-	-	0.40
8	Ramgarh-II West OC	1.00	-	-	-	-	0.20

Coal Vision-2025 document has projected indigenous coal production of 621 Mt and 778 Mt in the terminal year of XI Plan (2011-12) and XII Plan respectively. Against this, production envisaged in this document by Coal Companies is 680 Mt. and 1055 Mt in 2011-12 & 2016-17 respectively which is about 60 Mt and 277 Mt more than what was envisaged in Coal Vision - 2025 document. Projected production projections of CIL and SCCL sources are more or less attuned to Coal Vision - 2025 forecast. Taking cue from mine plans received, Coal Controller's Organization has projected production of 104 Mt from captive blocks in 2011-12 which may go up to 331 Million tonnes by end of XII Plan.

Chapter - 3

DEMAND AND SUPPLY

- 3.1 Demand projections for XI Plan are furnished in detail in Chapter- 1. Availability projections for XI Plan are furnished in Chapter- 2. After examining different projections Sub-group assessed total demand of coal in the terminal year of XI Plan (2011-12) as 731.10 Million Tonnes, 662.60 Mt non-coking coal and 68.50 Mt coking coal. Against this demand the production projection for the terminal year of XI Plan is 680.0 Mt out of which 27.65 Mt and 652.35 Mt would be coking and non-coking coal production respectively. This leaves a gap of 51.10 Mt in 2011-12 comprising of 40.85 Mt of coking coal and 10.25 Mt of thermal coal.

Assessed demand vis-à-vis Indegeneous supply projection (Figures in Million Tonnes)

Year	Demand			Indegeneous Supply			Gap(-) / Surplus(+)		
	Coking	Non-Coking	Total	Coking	Non-Coking	Total	Coking	Non-Coking	Total
2011-12	68.50	662.60	731.10	27.65	652.35	680.00	-40.85	-10.25 *	-51.10

Note : The gap shown for non-coking coal is essentially arising out of indicative consumers' preference. As it is, production potential of captive non-coking coal mines can be further harnessed to bridge the gap, if situation so demands.

3.2 STEEL

Demand and indigenous supply source for steel sector are mostly concentrated in Eastern Region. Out of seven integrated steel plants of the country, five of SAIL and one each of RINL and TSL only two plants viz. Bhilai at Chattisgarh and Vizag at Andhra Pradesh are out of Eastern Region. Similarly the entire indigenous coking coal reserves are available in Eastern Region, mostly in Jharkhand State. Only a small reserve is available at Korea-Rewa and Pench-Kanhan fields. Coking coal washeries, with the only exception of Nandan, are situated only in Jharkhand State. A few steel plants are also projected to come up out of the typical steel belt, particularly in coastal areas and would be dependent totally on imported coal. One such plant is based on corex technology and would be using imported non-coking coal to the extent of 3.8 million tonnes per annum.

Steel Plants, while indicating requirement of coal, have also mentioned their likely sources indigenous or imported.

Demand-supply scenario for steel sector works out to:

Figures in Million Tonnes	
	2011-12
Demand	68.50
Indigenous supply Availability :	
CIL	18.25
TATA STEEL	8.50
Others	0.90
Total indigenous supply	27.65
Gap(-)/ Surplus(+)	(-) 40.85

3.3 Power (Utilities):

As per the demand projections power utilities would continue to be the most important consuming segment. Against the projected total demand of 731.10 Million tonnes in 2011-12, the demand of power sector utility alone accounts for 483 Million tonnes, i.e. about 66% of total demand. The source-wise supply envisaged to meet this requirement of power sector is as below:

Figures in Million Tonnes	
	2011-12
Demand	483.00
Indigenous supply Availability :	
CIL	382.35
SCCL	29.40
Others /Captive Mines	65.95
Total indigenous supply	477.70
Gap(-)/ Surplus(+)	(-) 5.30

Some of the power stations are planned to use imported coal and therefore, a notional the gap is shown for power sector. Indigenous supply has potential to increase further attuned to demand situation.

3.4 Power Captive:

Coal requirement of Captive Power Plants is projected at 57.06 mt in 2011-12. The source-wise supply in 2011-12 is as under:

Figures in Million Tonnes	
	2011-12
Demand	57.06
Indigenous supply Availability :	
CIL	35.49
SCCL	2.20
Others /Captive Mines	19.37
Total indigenous supply	57.06
Gap(-)/ Surplus(+)	NIL

3.5 Cement Sector:

Cement Sector demand at 31.90 mt in 2011-12 accounts for about 4.4% of total coal demand of the country. The source-wise supply in 2011-12 is as under:

Figures in Million Tonnes	
	2011-12
Demand	31.90
Indigenous supply Availability :	
CIL	21.45
SCCL	5.50
Others /Captive Mines	0.00
Total indigenous supply	26.95
Gap(-)/ Surplus(+)	(-) 4.95

3.6 Sponge Iron:

The assessed demand for sponge iron sector in 2011-12 is 28.96 mt tonnes and the source-wise supply is given below:

Figures in Million Tonnes	
	2011-12
Demand	28.96
Indigenous supply Availability :	
CIL	15.55
SCCL	0.40
Others /Captive Mines	13.01
Total indigenous supply	28.96
Gap(-)/ Surplus(+)	NIL

3.7 Others:

The assessed demand for Others sector in 2011-12 is 61.68 mt tonnes and the source-wise supply is given below:

Figures in Million Tonnes	
	2011-12
Demand	61.68
Indigenous supply Availability :	
CIL	47.41
SCCL	3.30
Others /Captive Mines	10.97
Total indigenous supply	61.68
Gap(-)/ Surplus(+)	NIL

3.8 Overall situation:

Sector-wise Summary for Demand and supply in 2011-12

(in Million Tonnes)

Source	Coking Coal	Non-Coking Coal						Total
	Steel	Power (U)	Power C	Cement	Sponge Iron	Others	Sub - Total	
Demand	68.50	483.00	57.06	31.90	28.96	61.68	662.60	731.00
Indigenous Availability :								
CIL	18.25	382.35	35.49	21.45	15.55	47.41	502.25	520.50
SCCL	0.00	29.40	2.20	5.50	0.40	3.30	40.80	40.80
Others	9.40	65.95	19.37	0.00	13.01	10.97	109.30	118.70
Total Indigenous Availability	27.65	477.70	57.06	26.95	28.96	61.68	652.35	680.00
<i>Gap (-) / Surplus (+)</i>	<i>(-) 40.85</i>	<i>(-) 5.30</i>	<i>NIL</i>	<i>(-) 4.95</i>	<i>NIL</i>	<i>NIL</i>	<i>(-) 10.25</i>	<i>(-) 51.10</i>

Note : The gap shown for non-coking coal is essentially arising out of indicative consumers' preference. As it is, production potential of captive non-coking Coal mines can be further harnessed to bridge the gap, if situation so demands.

- Many of the consuming sectors have not furnished their import plan though import is a regular phenomenon for all-important sectors at present.
- Because of improved quality in comparison to indigenous coal, consumption / requirement decreases in proportion to quantity of import.
- Source-wise mis-match between demand and availability persists.
- The surplus availability from captive blocks can be considered for matching the demand indicated for consumers who are not yet granted linkage should the projected demand materialise.
- In addition to domestic production certain pit-head stocks would also be available for augmenting supplies if the movement of coal is possible from these areas.

Chapter – 4

BENEFICIATION OF COAL

4.1 Availability of Raw Coking coal as Washery Feed:

Only 60 % of total coking coal produced indigenously were used for metallurgical purpose and the balance are used for non-metallurgical purposes due to inappropriate quality and very high cost of washing to make it suitable for use in steel making. Therefore, although the production figures of indigenous coking coal appear to be somewhat impressive (About 32 Mts) yet the actual ground scenario is different. Due to depleting reserves of good quality coking coal in the existing mines, the production of good quality coking coal are declining year after year. Due to non-availability of sufficient quantity good quality coking coal, there is a steep decline in washery efficiency. Washery Yield, which is a ratio of total clean coal produced to total raw coal feed into the washery, is very low as compared to international standard and utilization of existing coking coal washeries is deteriorating day by day due to less supply of good quality coking coal. Pattern of production and use of indigenous coking coal for metallurgical and non-metallurgical use during previous five years are as under:

Year	Total Coking coal production (Mt)	Metallurgical use (Mt)	Non metallurgical use (Mt)	% of Coking coal suitable for metallurgical purpose
2005-06	31.39	17.13	14.26	60.20
2004-05	30.22	18.19	12.03	60.20
2003-04	29.40	18.27	11.13	62.13
2002-03	30.20	18.35	11.84	60.78
2001-02	28.67	17.96	10.71	62.63

In addition to the above, measures for improving performance of the Coking Coal Washeries has been taken as recommended by various Committees constituted by Govt. of India. At present action plan for modernization / renovation of *some coking coal washeries in BCCL, CCL & WCL has been taken up.*

To meet the demand of washed coking coal, CCL has initiated action to set up a washery at Dhori with a throughput capacity of 2.50 Mty on turn key basis and at Parej with a throughput capacity of 2.00 Mty under BOO Scheme. These two washeries are planned to be commissioned by the 2nd year of the XI Plan Period.

4.2 Performance of washeries:

61 coal washeries are likely to be operative in the country by the end of X plan with a total throughput capacity of about 130. Mty. Out of these, 16 are coking coal washeries with a total throughput capacity of around 27.4 Mty. But the scenario is different in case of non-coking coal washeries. 33 non-coking coal washeries with a total throughput capacity of about 84 Mty are in operation and 12 washeries are likely to be added in 2006-07 with capacity of around 19 Mty.

With the rising demand of washed non-coking coal, the capacity addition is about 60 Mty (mainly in the private sector) in the X plan period to cater to the need of washed Non Coking coal to thermal power stations, cement plants, sponge iron plants etc.

The washed non-coking coal production from CIL and private coal washeries during the X Plan Period is furnished in the table below:

Company	Washed Non-coking coal production (Mt.)				
	2002-03	2003-04	2004-05	2005-06	2006-07 (Target)
CIL	7.36	7.76	9.43	10.48	10.52
Private Washerries	9.76	13.08	16.93	28.33	44.72
Total	17.12	20.84	26.36	38.81	55.24

The washed non-coking coal productions of CIL washeries from the above table, is seen to be increasing steadily and in case of private washeries, the production has increased rapidly. The demand for washed non-coking coal has grown up in view of MoEF's stipulation to use coal with ash content not exceeding 34 % in the specified TPSs and growing concern over pollution of the environment.

The performance of the coking coal washeries in operation in the X plan period are shown in the table in the next page. At present 16 coking coal washeries with a total throughput capacity of 27.4 Mty are in operation in the country. CIL operates 11 coking coal washery with a total capacity of 19.68 Mty (Barora and Lodna washery not in operation and Madhuband converted to non-coking coal washery for non-availability of required feed) and others including SAIL & TISCO operate 5 with a total capacity of 7.70 Mty.

:

Performance of coking coal washery:

Company / washery	Capacity (Mty)	Washed coking coal production (Mty.)					Remarks
		2002-03	2003-04	2004-05	2005-06	2006-07 (Tar/ Ant)	
CIL:							
Dugda-II	2.00	0.24	0.19	0.22	0.55	0.52	
Bhojudih	1.70	0.66	0.59	0.50	0.67	0.58	
Patherdih	1.60	0.10	0.08	0.07	0.07	0.09	
Sudamdih	1.60	0.25	0.22	0.22	0.27	0.24	
Moonidih	1.60	0.41	0.47	0.54	0.49	0.58	
Lodna	0.48	-	-	-	-	-	Not in operation
Barora	0.42	0.04	0.01	-	-	-	Not in operation
Madhuban	2.50	0.15	0.02	-	-	-	Converted to non coking coal
Mahuda	0.63	0.31	0.30	0.33	0.24	0.32	
Kathara	3.00	0.54	0.56	0.58	0.54	0.65	
Swang	0.75	0.36	0.41	0.39	0.31	0.45	
Rajrappa	3.00	0.89	0.99	1.09	0.84	1.10	
Kedla	2.60	0.38	0.40	0.59	0.61	0.60	
Nandan	1.20	0.29	0.32	0.34	0.40	0.32	
Sub Total	19.68 *	4.63	4.54	4.85	4.98	5.45	
SAIL:							
Chasnala	2.04	0.52	0.56	0.65	0.65	0.67	
Sub Total	2.04	0.52	0.56	0.65	0.65	0.67	
TATA STEEL LTD :							
Jamadoba	5.66	3.05	3.10	3.28	3.09	3.09	
Belatand							
West Bokaro II							
West Bokaro III							
Sub Total	5.66	3.05	3.10	3.28	3.09	3.09	
TOTAL	27.38	8.20	8.20	8.78	8.72	9.21	

* Excluded Lodna, Barora & Madhuband washery.

The performance of the coking coal washeries of CIL is not satisfactory and the reason for its low performance may be attributed to the following:

- Many of the washeries have outdated life long back.
- Depletion of good quality upper seam coking coal.
- Deterioration in raw coal quality.

To improve the performance of the coking coal washeries, various measures taken by CIL are as follows:

- Reports / schemes have been prepared by CMPDI with respect to renovation / modernization of 5 washeries of BCCL (Sudamdih, Bhojudih, Dugda-II, Patherdih & Barora), 2 washeries of CCL (Kathara & Swang) and Nandan washery of WCL.

- Action for implementation of various revival schemes in the coking coal washeries of BCCL is in process.
- Action plan for modernization of *some washeries* of CCL has been taken up for implementation.
- Action for renovation/modernization of Nandan washery of WCL has been taken up.
- Various jobs related to modernisation/ renovation of washeries are also either in progress or completed in some washeries.

WASHED COKING COAL PRODUCTION PROJECTION – XI PLAN

(in Million

Tonnes)

Company	2007-08	2008-09	2009-10	2010-11	2011-12
BCCL	2.10	2.20	2.30	2.40	2.50
CCL	2.79	3.15	3.86	4.16	4.46
WCL	0.38	0.33	0.34	0.36	0.36
Total CIL	5.27	5.68	6.50	6.92	7.42
SAIL	0.83	0.95	1.25	1.25	1.25
TSL	3.09	3.09	3.29	3.49	3.89
Total	9.19	9.72	11.04	11.66	12.56

NON-COKING COAL

In the terminal year of XI plan ,about 96% of total coal production of the country would be non-coking coal and around 2/3rd of this non-coking coal produced, would be of high ash content (grade ranging between E to G). The mineral matter is highly dispersed in coal matrix. For this reason, Indian non-coking coal is difficult to wash. Effective combustion of this coal call for improving the quality of coal which can be achieved mainly through beneficiation including finer crushing for higher liberation of clean coal.

45 non-coking coal washeries of throughput capacity of about 103 Mt are likely to be available by end of X plan. Out of these, 6 washeries are being operated by CIL (capacity 19.72 Mty) and 27 are already in operation by private sector (capacity 64.6 Mty) for supply to the linked coal consumers. 12 Non coking coal washeries are likely to be added by 2006-07.The performance of non-coking coal washeries in X plan period is shown in the Table as below:

Non-coking coal washeries in India:

Sl. No.	Washery / Company	Capacity (Mty)	Washed Non-coking coal Production (Mty)				
			2002-03	2003-04	2004-05	2005-06	2006-07 (Target)
1	Dugda-I, CIL	1.00	0.29	0.30	0.44	0.32	0.37
2	Lodna, CIL	0.48*	0.06	0.03	0.02	0.00	0.00
3	Madhuban, CIL	2.50	0.00	0.42	0.36	0.63	0.77
4	Gidi, CIL	2.50	0.74	0.71	0.59	0.47	0.75
5	Piparwar, CIL	6.50	4.30	4.14	4.46	5.27	5.05
6	Kargali, CIL	2.72	0.71	0.74	0.71	0.82	0.90
7	Bina, CIL	4.50	1.25	1.43	2.85	2.96	2.69
	(A) CIL	19.72	7.35	7.77	9.43	10.47	10.53
8	Dipka washery, Aryan coal beneficiation Pvt. Ltd	7.00	3.65	4.89	6.20	6.40	9.60
9	Chakabura Washery, -do-	4.00			0.76	1.44	1.92
10	Panderpauny Washery, -do-	3.00		1.22	1.39	1.45	1.60
11	Talcher Washery, Aryan Energy private Ltd.	2.00					1.40
12	Gauri Washery, -do-	2.00					0.80
13	Indaram Washery, -do-	2.00			0.35	0.46	0.80
14	Wani, Kartikay Coal washeries Pvt. Ltd.(Aryan)	2.00				0.64	0.80
15	Korba, ST-CLI Coal washeries Ltd.	5.00	2.82	2.22	2.57	4.85	6.00
16	Ramagundam, Gupta coalfield & washeries Ltd.	2.50	0.82	0.82	0.82	0.82	0.80
17	Sasti, -do-	2.50		1.00	0.76	1.00	1.00
18	Wani, -do-	2.50		0.50	0.50	0.50	0.60
19	Ghugus, -do-	3.50				0.50	1.00
20	Bhandara, -do-	0.75	0.25	0.25	0.25	0.25	0.25
21	Umrer, -do-	0.75	0.20	0.15	0.10	0.10	0.10
22	Parasia, -do-	1.50			0.10	0.10	0.30
23	Bilaspur, -do-	2.00			0.30	0.60	0.60
24	Majri, United Coal Washeries Pvt. Ltd. (Gupta)	3.50					0.60
25	Talcher, Global coal Mining Pvt. Ltd.	2.80		0.07	0.07	0.62	1.25
26	Ramagundam, -do-	1.00			0.40	0.48	0.64
27	Wani, Bhatia International Ltd.	3.00	1.00	1.00	1.00	1.00	1.00
28	Ghuggus, -do-	4.00				0.96	0.96
29	Raigarh, Jindal	6.00	1.00	0.93	1.12	1.90	2.28
30	Nagpur, Indo Unique Flame Ltd . & Nair Coal Services Ltd	0.60	0.02	0.03	0.03	0.01	0.03
31	Wani, -do-	2.40			0.05	0.06	0.67
32	Annuppur, -do-	1.20			0.00	0.00	0.01
33	Punvat, Wani -do-	2.40					0.01
34	Bilaspur, Chhattisgarh Power & Coal Benefication Ltd.	1.25			0.16	0.56	0.37
35	Rajnandan, Allied Minerals	0.94				0.75	0.75
36	Raigarh, MSP Steel & Power Ltd.	0.60				0.48	0.48
37	Angul, MP Ispat & Power Ltd.	2.50				2.00	2.00
38	Chandrapur, Sidhbal i Ispat LTd.	0.25				0.20	0.20
39	Chandrapur, Solar Industries LTd.	0.25				0.20	0.20
40	Chandrapur, Anshul Impex Pvt. Ltd.	0.25					0.20

41	Chandrapur, Fuel Coal Washeries India LTd.	2.50					2.00
42	Chhattisgarh, Trumax Ispat LTd.	0.88					0.70
43	Jharia, Ranchi Casting Pvt. LTd.	0.88					0.70
44	Durgapur, Shyam Steel Industries LTd.	0.88					0.70
45	Ranigaunj, Chariot EXIMP Ltd.	2.00					1.50
	(B) Private	83.08	9.76	13.08	16.93	28.33	44.72
	Total (A+B)	102.8	17.11	20.85	26.36	38.80	55.25

*Lodna washery is not in operation and capacity excluded.

Washery-wise, year-wise performance during X plan indicating capacity vis-à-vis actual production with % yield is given in Annexure 4.1

The demand for washed non-coking coal is increasing rapidly because of MoEF's stipulation to use coal with ash content not exceeding 34% in the specified 34 TPSs and environmental laws becoming more and more stringent. At present the requirement of such coal in the MoEF stipulated TPSs is about 109.00 Mty. To mitigate the environmental pollution and improve the performance of the plants, consumers are opting for use of washed coal.

As per the projections given by CEA, out of 46,840 MW likely capacity addition during XI Plan, about 27 % power plants of capacity 12735 MW would be *located* at more than 1000 kilometer distance from pithead. Out of total projected coal requirement of 540.0 Mt , power stations situated beyond 1000 kilometers and others within MOEF stipulation would be consuming about 158.0 Mt of coal. Therefore, provision has to be made for another 49 Mt of coal of below 34% ash.

The total non coking coal production in the country has been estimated as about 650 Mt. in the terminal year of XI plan which includes around 104 Mt from captive mining. The requirement of the beneficiated non-coking coal by the turn of XI Plan period (2011-12) has been assessed as under:

Type of coal	Projected production (Mty)	Remarks
Superior grade (approx)	143	Need based
Pithead TPS linked low grade coal (approx.)	160	Need based
Coal from captive mining.	104	Captive consumption.
Remaining low grade coal	243	

Since the present capacity can handle beneficiation of 103 MTY of coal, another around 140 MTY capacity has to be build-up in order to beneficiate the entire low-grade coal. This capacity, of course would need to be operated at 100% capacity, which may not be consistently feasible. Therefore, provision for another 40-50 Mt capacity addition may have to be considered in subsequent phase.

The capacity of the washeries under development (construction and proposal stage) at present is to the tune of about 106.5 Mty.

Internationally all coal follow the route of “mine-washery-consumer” but in case of India, there are certain constraints in following this mode of supply of coal. These are:

- No. of mines is huge and located scattered across the country.
- The production capacity of the mines is very small as compared to international standard.
- Most of the mines are supplying coal to different sector i.e. power or cement or sponge iron when their quality requirement and quantity is varying.
- Most of the consumers are reluctant to pay the higher price for washed coal.
- Disposal of huge quantum of washery rejects that would be generated, in an environment friendly manner.

Inspite of the above odds, Ministry of Environment and Forest (MoEF), Govt. of India has notified some thermal power plants located in specified areas to use coal with ash content not exceeding 34% considering environmental pollution aspects. The pollution control standard are also becoming stricter day by day.

In view of above, Govt. of India is encouraging coal consumers to set up coal washeries for use of washed coal in their plants. In this connection following measures have been taken to comply with MoEF's stipulation and also for setting up new washeries:

- i) Supplying washed coal from CIL and non-CIL washeries.
- ii) Encouraging the coal consumers/private entrepreneurs by CIL to set up non-coking coal washeries for supply of washed coal to the linked consumers by providing infrastructural facilities like land, railway siding, water, power as available on lease/chargeable basis.
Two such washeries with total throughput capacity 12.5 Mty are in operation on CIL's land and CIL has also allotted land on lease for construction of 11.0 Mty & 3.5 Mty Washeries under BOO Scheme to its consumers.
MSEB is also being persuaded to finalise the draft agreement for supply of washed coal from CIL's proposed Dipka washery (6.0 Mty) under BOO Scheme.

- iii) CIL has also initiated action to set up 2 non-coking coal washeries (8.0 Mty), one coking coal washery (3.0 Mty) under BOO Scheme and 1 coking coal washery (2.5 Mty) on turn key basis in Jharkhand state.

Under the Chairmanship of Member (Energy) - Planning Commission, a Working Group with Members from Planning Commission, Ministry of Coal, Ministry of Power, NTPC, BHEL, CIL and CMPDI has been constituted to look into the suitability of using washed coal in thermal power plants with the objective to identify policies for promotion of coal washing in the country. The Committee has found the following during the Techno-Economic Study :

- a) Techno-economically, Pithead TPSs with ROM coal has the least cost of energy. But to optimize the plant cost and reduce O&M problems, the sized ROM coal in narrow GCV band with proper de-shaling should be supplied to TPSs.
- b) ROM coal with 44% ash and above, if it becomes the bulk supply to the power plants, should only be used at Pit-head TPS without washing.
- c) The washing of coal with a AFBC / CFBC plant for utilisation of washery rejects at pithead is techno economically viable for load-centre power plants beyond a certain distance from the pit-head. Use of 34% ash in coal produced from ROM coal with 40% ash given the most appropriate solution.
- d) For low performing power plants (where poor quality of coal has been identified as the reason for low performance), any increase in the PLF with the use of washed coal will result in higher break-even cost of washed coal. For such cases, use of washed coal upto calculated break-even cost may be viable option for consideration.

The final report of the study is expected shortly.

Expansion possibility of existing washery:

In case of existing new washeries, expansion in terms of capacity is possible. CIL has no such plan for expansion of the capacity of existing non-coking coal washeries. However, private washery operators have already expanded the capacity of *some of* their washeries and are also in the process of further expansion.

New Washery:

Non-coking coal washeries taken-up for construction and / or proposed to be taken-up are as follows:-

Washery	Capacity (Mty)	Status
APGENCO	11.0	Under construction (BOO Scheme)
CIL	14.0	Proposed under BOO Scheme
PSEB	3.5	Proposed under BOO Scheme

Private Sector	78.0	Under construction / Proposed
Total	106.5	

State Government's assistance in creation of infrastructure facilities for washeries:

With a view to create about 140 Mty of additional coal washing capacity, huge infrastructure facilities will be required to be developed which includes land, railway siding, road, power and water. In this regard CIL is encouraging its consumers to set up the washeries by offering land and other infrastructure facilities but gradually CIL is finding it difficult to provide such facilities *particularly* like land because most of the land acquired by CIL is in coal-bearing areas and with the rapid production expansion programme, the existing land is found to be insufficient to cater to the need of the proposed *coal mining* projects of CIL. To resolve the issues of land, road for setting up the washeries etc., State Governments should provide necessary assistance.

Chapter - 5

COAL MOVEMENT

- 5.1 The consuming points and producing points being in different regions, movement matrix is an essential feature for planning coal supplies. The usual modes for coal movement are Rail, Rail-Cum-Sea (coastal movement), Road, Merry-Go-Round, & Other Modes (Belt & Ropeway systems).
- 5.2 The incremental demand, as assessed by Working Group for XI Plan (in comparison to terminal year X Plan) is projected to be 271.10 Million Tonnes.
- 5.3 Taking into account the requirement placed by major users industries, and demand assessed by the Working Group at 731.10 Mt, a matching supply plan of projected available domestic coal has been drawn, which is projected to reach to the level of 680.0 Million during 2011-12 leaving a gap of 51.10 Million Tonnes between assessed demand and domestic availability. Consuming sectors have not indicated their import plan for XI Plan period.
- 5.4 Movement matrix for Terminal Year of XI Plan (2011-12) is being drawn excluding requirement of imported coal at the level of supply of 680.0 Million Tonnes and is placed in attach Annexure- 5.1..

From the attach movement matrix it may be seen that requirement of coal movement (of raw coal) by Rail during 2011-12 would be 322.16 Million Tonnes. However, actual movement increases to 699.5 million tonnes in terms of despatch of coal & coal products and rail movement increases accordingly to 342.78 million tonnes with corresponding wagon requirement of 36,728 Fwvs/day @ 1 Fwv=25.50 tonnes. This, of course, includes coastal movement of 28.26 Million Tonnes.

- 5.5 Mode-wise transport of raw coal involved for movement of domestic coal are as under:

Million Tonnes			
Mode	In raw coal term		Coal & Coal Products
▪ Rail	322.16	(47.4%)	342.78 (49.0 %)
▪ Road	190.57	(28.0 %)	190.57 (27.2 %)
▪ MGR	133.49	(19.6%)	133.49 (19.1%)
▪ Belt/Rope	32.70	(4.8%)	32.70 (4.7%)
▪ Colly.Consmptn	1.08	(0.2%)	
▪ Total	680.00		699.54

- 5.6 A substantial quantity has been projected for movement from captive mining blocks – 104.08 MT (15.3%). Movement plans of these blocks have been arrived at on the basis of the location of the end-use plant and the position of the mining block. Wherever, end-use plants are located far away from mining blocks, movement is construed to be made by rail, which works out to 39.75 Mt. However, actual movement by Railway would be dependent on development of railway infrastructure, like rake-fit loading sidings, matching tracks etc. Moreover, once the golden quadrilateral would be opened up for the entire stretch, many of the small blocks might prefer Road movement to avoid multiple handling.

The pattern of mode-wise distribution of despatch in raw coal terms for earlier plans in comparison to projected movement for XI Plan is tabulated below:

Period	Percentage contribution of different modes			
	Rail	Road	MGR	Belt/Others
2001-02 (IX Plan)-Actual	53.3	18.2	22.7	5.8
2006-07 (X Plan) Antic	47.1	25.0	23.2	4.6
2011-12 (XI Plan) Projected	49.0	27.2	19.1	4.7

Due to substantial increase in coal traffic as such, there would be major increment in rail handling to the tune of 119.67 Mt in comparison to anticipated rail despatch in the terminal year of X Plan, which accounts for increase in wagon loading to the extent of 36728 wagons/day from an anticipated level of 25317 wagons/day in 2006-07. Field-wise distribution of major incremental loadings is given in table below:

Wagons/day

Field	2006-07 (Antic)	XI PLAN (2011-12)	
		Projection	Increment
N.Karanpura	2166	3655	1489
Korba	1740	2307	567
IB Vally	2154	3148	994
Talcher	3342	5701	2359
Captive Blocks	780	4259	3479

- 5.7 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.
- 5.8 Consuming sectors, particularly power stations would be required to develop matching unloading facilities and necessary infrastructure to handle multiple types of wagons.
- 5.9 Mechanisation of loading facilities and rationalization of loading points would be important tasks for Coal Companies.

- 5.10 Development of connecting roads from mines to railheads with all-weather bridges and culverts would be another important issue for implementation of targeted movement.
- 5.11 Some of the important issues need special attention of railways to achieve the projected wagon loading are as under:

a) Development of independent/dedicated freight corridor

Presently common tracks are used for passenger and freight traffic. With increase in population, new passenger trains are being introduced in regular periodicity. The common corridor has to accommodate halts for these increased numbers of passenger trains as well. This takes away the previous line capacity and the throughput of freight traffic has to face difficulties. Unfortunately coal-bearing areas as well as consumption centers are predominantly located in these already congested trunk routes. Coal traffic, as such face extreme operational difficulty in day-to-day movement even with present level of traffic. Even a slightest dislocation in track operation by natural reasons, accidents or agitation aggravates the predicament in movement of coal to further extent due to shift in priority. Only dedicated freight corridor for coal could have ensured uninterrupted movement as per plan. Railways have already been taking steps for constructing freight corridor from Mumbai to Delhi and Sonenagar to Ludhiana. A SPV is being created by Railways to execute these projects. Sonenagr to Ludhiana fright corridor would definitely help moving coal from Karanpura to Up-country destinations. The other corridor is essentially to handle container traffic.

b) Up-gradation of axle load in important routes:

Railways, of course have already taken initiatives to upgrade axle load in a few routes from 20.5 tonnes to 25.0 tonnes. Up-gradation of routes would be effective only if the design of the wagons is changed for increasing carrying capacity. While, up-gradation of tracks along with augmentation of carrying capacity of wagons would help to haul increased quantity of coal in one rake, this cannot provide relief from congestion neither it would ensure faster movement of traffic. Unless a dedicated coal corridor is developed, bettering turn around of rolling stock would not be possible.

c) Feeder lines from coal bearing areas to freight corridor:

Matching feeder lines connecting coal-bearing areas with freight corridor would be of immense importance for optimum utilization of the corridors. Railways have already decided to construct certain feeder routes, as under, which is expected to remove bottlenecks to certain extent and would also help moving coal from Raniganj field to up-country destinations.

1. Sonnagar – Garwa Road – Barkakana (311 Kms)
2. Patratu – Gomoh (including PD Branch Line) (128 Kms)
3. Sonnagar – Gaya – Gomoh (249 Kms)
4. Gomoh – Pradhankhunta (39 Kms) including Kusunda – Tetulmari (4.5 Kms), Katrasgarh – Nichitpur, Pradhankhunta – Pathardih links (24 Kms)

5. Pradhankhunta – Asansol – Andal including coal branch lines (75 Kms)
6. Andal – Sainthia – Pakur (151 Kms)
7. Chandrapura – Dhanbad (36 Kms)
8. Bhojudih – Mohuda – Gomoh (44 Kms)
9. Aligarh – Harduaganj (15 Kms)
10. Kanpur – Paricha (198 Kms)
11. Mughalsarai – Unchahar via Janghai, Phaphamau (205 Kms)
12. Varanasi – Sultanpur – Utratia – Rosa (558 Kms)
13. Zafrabad – Tanda (99 Kms)
14. Ludhiana – Beas – Govindwal Sahib (112 Kms)
15. Rajpura – Dhuri – Bhatinda (Lehra Mohabbat) (173 Kms)
16. Sirhind – Rupnagar – Nangal Dam (104 Kms)
17. Hissar – Bhatinda – Suratgarh (298 Kms)

Feeder routes undertaken in Western sector would primarily facilitate movement of imported coal from Gujarat Coast to hinterlands.

d) Up-gradation of Terminal Management:

Railways would be required to upgrade terminal management as the present facilities provide scope for wagons to actually move for only one-third part of a day.

e) Increasing volume of rolling stocks to match the upgraded axle load:

in major coal-bearing routes Railways have already increased axle load from 20.5 tonnes to 25.0 tonnes. However, volume of rolling stock remaining same capacity is not being utilized and only idle freight movement is taking place, as Railways have been increasing carrying capacity of wagons. This is definitely a national loss. Railways, in XI Plan, should enhance volume of coal-carrying wagons in line with axle load and bulk density of coal.

f) Development of Railway sidings/tracks in Ib valley, Korba & Karanpura fields

Major incremental loading of CIL would be coming from Karanpura, Korba and Ib fields. Proactive actions are to be taken to develop infrastructure to cope up with the evacuation needs. Following are the areas, where infrastructure development work is to be undertaken on priority.

- **KARANPURA**

Construction of Tori-Shivpur-Hazaribagh BG Line. Railways, though have taken up the work during X Plan period, because of land acquisition and law and order problem, the project has been constantly getting delayed. Railways have to finish the job expeditiously to ensure movement of coal to linked power stations as per plan during XI Plan period.

- **MAND-RAIGARH COALFIELDS**

Due to poor infrastructure existing in this coalfield, the development has not picked up. The production potential of the field is quite high with a reserve of 11 billion tonnes of coal. Once this area is linked with trunk routes, both SECL and captive mining blocks would be benefited for moving coal from this field. It should taken as a thrust area for infrastructure development of Railways.

- **KORBA COALFIELDS :**

In Korba coalfields railway track extends upto Gevra Road Railway Station from where it has been further extended upto Dipka project as a private siding/track. However, coal are serves are also available in Saraipali and Budbud blocks and if this line is extended towards Saraipali, coal from Saraipali and Budbud can also be evacuated through rail for which railway assistance is required.

- **CIC COALFIELDS :**

Sufficient railway infrastructure is available in CIC coalfields with the exception of Bistrampur-Ramkoloa Tatapani sections. As per the records available, the coal reserves in Ramkola Tatapani Sections/blocks are to be extent of about 1.8 billion tonnes. In addition around 0.3 billion tonnes of coal reserves have also been found in Lakhanpur block. Evacuation of coal from these sections shall require development of rail infrastructure including laying of new track. It is estimated that the around 50 kilometers length of railway track shall have to be laid.

The coal reserves in Jamuna OCM mines of J&K Area is on the verge of getting exhausted and new OC/UG mines i.e. Amadand, Bakumuni etc. are coming up. These mines are located opposite to the existing mines. Evacuation of coal from the new block i.e. Amadand shall require extension of the already existing railway track from Kotma Station to the new block.

- **Ib-Valley**

Ten mines, Gopalpur-Monoharpur Blocks, totaling capacity of about 40MTPA production are coming up in this section. About 24 MTPA coal has to be evacuated from this section through Railway system. There will be separate siding for each project for dispatch of coal to MSEB, APGENCo, KPCL and other consumers. In order to ensure connectivity of different projects, Railway line from Jharsuguda to Sarguda would be needed.

- 5.12 From a level of about 32 Million Tonnes coastal movement of coal through ports (both loading and unloading taken together), it is envisaged to increase coastal movement through ports to a level of about 56 Million Tonnes. The entire coastal movement is limited to east coast only. This essentially involves 3 load ports (Haldia, Paradeep & Vizag) and 3 unload ports (Chennai, Ennore & Tuticorin) for the present. Kakinada port is being developed and this could help moving coal from potential Ib/Talcher fields to Andhra Pradesh and further hinterland up to Karnataka.

- 5.13 From the demand and indigenous availability position, discussed in earlier chapter, no clear-cut picture emerges as to what would be the likely import of coking and non-coking coal during XI Plan period. While, coking coal import is imminent to the extent of 40.00 million tonnes, in case of non-coking coal the import would be primarily on commercial and quality reasons as the projected gap of 10.25Mt can be bridged through better utilization of production potential of captive blocks.

However, there have been some concrete indications available for import of non-coking coal, which more or less corroborates with the gap worked out between demand and supply in earlier chapter as under:

In Million Tonnes

Sector	Quantity	Remarks
Import based new power utilities	5.30	Import-based power plants
Steel Plants (Corex)	3.80	For Essar Steels/ Hazira
Cement Plants	4.95	Gap between envisaged demand and supply
Total	14.05	

5.14.1 Port Movement:

From the above, it is seen that likely movement of coal through ports would be in the order of 110 Million Tonnes as under:

Particulars	Expected port handling quantity (Mt)
Non-coking Coal	14.0
Coking Coal	40.0
Coastal Movement of Domestic coal (Load & Unload ports combined)	56.0
Total	110.0

The port infrastructure needs to be strengthened in order to facilitate rise in imports as well as coastal shipment. About 110 Mt of coal is required to be handled at the end of XI Plan including coastal shipment implying a port capacity of about 120-130 Mt .by 2011-12.

Chapter – 6

LIGNITE

6.1 Importance of Lignite in energy security

Occurrence of lignite in India is confined to 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, it is considered necessary that the lignite deposits available in these states are exploited for power generation which would be the best economic and viable option.

Keeping the above view, it is considered advantageous to develop many lignite mines in the states of Tamil Nadu, Gujarat and Rajasthan and utilize them for generation of power as well as for meeting the demand from other industries such as cement, textiles, chemical etc., where coal was being used previously. Gradually lignite became one of the major alternate and important source of energy in the country for thermal power generation.

6.2 Lignite resources in the country

The total Geological reserves of lignite in the country stands at 38,274.43 million tonne as on 1.4.2006 against 34605.05 million tonnes estimated as on 1.1.2001. State wise Lignite resource in the country as on 1.4.2006 is given below:

State	Proved	Indicated	Inferred	Total
Tamilnadu	2831.00	16953.54	11137.98	30922.52
Rajasthan	560.91	2620.60	1053.84	4235.35
Gujarat	785.27	259.40	1618.08	2662.75
Pondicherry	0	405.61	11.00	416.61
Kerala	0	0	9.65	9.65
Jammu & Kashmir	0	20.25	7.30	27.55
Total	4177.18	20259.40	13837.85	38274.43

There is an increase of about 3669 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 3696.62 MT as on 1.1.2001 to 4177.18 MT as on 1.4.2006 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 (30,922.53 M.t.) followed by Rajasthan (4,235.35 M.t.), Gujarat (2662.75 M.t.), Pondicherry (416.61 M.t.), J&K (27.55 M.t.) and kerala (9.65 M.t.).

6.3 Development of lignite sector in different Plan Period

Lignite production in the country first started at Neyveli in Tamilnadu in 1961-62 and then started in the State of Rajasthan in 1997-98 and in the State of Gujarat in 1979-80. Lignite production, which was 2.563 Mt at the end of Third Five Year Plan, has increased substantially and reached a level of 24.814 Mt at the end of IX Five Year Plan.

Plan period wise lignite production trend and annualised growth rate are as under:

Plan Period	Terminal Year	Production in Mty	CAGR %
I Plan	1955-56	Nil	-
II Plan	1960-61	Nil	-
III Plan	1965-66	2.563	-
IV Plan	1973-74	3.32	3.29
V Plan	1978-79	3.30	-
VI Plan	1984-85	7.84	15.51
VII Plan	1989-90	12.36	9.53
VIII Plan	1996-97	22.64	7.21
IX Plan	2001-02	24.814	1.85

6.4 Performance during IX Five Year Plan

In **Tamilnadu**, Neyveli Lignite Corporation (NLC) Limited, a Public Sector Undertaking, is the only agency engaged in the exploitation of lignite. The lignite produced from the mines of NLC in Tamilnadu is mainly consumed for power generation and a small quantity is sold to a few small private consumers.

In **Gujarat** only GMDC and GIPCL are engaged in mining of lignite in the state. The Production of lignite from mines at Panandhro and Vastan is utilized for power generation and production from other mines is utilized for other sectors namely cement, textiles etc.

In **Rajasthan**, Rajasthan State Mines & Minerals Limited, a state sector undertaking is the only agency engaged in the exploitation of lignite and Giral in Barmer district is the only mine operating at the end of IX Plan. All the lignite produced in the Rajasthan State till the end of IX plan is being consumed by various small Industries.

Against the anticipated lignite production of 174.10 MT of during the IX Plan, the actual production was only 118.184 MT which is mainly due to delay in commissioning of mines in Tamilnadu, Gujarat & Rajasthan and non-starting of certain mines in Tamilnadu & Rajasthan. However the lignite demand from different sectors projected at 24.385 MT at the end of IX Plan i.e. 2001-02 has been fully met by the coal companies by dispatching about 24.578 MT of lignite in 2001-02. The total installed lignite based power generation capacity, which was only 600 MW in the year 1962-63 has increased to 2535 MW at the end of IX plan because of the efforts taken by the states of Tamilnadu and Gujarat in installing more lignite based power stations to meet out the growing demand in power.

6.5 Performance during X Five Year Plan

6.5.1 Lignite production:

The lignite production as projected in X Plan document in the country was 208.80 MT during the X plan. Against this, the actual production was only 145.96 MT leaving a shortfall of about 63 MT. Similarly the projected target of lignite production at the terminal year of X Plan was 55.96 MT (Tamil Nadu 33.68 MT; Gujarat 15.80 MT; Rajasthan 6.48 MT), against which the anticipated production is only 31.57 MT (Tamil Nadu 20.40 MT; Gujarat 10.10 MT; Rajasthan 1.07 MT), leaving a shortfall of about 24.39 MT. This shortfall was 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. The year wise and state wise lignite production during the X Plan period is as under.

Year/Plan	Tamilnadu	Gujarat	Rajasthan	Total
Projected target	131.72	64.10	12.98	208.80
Actual Production				
2002-03	18.624	6.921	0.473	26.02
2003-04	20.556	6.724	0.678	27.96
2004-05	21.567	8.222	0.548	30.34
2005-06	20.435	8.944	0.687	30.07
2006-07 (Anticipated)	20.400	10.100	1.070	31.57
Total X Plan	101.582	40.911	3.456	145.96

6.5.2 Lignite Productivity:

Trend of Man Productivity (OMS) of NLC during X Plan period is as under:

	(in tonnes)				
	2002-03	2003-04	2004-05	2005-06	2006-07
Target	9.16	9.81	9.43	8.91	8.66
Actual	9.24	9.83	10.41	9.84	9.55 (Up to Aug. '06)

Productivity in NLC, in terms of output per man per shift has steadily increased during the first three years of X Plan period and decreased in the year 2005-06 and however improved in the terminal year and expected to further improve in the coming years.

6.5.3 Lignite Demand:

The demands for lignite comes mainly from power sector and to some extent from other sector viz. cement, textiles, chemicals, paper industries etc. The lignite demand as projected in X Plan document in the country at the end of X Five year Plan (2006-07) period is 57.786 MT ((Tamil Nadu 35.86 MT; Gujarat 16.27 MT; Rajasthan 5.65 MT, (Power Sector – 49.34 MT and Other

sector – 8.45 MT)) against which the actual demand was only 32.40 MT (Tamil Nadu 20.24 MT; Gujarat 11.09 MT; Rajasthan 1.07 MT). The shortfall in demand was mainly from power sector due to non-starting of the following lignite based power stations in all the three states in Tamilnadu, Gujarat & Rajasthan.

Non-starting of both the Jayamkondam and Srimushnam projects in Tamilnadu under private sector and delay in commissioning of NLC's Second TPS expansion project.

(a) Non-starting of GPCL's Ghogha power plant and GIPCL's expansion project at Mangrol in Gujarat.

(b) Non- starting of the power stations listed below in Rajasthan.

1. **2X250 MW power station at Barsingsar in Bikaner District**
2. **1X125 MW power station at Giral in Barmer District**
3. **1X125 MW power station at Hadla-Raneri in Bikaner District**
4. **1X50 MW power station at Matasukh in Nagaur District**

Against the projected installed capacity of 6380 MW at the end of X Plan, the capacity available at the end of X Plan is only 3594 MW. Lignite based capacity addition in power sector envisaged by Ministry of Power as per X Plan document Ministry of Coal is 2285 MW {TN – 960 MW (NLC-710 MW, STCMS-250 MW), Gujarat – 825 MW, Rajasthan –250 MW}

Against this, the actual addition is only 835 MW {TN – 460 MW (NLC-210 MW, STCMS-250 MW), Gujarat – 250 MW, Rajasthan –125 MW}. Due to the shortfall in lignite demand, the shortfall in production has not caused any major impact.

6.6 Lignite Demand Perspective (XI & XII Five year Plan):

After reviewing the performance of lignite sector during the X plan and considering the need to increase the share of lignite based power generation capacity in the country, the Working Group 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 XI plans & XII plans. The Working Group has estimated the anticipated installed capacity of lignite based power stations at 5819 MW at the end of XI plan and 9569 MW at the end of XII plan against the installed capacity of 3594 MW at the end of X Plan. Of the 5819 MW estimated, shares of Tamilnadu, Gujarat and Rajasthan are 3240 MW, 1554 MW and 1025 MW respectively. While 1000 MW will be added by NLC, RVUNL will add about 400 MW and the balance about 825 MW will be added by GEB, GIPCL & GPCL in Gujarat. The state wise anticipated additional installed capacity during XI and XII Plans is as under.

State	INSTALLED LIGNITE BASED POWER CAPACITY IN MW				
	At the end of X Plan	Projected Addition during XI Plan	At the end of XI Plan	Projected Addition during XII Plan	At the end of XII Plan
Tamil Nadu	2740	500	3240	2000	5240
Gujarat	729	825	1554	1250	2804
Rajasthan	125	900	1025	500	1525
Total	3594	2225	5819	3750	9569

With the above projected installed capacity and anticipating increased demand for lignite from other sectors, the Working Group has projected the total lignite demand at 231.30 MT for XI plan. The demand projected at the terminal year of XI Plan and XII plan are 55.926 MT and 87.934 MT respectively. The state wise and sector wise details are as under

Fig. in MT

	XI PLAN					XII PLAN
State	2007-08	2008-09	2009-10	2010-11	2011-12	2016-17
Tamil Nadu	20.407	21.398	24.288	24.577	24.516	38.096
Gujarat	13.300	15.450	17.410	19.750	23.730	37.830
Rajasthan	2.130	4.052	5.960	6.652	7.680	12.008
Total	35.837	40.900	47.658	50.979	55.926	87.934

Fig. in MT

	XI PLAN					XII PLAN
Sector	2007-08	2008-09	2009-10	2010-11	2011-12	2016-17
Power	27.557	31.350	36.898	38.949	42.456	68.264
Others	8.280	9.550	10.760	12.030	13.470	19.670
Total	35.837	40.900	47.658	50.979	55.926	87.934

Details of lignite based power projects planned for capacity addition along with their lignite requirement are detailed in **Annexure-6.1**.

6.7 Lignite Production Perspective (XI & XII Five year Plan):

Having estimated the lignite demand, the Working Group has estimated total lignite production at 223.993 MT for the entire XI plan and the availability at the terminal year of XI plan and XII plan are projected at 54.203 MT and 89.58 MT respectively. The state wise projected lignite production during XI Plan and at the terminal year of XII Plan in the country i.e. in the states of TamilNadu, Gujarat and Rajasthan is given below:

Fig. in Mt.

	XI Plan					XII Plan
State	2007-08	2008-09	2009-10	2010-11	2011-12	2016-17
Tamilnadu	20.05	21.20	24.225	24.225	24.225	37.82
Gujarat	11.35	14.10	16.40	19.27	22.26	32.06
Rajasthan	1.90	4.20	6.185	6.685	7.713	19.69
Total XI Plan	33.30	39.50	46.810	50.18	54.203	89.58

The incremental Lignite production projection in XI Plan is 24.283 Mt. and in XII Plan is 35.377 Mt. The mine wise anticipated lignite production during XI Five Year Plan and at the terminal year of XII Plan in the states of Tamil Nadu, Gujarat and Rajasthan is given in **Annexure-6.2**. The projected availability is just sufficient to meet the anticipated demand at the terminal year of XI

Plan. To achieve the projected availability, new lignite mines in all the three states are planned.

6.8 Capital Investment in Lignite Sector:

After assessing the anticipated lignite demand and production the Working Group has also assessed the investment required to be made by the developers to undertake the projected proposals. As per the assessment made, a total of about Rs.21678 crores is required to implement the planned projects during the XI five year plan. Of Rs. 21678 crores, the on-going projects of NLC require about Rs.3546 crores and balance Rs.18132 crores is required for the remaining new/expansion projects. Of 21678 crores, the equity/Internal resources requirement is Rs.7151 crores and balance Rs.14527 crores is loan component. The share of NLC, PSUs of Gujarat and Rajasthan in the total investment are Rs.14868 crores, Rs.4911 crores and Rs.1899 crores respectively. The share of mining sector and power sector are Rs.3751 crores and Rs.17927 crores respectively. The state wise and project wise details of investment required for undertaking various mining and lignite based power projects are given in **Annexure-6.3**.

Additionally NLC has assessed an amount of Rs.176 crores requirement towards Mine IA, TPS – I Expansion, Science & Technology, Geological Investigation and others spill over payment (land) etc. during the XI Plan. Including this, the investment required by lignite sector during the XI Plan is Rs. 21854 crores.

6.9 Bilateral Collaboration:

There is no proposal for Bilateral Collaboration in Lignite Sector.

6.9 New Development In Lignite Sector:

• Coal Bed Methane:

The target areas for CBM are mostly deep lying deposits containing higher rank coals which provides conducive condition for generation / storage of methane. However, successful recovery of methane in Powder River Basin in USA from thick extensive lignite to sub-bituminous coal deposits occurring at shallow depth has given new dimension to exploration strategy. The lignite deposits of Tamilnadu/Pondicherry, therefore, can be considered under such category for taking up further investigation for methane potentiality. Since documented information is limited to only Powder River Basin, how best a Lignite deposit qualifies for methane exploration is largely dependent on the extent that deposit is comparable to methane producing Powder River Basin Comparing Neyveli Lignite with Powder River Basin, many similarities exists in respect of several vital characteristics suggesting possible presence of methane in the Neyveli deposit. In this regard detailed analysis and exploration programme are necessary before arriving the suitable decision.

• Under Ground Gasification:

NLC is also actively considering exploiting the lignite deposits which are constrained by various techno economic feasibility factors, through alternative/clean coal technologies such as Underground coal Gasification and Coal Bed Methane. NLC has already taken up a UCG project under funding from Coal S&T and Department of Science and Technology (DST) grant. A suitable lignite block in Rajasthan is being selected for under ground gasification.

6.11 Emerging issues in the development of lignite in the XI plan:

- As on 31.3.2006 only 10.9% of the total lignite reserves are brought under proved category which could be taken for projectisation while the balance are still under the inferred and indicated category. There is an urgent need for expediting the process of exploration with the participation of private sector for development and exploitation.
- The states where lignite is available are devoid of coal deposits. Further, no lignite based power station in the country has so far starved for want of lignite and there remains still unsatisfied demand. In the case of coal, there were instances where power units starved during the critical period for want of adequate supply of coal. Hence a policy decision to install more nos of lignite based power stations in comparison to coal based stations. This would increase the usage of lignite to avoid unnecessary transportation of coal over long distances which otherwise cause strain on the existing transportation system and increase the price of end product.
- Only pithead power stations may be recommended since transportation of lignite over long distances is difficult.
- The lignite available in the States of Rajasthan and Gujarat to a larger extent and to some extent in Tamilnadu has higher sulphur content, which forces to go for some environment friendly technology boilers because of environmental stipulations. Presently only one technology i.e. Circulating Fluidised Bed Combustion technology is available to take care of higher SO₂ emissions. More R&D efforts to be taken to explore alternative and cost effective technologies to combat SO₂ emissions in lignite based boilers.

Chapter – 7

INVESTMENT INCLUDING FOREIGN DIRECT INVESTMENT

- 7.1 The NDC had approved capital outlay of Rs.31591.00 Crs. For Ministry of Coal for Xth Plan period. During the Mid Term review, the overall outlay of the Ministry of Coal has been revised downward to Rs.18652.20 Crs Fund allocation and actual expenditure including departmental schemes, in IXth Plan and approved outlay of Xth Plan as per original document & MTA are as under :

Sector	Ninth Plan		Tenth Plan	
	Approved Outlay	Actual Expenditure	Approved Outlay	Revised in Mid Term Appraisal (MTA)
• Coal & Lignite *	17975.23	12549.66	23583.36	15659.29
• NLC (Power)	1866.36	1055.30	8007.64	2992.91
Total MOC *	19841.59	13604.96	31591.00	18652.20

Note : * Including Departmental Schemes of MOC

Company-wise details are as under :

Company	Ninth Plan		Tenth Plan		
	Approved by NDA	Actual Expenditure	Approved Outlay	Revised in Mid Term Appraisal (MTA)	Anticipated Expenditure
• CIL	12401.00	8632.19	14310.00	10975.13	7100.00
• SCCL	1635.00	935.79	2113.00	1550.00	1579.05
• NLC – Mines	2581.80	2097.14	6125.84	2130.26	1113.73
• NLC – Power	1866.36	1055.30	8007.64	2992.91	1067.85
TOTAL NLC	4448.16	3152.44	14133.48	5123.17	2181.58
• Dept. Schemes	757.43	884.54	1034.52	1003.90	NA
TOTAL MOC	19841.59	13604.96	31591.00	18652.20	

Company-wise capital expenditure made during IX & X plan is given below:

Fig Rs Crores

Company	IX Plan	X PLAN		
	Actual Expenditure	Approved by NDA	Mid Term Appraisal	Antic. Expenditure
ECL	650.10	1460.00	1363.17	650.00
BCCL	555.40	1300.00	995.39	750.00
CCL	973.93	1250.00	1620.00	1300.00
NCL	2121.43	2750.00	2325.00	1320.00
WCL	1307.73	1435.00	977.85	1020.00
SECL	1726.14	3520.00	1859.33	1240.00
MCL	1233.70	2500.00	1650.00	780.00
NEC/CIL/ CMPDIL	63.76	95.00	184.39	40.00
OVERALL CIL	8632.19	14310.00	10975.13	7100.00
SCCL	935.79	2113.00	P 1550.00	1580.00
NLC- Mines	2097.14	6125.84	2130.26	1113.73
NLC-Power	1055.30	8007.64	2992.91	1067.85
Total NLC	3152.44	14133.48	5123.17	2181.58

*Note : Source: Mid-term appraisal of Xth Five Year Plan

7.2 Coal India Limited

Estimated projection of incremental coal production from CIL is 156.70 Mts in XI Plan as against anticipated increase of 84.15 Mt in X plan and 29.02 in IXth Plan. Company wise tentative capital investment estimation with part outsourcing assumptions are as under:

Company	Total XI Plan (Rs Crs)
ECL	1850
BCCL	1250
CCL	1990
NCL	4000
WCL	1375
SECL	3085
MCL	2125
NEC/ CMPDIL/DCC/CIL(HQ) etc.	200
Overall CIL	15,875

Bilateral Collaboration :

No project has been identified for Bilateral Collaboration in CIL.

Foreign Exchange Components

Foreign exchange component of above investment proposal of CIL estimated by following companies are as under :

ECL	:	For 3 continuous miners sets at 3 projects (Jhanjra, Sarpi & Khottadih)	Rs.145 Crores
		For PSLW face at Jhanjra project	Rs.235 Crores
BCCL	:	For continuous miner at Block-II UG mine	Rs. 35 Crores
		2 PSLW sets at Moonidih project	Rs.165 Crores
SECL		Dipka Expansion	Rs 250 Crores
		Gevra OC	Rs 550 Crores

- 7.3 SCCL - To achieve an increase of production to 40.80. Mt. in the terminal year of Eleventh plan (2011-12), SCCL has projected investment requirement of Rs.3340 Crore during XI plan and year wise break-up is as under:

Year	Amount (Rs Crores)
2007-08	570.50
2008-09	665.00
2009-10	580.50
2010-11	632.00
2011-12	892.00
Total XI Plan	3340.00

Bilateral Collaboration and Foreign Exchange Components:

No project has been identified for Bilateral Collaboration. However, certain equipment will be imported which will entail Foreign Exchange Outgo. The foreign exchange component of such investment has been estimated at Rs.560 crore.

- 7.4.1 A total amount of about **Rs.21678** crores is assessed during the XIth five year plan. For on-going projects Rs.3546 crores and Rs.18132 crores for New/expansion projects. The share of NLC, PSUs of Gujarat and Rajasthan in the total investment are **Rs.14868 crores**, Rs.4911 crores and Rs.1899 crores respectively. The share of mining sector and power sector are Rs.3751 crores and Rs.17927 crores respectively. Additionally NLC has assessed an amount of Rs.176 crores requirement towards Mine IA, TPS – I Expansion, Science & Technology, Geological Investigation and others spill

over payment (land) etc. during the XI Plan. Including this, the investment required by lignite sector during the XI Plan is **Rs. 21854 crores**.

Agency wise Investment

NLC Ltd.	Rs 14,868 Crs. (+176 crores for completed projects & others)
Gujarat (other than NLC)	Rs 4,911 Crs
Rajasthan	Rs 1,899 Crs

Financing pattern – An amount of Rs.7151 crores will come from internal resources and balance Rs.14527 crores from commercial borrowing.

7.5 Capital investment requirement for other schemes of coal sector:

For implementation of various schemes, XI Plan capital requirement are summarised as under :

■ Information Technology

CIL

o Set-up of IT infrastructure	:	Rs.224.50 crores
o Extension of coal net application	:	Rs. 67.56 crores
o Introduction of GPS based TDS	:	Rs.210.00 crores
o Environmental monitoring and control	:	Rs. 20.00 crores
o IT application for mine safety	:	Rs.139.00 crores
o Other IT activities	:	Rs. 58.80 crores
Total		Rs.719.86 crores

SCCL : Rs. 66.00 crores

NLC : Rs. 78.00 crores

Grand Total (to be funded by Company) : **Rs.863.86 Crs.**

■ Research and Development

o S&T projects of coal sector	:	Rs.176.00 crores
o S&T projects of Lignite sector	:	Rs. 43.17 crores (MoC – 38.40, NLC- 4.77)
Grand Total	:	Rs.219.17 Crs.
(to be funded by MoC –Rs 214.40)		

■ Implementation of safety measures

o For coal sector	:	NA	:
o For Lignite sector	:	Rs.17.40 crores	
Grand Total	:	Rs. 17.40 Crs	
(to be funded by Company)			

■ Environmental management

o CIL	:	Rs.676.50 crores
o SCCL	:	Rs. 25.07 crores

- o NLC : Rs.191.87 crores
- Total (to be funded by Company): **Rs.893.44 Crs.**

- Exploration of coal and lignite
 - o Promotional exploration : Rs.383.50 Crs.
 - o Regional exploration : Rs.195.00 Crs.
(to be funded by Ministry of Mines)
 - o Detailed exploration
to be funded by MoC : Rs.1269.69 Crs
 (Non CIL coal block – Rs.1236.95 crores including coal core analysis
 capacity creation of Rs 3.50 crs) (Non NLC lignite block-Rs.33.00 crores)
To be funded by Mining Companies
 Exploration in Coal blocks : Rs.409.93 Crs.
 Exploration in Lignite blocks : Rs. 44.00 Crs.
Grand total : Rs.2302.12 Crs.
- Rehabilitation and control of Fire and Subsidence : **Rs. 4622.00 Crs.**
- Schemes under CCDA : **Rs 1665.60 Crs**
 (Stowing & Protective works Rs 692.95 crs
 Road & Rail infrastructure Rs 972.65 Crs)

Grand Total

- Departmental schemes of MoC : Rs. 7702.00 Crs
(to be supported through domestic budgetary support)
- to be funded by Mining Companies : Rs. 2233.40 Crs
(included in the proposed PSU investment proposal)

The capital outlay projected for the XI Plan is summarized as under: -

Sl. No.	Company	Amount (Rs. Crores)
1.	Coal India Limited	15,875
2.	Singareni Collieries Co. Limited	3,340
3.	Neyveli Lignite Corporation Limited – Lignite Mines	2801
	- Coal Mines	25
4.	Neyveli Lignite Corporation Limited – Power(Lignite)	7948
	NLC Coal Based Power	4094
	X Plan Spill over payment	176
	NLC – TOTAL	15,044
	TOTAL PSU	34,259
5.	Dept. Schemes of MoC (to be funded through domestic budgetary support) Exploration – Rs 1653.44 Crs, R&D – 214.40 Crs, EMSC/Jharia Action Plan – Rs 4622 Crs, CCDA- Rs 1665.60 Crs	1200
Total		Rs.35459 Crs

The proposed Public Sector investment for the XI Plan for supporting their production plans is Rs. 34.259 crore (CIL Rs.15,875 crore; SCCL Rs.3340 crore; NLC Rs. 15,044 crore (including Rs. 176.00 Crs. for the ongoing projects – NLC Mines Rs.2,993 crore; NLC Power Rs. 12,051 crore). The outlay proposed for coal PSUs for the XI Plan is about 115% more than the X Plan outlay (MTA) of Rs.15835.15 crore.

The proposed outlay for departmental schemes to be supported through domestic budgetary support is Rs. 7702 crore (Promotional Exploration Rs.383.50 crore; Detailed Drilling in non-CIL blocs Rs.780 crore; Detailed Drilling in non-NLC blocks Rs.33 crore; Coal Core Analysis Capacity Creation Rs.3.5 crore; (total exploration outlay Rs.1200 crore); R&D Rs.214.40 crore; EMSC/Jharia Action Plan Rs.4622 crore; and schemes under CCDA Rs 1665.60 crore - comprising of Rs. 692.95 crore for stowing and protective works and Rs. 972.65 crore for road and rail infrastructure).

Thus the total plan outlay proposed for MOC for the XI Five Year Plan is Rs. 41961 crore (Rs. 34259 crores for PSUs+ Rs. 7702 crores for Departmental Schemes through domestic budgetary support).which is 125% more than the X Plan outlay (MTA) of Rs. 18652.20 crore.

7.5 Projected Resource Position for XI Five Year Plan (2007-2012)

The estimated internal and extra budgetary resource (IEBR) position of the PSUs under Ministry of Coal for the XI Plan Period is tabulated below:-

(Fig. in Rs. crores)

Companies	IR	EBR	IEBR	Plan Outlay
CIL	51241.55	301.00	51542.55	15875.00
SCCL	(-)1347.20	4687.50	3340.30	3340.00
NLC	4636.43	10407.49	15043.92	15044.00
Total	54530.78	15395.99	69926.77	34259.00

Against the estimated IEBR position of Rs. 69,926.77 crore the proposed plan outlay of PSUs is Rs.34,259 crore. While the resource position of SCCL and NLC is just sufficient to meet the plan outlay there is a huge surplus in the resource position of Coal India Ltd. and the company has to consider productive investment of the surplus resources through feasible diversification plans.

Besides, the above investment projection for Public Sector and Departmental schemes of MOC, additional investment is required in coal sector for development of captive blocks and washeries. So far, 123 blocks have already been allotted in coal sector. It is expected that about 60 of these blocks would start production and projected production in the terminal year from these blocks is 104 Mt. From the present trend of investment pattern, it is expected that around Rs.10,000 Crores would be required for development of these blocks. Further, an investment of Rs 2200 Crs would be required for establishing the envisaged addition of about 140 Mty washing capacity.

CHAPTER- 8

COAL, LIGNITE AND COAL BED METHANE EXPLORATION

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 X PLAN

Regional / Promotional Exploration: Against a target of 2.04 lakh meters for Regional Exploration, 1.69 lakh meters (82%) of drilling is expected to be achieved and 11.77 Bt of coal resources and 1.36Bt of lignite resources are likely to be established. In Promotional Exploration, against a target of 6.00 lakh meters (revised to 6.90 lakh m) of exploratory drilling, 6.88 lakh meters (99%) is expected to be achieved, establishing 19.78 Bt of coal and 17.53 Bt of lignite resources. The established resources include the resources which have been re-categorised to enhance the confidence level.

Detailed Exploration: Against a target of 6.18 lakh meters in CIL areas, 5.14 lakh meters (83%) of exploratory drilling will be achieved and 8.00 Bt of reserves are projected to be 'Proved' during X Plan. In SCCL area, 2.35 lakh meters of drilling (87%) will be achieved against a target of 2.70 lakh meters, establishing 0.91 Bt of reserves. In Non-CIL areas, 2.83 lakh meters of drilling against a target of 2.83 (revised) is envisaged to be carried out establishing 7.06Bt of coal reserves by the end of X Plan. In addition 0.48Bt of reserves are envisaged to be 'Proved' by different agencies in their own blocks against exploratory drilling of 1.0 lakh m.

A summary of the Programme and Progress of work during X Plan is given in **Annexure- 8.1.**

About 19Bt of coal resources have been accredited to the inventory and almost 8.5Bt of resources have been brought to 'Proved' category during the first 4 years of the X Plan.

8.3 REVIEW OF INTEGRATED COAL AND LIGNITE RESOURCE INFORMATION SYSTEM

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

8.4 REVIEW OF CBM EXPLORATION

On approval in Oct, 2004, the desorption studies were taken up and 30 boreholes are likely to be tested for CBM during X Plan. The study will continue in XI Plan.

8.5 ALLOCATION OF FUNDS DURING X PLAN

Regional Exploration: The funding of Regional Exploration for coal and lignite was not covered in the X Plan by the MoC and hence, the same is not being reviewed here.

Promotional Exploration: During Mid-Term review of X Plan, the financial outlay of the scheme was revised to Rs 261.55 crores against the originally approved expenditure of Rs 275.80 crores. The cost of Coal data base project was revised (lowered) due to free supply of data by GSI. However, the drilling meterage was revised from 6.0 Lakh m to 6.90 lakh metres. A sum of 10% of the above estimates is required for NE region and is likely to be deducted. Against Rs 183.79 crores released by MoC till August, 2006, a sum of Rs 165.62 crores have been utilized.

Detailed Exploration in CIL/SCCL: An estimated expenditure of about Rs416.89 crores will be made by CIL and SCCL towards Detailed Exploration in X Plan. The details of expenditure in respect of private coal companies are not available

Detailed Exploration in Non-CIL Blocks : MoC approved the expenditure of Rs.70.66 crores for undertaking 2.13 lakh metre of Detailed Drilling in Non-CIL blocks. There was spurt in demand of drilling in Non-CIL/Captive Mining blocks and a revised cost estimate of Rs.93.84 crores was submitted and approved for conducting 2.83 lakh m of drilling. A sum of Rs 76.71 crores have been utilized so far and the balance will be consumed in 2006-07.

8.6 STATUS OF PROJECTISATION AND MEETING OF PRODUCTION NEEDS OF X PLAN AND SUBSEQUENT PLANS.

The Coal Resource Status: The summary of the Inventory of coal reserves as on 1.1.2006 incorporating exploration results of 4 years of X Plan is given below and coalfieldwise details are given in **Annexure- 8.2**.

Prognosticated Potential area (sq km)	Approximate Area covered by Regional Exploration (sq km)	Approximate Area covered by Detailed Exploration (sq km)	Proved (Mt)	Indicated (Mt)	Inferred (Mt)	Total (Mt)
17303*	11992	5568	95866	119769	37666	253301

*Tentative estimates

The Lignite Resource Status: As on 1.04.2006 the inventory of lignite resources stands at 38.27 Bt with 4.476 Bt in 'Proved' category. The details are provided in Annexure- 8.3.

8.7 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
XI Plan (011-012)	493	164	657	*Includes coking coal
XII Plan (016-017)	656	221	877	
XIII Plan (021-022)	814	299	1113	
XIV Plan (026-027)	1133	408	1541	
XV Plan (031-032)	1478	562	2040	

The exploration requirement for the production needs of non-coking coal during XI and XII plans have almost been met. For the XIII Plan, however, Detailed Exploration in XI Plan in Non-CIL blocks will be required to fill in the gap of production requirement.

The production of coking coal will, however, will remain short of the demand.

The Detailed Exploration in CIL and SCCL areas will be required during the XI Plan period for meeting the production demand of the XIII Plan and beyond.

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

The Detailed Exploration in lignite in XI Plan will contribute for the production requirement of the XI & XII plans.

8.8 EXPLORATION PROGRAMME FOR XI PLAN FOR COAL AND LIGNITE

Regional Exploration : The programme for Regional Exploration with 1.94 lakh meters of drilling in coal and 0.10 lakh meters of drilling for lignite by GSI has been drawn up. GSI will be able to establish resource base of about 9.90 Bt in coal and 0.15Bt in lignite.

Promotional Exploration : A programme comprising 4.0 lakh meters of drilling in coal and 3.5 lakh meters in lignite has been drawn up. About 1720 sq.km. area will be covered in coal and a resource of about 20.0Bt is likely to be established. In lignite, 4.06 Bt of resources will be established covering an area of 2600 sq km.

Detailed Exploration : Keeping the production requirement beyond the XII Plan in view, programme has been drawn up with 5.0 lakh meters of drilling, each in CIL and SCCL areas. It is expected that 14.0 Bt of coal reserves will be established through Detailed Exploration. Similarly, a programme for Detailed Exploration for lignite involving 1.33 lakh meters of drilling has been drawn up for XI Plan.

10 lakh metre of exploratory drilling has been assessed in 32 Non-CIL blocks to be undertaken during XI Plan to bring around 10.75 Bt of coal resources under 'Proved' category. Due to limited capacity available only 0.90 lakh m of drilling in blocks under exploration/partly explored will be taken up by CMPDI and remaining 9.10 lakh m to be outsourced.

In addition 41 unexplored blocks 'de-reserved' by MoC for allotment to private agencies, with around 11.5 lakh m envisaged exploratory drilling, are to be explored in detail by allottees as per stipulations of MoC. 28 blocks identified by MoC for allocation to Govt. PSUs / State Govts will require almost 21.3 lakh m of exploratory drilling. Only around 3.36 lakh m of drilling in the blocks identified for Govt. PSUs / State Govts may be taken up by CMPDI and the rest of the drilling will have to be arranged by PSUs / State Govts from other sources. There is a need for scheme of detailed exploration in non-NLC areas. 1.0 lakh m. of drilling is proposed in 8 Non-NLC blocks which can be considered for immediate exploitation by agencies other than NLC.

Developmental Exploration : Programme for 3.27 lakh meters of Developmental Exploration has been drawn up in CIL, SCCL, NLC and other areas.

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

given below:

Exploration stage	Agency		Area Coverage (Sq km)	Projected Drilling in XI Plan (Lakh m)	Resources to be Established in XI Plan (Bt)
Preliminary	GSI	No requirement of Drilling & no resource to be established as per nature of work			
Regional	GSI	Coal	758	1.94	9.9
		Lignite	150	0.10	0.15
Promotional	GSI, MEC & CMPDI	Coal	1717	4.00	20.0
		Lignite	2606	3.50	4.10
Total Regional + Promotional		Coal	2475	5.94	29.9
		Lignite	2756	3.60	4.25
Detailed (Coal)	CMPDI	CIL Areas	409	5.0	11.8
	SCCL	SCCL Area	166	5.0	2.2
	CMPDI/Outsourcing	Non CIL	261	10.0	10.75
	Allottees	Blocks de-reserved	416	11.48	13.0
	CMPDI/St. Govts	Identified for St.Govts/PSUs	404	21.28	
Total Detailed Coal			1656	52.76	46.95
Detailed (Lignite)	NLC	Own area	NA	1.06	
	RSMML	Own area	NA	0.27	
	Outsourcing	Non-NLC	255	1.00	1.11
Total Detailed Lignite			2.55	2.33	
Developmental	CIL Areas			1.03*	
	SCCL Areas			1.5	
	NLC Areas			0.55	

Note : *Included in Detailed Exploration in CIL Blocks. Areas will be identified as and when required

8.9 CAPABILITIES OF EXPLORATION AGENCIES AND PRIVATE SECTOR PARTICIPATION

Detailed interaction with the existing exploration agencies viz. GSI, MEC, CMPDI, SCCL etc., all in the Govt. and Public Sector, indicates that these agencies have the full range of geological, drilling, geophysical, coal petrographic, geochemical, remote sensing, computer modeling and other capabilities. Although drilling is the most important activity involved, it can not be considered the beginning and the end in itself as proper conceptualization and modelling of the resource is essential to present a sound base for efficient and optimal exploitation with due consideration to conservation of this precious non renewable energy source.

However, the capacities are adequate only to meet the present level of coal/lignite exploration. Therefore, the manifold increase in detailed exploration in areas other than CIL will require outsourcing of jobs. The available capacities in private sector, however, lack adequate technical environment and facilities. The outsourcing of exploration to these agencies will, therefore, need close coordination and supervision by established exploration agencies in Govt. sector.

8.10 NEED FOR ENHANCEMENT OF CAPACITIES IN GOVT. PSUs

The agencies in Govt. Sector need to enhance their own capacities, particularly, in technical support system to cope with proposed enhanced exploration activities.

The available manpower with CMPDI, which is the nodal agency for detailed exploration for coal in the country, is not even adequate to meet the present work load. There is urgent need for substantial increase in geological manpower for technical support and supervision of exploration by other agencies

It is proposed to enhance capabilities of Geophysical surveys, such as, Seismic, magnetic, electrical and gravity, to help in assessment during XIth plan. Presently, there is no system of correlating these surveys vis-a-vis resources established, as they only assist in optimizing exploration through drilling.

8.11 MODERNISATION OF DRILLING FLEET BY CMPDI

CMPDI proposes to purchase of Hydrostatic drills with likely productivity of 1000m per month as against 330m per month of presently deployed machines. Replacement of old fleet is also planned. Qualified drilling manpower will be prerequisite for this attempt on revamping the drilling activities of CMPDI.

8.12 NEED FOR ENHANCING ANALYTICAL CAPACITIES

The existing capacity of laboratories for undertaking chemical analysis of coal cores is just sufficient to meet the present level of exploration. The quantum jump in the detailed exploration will require immediate enhancement in the existing capacities and development of additional facilities. CMPDI has proposed to enhance its capacity from 5,000m to 15,000m of coal core analysis in phased manner which will be of help only in a very limited way. For balance load, additional labs are required to be established.

8.13 EXPLORATION IN NORTH-EASTERN INDIA

The Coal deposits in the North-Eastern India occur in widely separated belts in the states of Arunachal Pradesh, Assam, Nagaland, and Meghalaya. The Tipong and Honju-Yongkhuk to Haflong-Disang Thrust in Makum Coalfield of Assam, area between Karnoi-Mahadeo rivers in Balpakram-Pendenguru Coalfield, areas between Rengdim-Rongkhai rivers and Nong- Nirang along the Wah river, areas west of Umleh river and around Liasang in Mowlong-Shella coalfield, and area south of Ghingpo along KuwenBurn in Namchik-Namphuk coalfield may have potential for future exploration. However, the terrain and forest cover imposes serious constraints in taking up these areas for exploration.

8.14 NEED FOR IDENTIFICATION OF PROGNOSTICATED & EXPLORED AREAS

The generation of voluminous geological data in different basins over many decades necessitates an in-depth basin-wise reappraisal of the coverage of exploration through a comprehensive joint exercise involving exploration agencies of Central and State governments. A document of this exercise needs to be brought out for future planning and reference, which must include a write-up indicating basis of computation and supporting plans. This exercise may be taken up under a specific scheme during the XI plan period.

8.15 NEED FOR SCHEME OF DETAILED EXPLORATION IN NON-NLC AREAS

There are 56 mineable lignite blocks, having 7500 Million tonnes of geological resources in various categories. Out of these, only 3320 MT reserves have been proved. Presently 29 blocks are being mined, are under implementation or have been identified for future development. From the remaining blocks of lignite within 150 m depth, 8 blocks with a total of 1.0 lakh metre of drilling are proposed for detailed exploration in under MoC funding.

8.16 ASSESSMENT OF CBM RESOURCES

The programme for XI Plan envisages CBM related test in 30 boreholes by CMPDI, apart from 15 boreholes spill over from X Plan. Similarly, GSI will take up 20 boreholes for CBM studies.

8.17 FINANCIAL OUTLAYS OF EXPLORATION PROGRAMME FOR XI PLAN

The total fund requirement of Preliminary/Regional, Promotional and Detailed Exploration in different coal, lignite and CBM prospects for XI Plan has been estimated at Rs.3195.07crores, including Rs 195 crores to be funded by Ministry of Mines for Regional Exploration to be conducted by GSI. Ministry of Coal is to provide Rs.1200.00 crores for Promotional Exploration and Detailed Exploration in Non-CIL/Non-NLC Blocks. A fund of Rs.209.93 cr. is required from CIL for Detailed Exploration in CIL blocks whereas SCCL will provide about Rs.200 crores for their blocks. NLC and RSMLL will spend about Rs.44 crore for detailed exploration.

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

Sl. No	Item	Scheme	Fund (Rs.Cr)	Proposed Source of Funding
A. To be Funded by Govt.				
1.	Promotional Exploration	Promotional Expl. - do - - do - - do - - do - - do -	184.86	MoC
	a) Coal Exploration		124.95	MoC
	b) Lignite Exploration		16.21	MoC
	c) Coal data base		8.98	MoC
	d) Lignite data base		10.15	MoC
	e) CBM Studies		38.35	MoC
	f) 10% for NE region			
Sub-Total			383.50	
2.	Regional Exploration	Regional Expl.	195	MoM
	a) Coal & Lignite		(Aprox)	
Sub-Total			195	
3.	Detailed Exploraion of Coal in Non-CIL Blocks	Detailed Exploraion in Non-CIL Blocks	780	MoC
4.	Detailed Exploraion of Lignite in Non-NLC Blocks	Detailed Exploraion in Non-NLC Blocks	33	MoC
5	Enhancement of capacity for coal core analysis		3.5	
	Total of A: Funded by Govt.			
	a) MOC		1200	
	b) MOM		195	
Total of A			1395	
B. To be Funded by Coal/Lignite Companies/St Govts,PSUs, Allottees				
1	Detailed Exploration in Coal		209.93	CIL
	a) CIL		200	SCCL
	b) SCCL		(Aprox.)	St.Govts/PSUs
	c) State Govts/PSUs		1346.14	
	d) Allottees		NA	
Sub-Total			1756.07	
2	Detailed Exploraion in Lignite		35(Aprox)	NLC
	a) NLC		9(Aprox)	RSMLL
	b) RSMLL			
Sub Total			44(Aprox)	
9999Total of B			1800.07	
Grand Total of A and B			3195.07	

MOC : Ministry of Coal, MOM : Ministry of Mines

T. L. Shankar Committee has recommended for a rolling fund of Rs 500crores for the purpose of undertaking detailed exploration in Non CIL Blocks. However considering the anticipated quantum of work the requirement has to be much more. Moreover the concept of revolving fund may not be practical as exploration cannot be a self sustaining activity. As such a policy decision for continuous funding for detailed exploration in Non CIL blocks will have to be taken.

8.18 THRUST AREAS

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. This has also been highlighted by High Power Committee (Headed by Shri TL Shankar). 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 structured on the UNFC pattern needs to be continued for their successful completion.

Detailed Exploration in the Non-NLC blocks: In view of the efforts needed to bridge the gap between the lignite demand and supply in the XII Plan and later, Detailed Exploration is envisaged in 8 Non-NLC blocks located in the states of Tamilnadu, Rajasthan and Gujarat with funding from MoC and technical supervision of NLC.

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.

CBM Exploration: The assessment of CBM resources needs to be continued in XI Plan.

Exploration in Forest Areas: More and more coal / lignite bearing areas remaining to be explored in future are likely to fall below forest land. There is a need to identify forest areas as 'Yes' and 'No' zones for exploration, if the nation is ready to sacrifice the coal/ lignite 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: CMPDI, SCCL and NLC are premier organizations in Detailed Exploration of coal / lignite. 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.

Modernisation of Drilling Fleet: 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, routine maintenance practices adhered to, spares stocking planned and training of personnel needs to be strengthened.

Need for Flow Information from Block Allottees: With the allotment of a number of regionally explored coal 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) in respect of exploration activities undertaken by these entrepreneurs to upgrade the resources for updating of the national inventory of coal.

Revolving Fund: T. L. Shankar Committee has recommended for a rolling fund of Rs 500crores for the purpose of undertaking detailed exploration in Non CIL Blocks. However considering the anticipated quantum of work the requirement has to be much more. Moreover the concept of revolving fund may not be practical as exploration cannot be a self sustaining activity. As such, a policy decision for continuous funding for detailed exploration in Non CIL blocks will have to be taken.

CHAPTER-9

INFORMATION TECHNOLOGY

To meet the information needs, Coal India and its subsidiaries have progressively and steadily used computers to meet the data processing needs for the individual organization. During 10th Plan, CIL took initiative to design, develop and implement customized ERP solution by way of Integrated CoalNet Application Software for uniformity and standardization across CIL. The Software has been implemented in CIL and subsidiary Hqs and under implementation in Areas. WAN has been established between CIL and subsidiary Hqs through VSAT. CIL has taken initiative for introduction of GPS based TDS System in 8 large O.C Mines and its procurement process in progress. Though considerable steps taken during 10th Plan, still more is required to bring state of the art technology up to colliery / project level.

SCCL has implemented various IT applications during the X plan as below:

- a) Employee personnel data – all transfers, promotions are through software.
- b) Minex – for Mine Planning.
- c) Auto CAD for maintenance of Mine Plans.
- d) Coal marketing and movement – Coal dispatch and production reports.
- e) Online material management: The transactions at all the stores are online. The internal purchase process is computerized. SCCL also started E-procurement on the Portal arranged by AP State Government.
- f) The software for preparation of Civil Bills developed in-house is implemented in some areas.
- g) Hospital management software is in implementation.
- h) Additionally, number of department specific stand along local applications is operative. With establishment of connectivity, steps are in progress to integrate these applications.
 - Online payroll, Financial Accounting System, Provident Fund accounting system, Personnel Information System and MIS have been implemented using Oracle Database and using Fibre Optic Network.
 - Computerized Attendance Monitoring System is implemented.

NLC has implemented various IT applications during the X plan as below:

- Implemented Integrated Voice and Data Fibre Optic Network (IVDFN) .
- Online Integrated Material Management System (OLIMMS) has been implemented.
- NLC website is hosted at NLC Web Server.

9.1 COAL INDIA LIMITED

Coal India is a holding company consisting of eight subsidiaries located in a geographically & widely distributed rough terrain. It operates around 480 collieries in remote forest area, sells over 280 million tones of twenty different grades of coal and makes an yearly transaction of above Rs 30000 crores. To meet the information needs and proper management of various functions of the organization, Information

Technology with state-of-the-art-facilities needs to be introduced at various levels *i.e.* from corporate level down to colliery/ project levels.

9.2 IT THRUST AREA IN 11TH FIVE YEAR PLAN

In view of Coal demand of 469 million tonne by the terminal year of 11th Plan (2011-12) a proper IT infrastructure needs to be established up to colliery/project level. Under the background, following thrust areas have been identified for introduction of IT in 11th five-year plan:

1. Infrastructure upto Colliery / Project Level: CIL has adopted Top Down approach of computerization of its various business functions and in the process IT infrastructure has been laid at subsidiary Hqs and has been extended / being extended up to area level. In order to capture Information / data at source *i.e.* where it is generated, proper IT infrastructure needs to be laid down at colliery/project level. This will require establishing LAN, providing Nodes of area servers at various points (including weigh bridges, work shops etc) servers and 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.

2. Integrated CoalNet Application Software: The Software has been implemented in CIL, subsidiary Hqs and under implementation at 36 Areas of Coal India. This has introduced Uniform data and file structures, enhancement in MIS *etc.* For uniformity across Coal India, the software is proposed to be introduced in balance areas of CIL and to be extended to mine / project level. 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.

3. GPS Based Truck Despatch System: It is TOOL used world wide for maximizing equipment utilization/productivity. CIL has introduced the system in one of large O.C mines and is introducing the system in additional 8 large Open Cast Mines (above 5 mtpy). The procurement process is under progress. Equipment utilization in Open Cast mines is considerably low (36% for Dumper, 48% for Shovel) which is cause of concern and criticism. There being considerable scope of improvement in operational efficiency of HEMM, it is proposed to introduce the system in mines producing 2mtpy and above. There will be around **21 mines** above 2 mtpy. GM (Systems), SECL informed that procurement of Truck Despatch system for two projects in SECL is under process.

4. 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.

5. Integrated Safety, Production & Environment Monitoring and Control in Under Ground Mines : So far IT application has not been introduced in Under Ground 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. It is proposed to introduce the system in twenty large selected Under Ground mines in different subsidiaries of Coal India to start with.

6. Centralized Mail / Messaging System : At present there is no standardized mail/messaging system in CIL and subsidiary companies. Some users are created on rediff, yahoo, hotmail etc. There is no company identification associated with these e-mail addresses and it suffers various problems due to lack of security, no possibility for introduction of digital certification etc. Coal India Ltd has been allotted a domain name as coalindia.gov.in. It is proposed to implement standardized Mail Messaging System for Coal India as well as subsidiary 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.

7. Employee Welfare : As on date Identity Card with photo, Name, Employee No., Designation are 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 would be installed at CIL, subsidiary Hqs, Area, Projects/Collieries etc.

8. E-Governance : Though 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.

Considering the above IT Applications estimated expenditure has been given at Annexure-A and summarised here under:

Sl. No.	Items	Cost in Rs.Crore
1	Infrastructure Development at Colliery/ Projects and Area	224.49
2	Integrated Coal Net Application Software	48.40
3	GPS based TDS System	210.00
4	GIS center in each area	80.00
5	Integrated Safety, Production & Environment Monitoring and Control in Under Ground Mines	20.00
6	Centralised Mail Messaging System	10.00
7	Employee Welfare	10.00
8	e-Governance	10.00
9	Total	612.89

9.3 SINGARENI COLLIERIES COMPANY LIMITED

I. Future Strategy:

- 1) Elimination of conventional preparation of mine plans and complete use of Auto CAD software.
- 2) Advanced mine planning software "MINEX" and "AutoCAD" software will replace the conventional preparation of Feasibility Reports.
- 3) Digitization of all old Feasibility Reports, Mining Plans and other reports and storing them in electronic form.

II. IT activities proposed:

1) Mine Planning:

- a) Establishing CAD and special Mine Planning Software in all big Opencast Mines (+2.0 MTPA) and also in the Project Planning Department of SCCL.
- b) To establish latest software facility for Exploration and Survey Departments.

2) Mine Management:

- a) To implement UGMMS package developed in-house in major mechanized UG mines.
- b) To implement OCMMS package in all remaining Opencast Mines.
- c) OITDS (Operator Independent Truck Dispatch System), which is implemented at one opencast mine to be implemented in other selected opencast projects.

3) Personnel:

Employee personal data is stabilized. All transfers, promotions are being done through software. It is planned to extend the software to all the transactions with the employees.

4) Safety:

Web based software developed for capturing accident data from mines and it will be stabilized during the next 2 years.

5) Communication and Data transmission:

- a) To establish LANs in all the mines for online communication between mines and offices of General Managers in each Area.
- b) To establish WAN connectivity from all the mines to GM offices.
- 6) **Quality:**
In Stream automatic sampling in CSP with required computers with on-line linkage, if necessary, to Areas / Corporate Office.
- 7) **ERP:**
As a long term strategy to implement ERP to meet its IT requirements for some of the important modules like FI (Finance Accounting), MM (Material Management), SD (Sales and Distribution), Marketing and HR (Human Resources).

ALLOCATION OF FUND FOR IT FOR XI PLAN

					(Rs. In Crores)
2007-08	2008-09	2009-2010	2010-11	2011-12	total
20.00	10.00	10.00	12.00	14.00	66.00

9.4 NEYVELI LIGNITE CORPORATION LIMITED

The following areas are identified for introduction / enhancement of IT and e-Governance related activities:

1. **LAN & WAN Network to New Project Sites:**
NLC is involved in opening up New Lignite Mining Projects and Power Generation Projects in various parts of India. NLC has been identified as the Nodal Agency for the Lignite Deposit related activities in India by GOI.
2. **Maintenance Management System for Plant & Machineries:**
The system will improve the availability of the plant and equipment for the production activities and hence it has got direct impact on the productivity of the organization.
3. **Integrated Hospital Management System:**
The various modules of the Hospital Management System including Drug Inventory, Referral System, Inpatient Monitoring System, LABs, Billing and Accounting, Health Recording System, Industrial Health System, etc. are to be implemented.
4. **Biometric based Attendance Management System & Access Control System:**
It is planned to introduce advanced features including finger prints, hand geometry, etc. in the Attendance Monitoring System and Access Control Systems. Smart cards with employees details, blood group details, salary details, biometric details of the employees, eligible subsistence allowances, Hospital facilities availing limits, canteen usage limits and any other relevant data for the implementation of Smart Card based applications for effective administration of facilities as a part of e-Governance implementation. All possible activities will be taken up.

5. Central Data Centre Formation with DR Facilities, Portal implementation and Public Information Kiosk deployment :

Data are to be captured at the source on origination and organized in a database. Data redundancy is to be eliminated and accuracy of the data is to be assured. The database level and application level integration is to be carried out with necessary portal implementations. E-Tendering, e-Procurement, e-payment, e-recruitment, etc. are to be added to enhance the flexibility of the system. Suitable Disaster Recovery sites will be identified for implementing high secured IT implementation.

Security policy formulation is to be revised periodically in response with the threats and dangers sensed. Security policy administration has to be taken up with the latest well established security products contemporarily deployed in similar implementations.

6. Development of an Integrated R&D Online System:

7. Online safety Management:

8. E-Governance implementation:

NLC has been making longer strides in e-Governance implementation in the field of fast advancements of IT field. NLC is planning to move towards the paperless office by implementing Office Automation Systems.

The system has to cater to the needs of the employees of the organization, general public, concerned Ministries, Government Organisation, etc. for speedy services, easy accessibility, affordability, and user friendliness with necessary interactivity. A trusted working environment has to be established with convenience, cost and time savings.

9. Mine Planning, Afforestation, Land reclamation and Ground Water Management System - Lignite database implementation, maintenance, operation and administration:

NLC has been identified as a central nodal agency to look after the exploitation of Lignite reserves for the efficient use and power generation purposes in all parts of India. The Lignite database is to be updated and revised with every new input and it should be made available to the various Mines at national level as per Government guidelines. The lignite exploration data from the concerned agencies relating to various zones and deposits will be taken up in the Lignite database formation. The Mine Planning activities for each Mines and integrating for all Mines in a particular Lignite Deposit has to be carried out with the latest IT support tools and facilities. Centralized Mine Planning activities with concentration on land reclamation, rejuvenation and afforestation has to be taken up and carried out as per Ministerial guidelines. GPS System has to be integrated with the Mine Surveying Model.

COST ESTIMATES

Rs. In Lakhs

Sl. NO.	Item	2007-08	2008-09	2009-10	2010-11	2011-12	Total
1	LAN & WAN Network to New Project Sites	300	200	200	200	200	1100
2	Maintenance Management System for Plant & Machineries	500	-	300	-	200	1000
3	Integrated Hospital Management System	100	50	50	50	50	300
4	Biometric based Attendance Management System & Access Control System	200	100	100	100	100	600
5	Central Data Centre Formation with DR Facilities, Portal implementation and Public Information Kiosk deployment	700	200	200	200	200	1500
6	Development of an Integrated R&D Online System	30	20	10	10	10	80
7	Online safety Management	10	-	-	10	-	20
8	e-Governance implementation	500	500	300	300	500	2100
9	Mine Planning, Afforestation, Land reclamation and Ground Water Management System – Lignite database implementation, maintenance, operation and administration	100	150	150	150	150	700
10	Technical Support	400	-	-	-	-	-
	TOTAL	2840	1220	1310	1020	1410	7800

CHAPTER-10

RESEARCH & DEVELOPMENT

10.1 The three pronged approach for Research and Development in coal viz coal S&T Programme under the Standing Scientific Research Committee (SSRC), inhouse Research and Development programmes of Coal Companies and Inter-Sectoral Research Technology Advisory Committee (IS-STAC) has been adopted during the X Five Year Plan. R&D in coal is carried out under four broad areas namely production, productivity and safety; coal beneficiation; coal utilisation; and environment and ecology. The major thrust areas identified for R&D in the X Plan have been coal gasification, coal washing, beneficiation low volatile coking coals, coal liquefaction, fluidised bed combustion, sequestration of carbondioxide etc. Despite the thrust laid on coal S&T the progress has not been satisfactory both in taking up new projects or in utilising the outlays provided to various projects. Some of the high value projects like pilot project for washing, low volatile medium coking coal, demonstration project for coal bed methane exploitation and utilisation assisted by UNDP/GEF have not been progressing satisfactorily.

10.2 However, some progress has taken place in formulating an R&D Project on capacity creation for CMM activity by CMPDIL which is proposed to be funded through CIL R&D Board. Regarding coal beneficiation the earlier sanctioned pilot washery for LVMC coals has been dropped due to cost implications. Coal India, SCCL and NLC have entered into MoU with ONGC for developing underground coal gasification. ONGC in turn has a tie up with SIT Moscow for technical assistance. NLC has taken up an R&D project for gasification of lignite seams in Rajasthan.

10.3 Some of the other areas where progress has been achieved through R&D efforts are as follows:

- **Cable bolting** for extraction of thick coal seams (5 to 8 m).
- **Rock mass rating (RMR)** for underground roof support design.
- **Ground Penetration Radar (GPR)** for detection of old waterlogged mine workings (under upgradation).
- **Controlled blasting** in opencast mines near surface structures.
- **Mine Fire Model Gallery** for study of fire suppression techniques.
- Development of different types of **steel props/chocks**.
- Studies on strata behaviour leading to large-scale adoption of roof bolts.
- Development of **Microprocessor based controller** for coal haulers.
- Minimizing the loss of fines through optimization of circuits of **fine coal beneficiation**.
- **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** Leaching effects of fly ash as mine fill on underground water.

10.4 Status of X Plan Projects

Sl. No.	Details	Nos.
1	Projects completed before June 2006	13
2	Projects likely to be completed before the end of X Plan	6
3	Projects spilled over to XI Plan	5
	Total	24

10.5 Status of S&T projects taken up during IX & X Plans:

Particulars	Plan		
	IX	Xth	
		Upto 31.3.06	Anticipated
Projects completed	48	41	51
BE (in Rs. crores)	88.73	80	100
RE (in Rs crores)	40.60	46.81	61.81
Total fund utilized (Rs. in crores)	24.97	43.33	58.33
* mid term appraisal of Xth plan : Rs. 72.93 crores			

10.6 Future research projects :

The following areas have been identified for research activities -

Underground Mines:

- Mapping of UG old unapproachable abandoned mine workings
- Hard roof management by induced caving
- Development of mining method for thick, flat & inclined seams
- Support system for weak/clay roof strata
- Method of mining for deep seated seam under built up areas
- High capacity pre-tensioned roof bolts to create artificial breaker line during multi seam working by continuous miners
- Method of mining for multi seam workings
- Method of mining with fly ash stowing under built up areas

Coal Preparation:

- Application of multi gravity separator
- Development of simulation software for control of jigs to achieve optimum yield at desired ash level
- Development of zero emission coal combustion technology

Environment:

- Methodology for prediction of mine water quality
- Base line measurement of GHG emission in mine fire areas
- Use of tissue culture for conservation of plant species
- Software development for air quality prediction

Opencast :

- Studies on dump and high wall stabilities in opencast mines
- High Wall Mining

Safety:

- Communication system in case of miners trapped in underground mines
- Development of predictive models to determine the progress of fire in mine fire areas
- Establishment of integrated survey systems for UG and OC workings and OB dumps

New emerging areas:

- In-situ coal gasification
- Liquefaction of coal
- Carbon sequestration
- Underground gasification of coal after coal bed methane recovery from deep seated seams
- Coal Bed Methane reserves estimation.

10.7 Expansion of Research Base

In order to have wider involvement of institution in Coal R & D it is suggested to consider the followings -

- Invitation of expression of interest by open advertisement
- To involve private sector participation in R&D work
- To involve overseas institutions for R&D
- Need to encourage and to be brought out R&D activities in coal mining / beneficiation of other public and private sector organizations.
- It is suggested that the research scholars/ academicians/ coal sector employees pursuing Ph.D. in the emerging areas of mining and granted full financial assistance to help development of such practices in the coal and lignite sectors. This effort will supplement the research and development being undertaken by various agencies in coal and lignite sectors.

A. In-Situ Coal Gasification

The Underground Coal Gasification (UCG) is a process by which coal is converted in situ to a combustible gas that can be used as a fuel or chemical feedstock. UCG offers a potential economic means of extracting energy from deep-seated deposits, which will not be amenable for conventional physical extraction economically at present. The medium Btu gas can be used for power generation and can as well be used as a feedstock in the manufacture of methanol/ gasoline etc. CIL's vision for 2025 is to perceive underground coal gasification as technologically and economically viable eco- friendly method of extraction of energy from isolated and uneconomic coal deposits to augment the energy need from coal sector.

B. Coal liquefaction

1. Introduction:

Coal liquefaction involves conversion of coal into oil. Coal can be converted into liquid fuels like gasoline or diesel by several different processes.

There are following routes of converting coal to liquid fuel, extensive work has been done globally on –

- i. Indirect liquefaction by coal Gasification and subsequent conversion of synthesis gas to liquid products through Fischer-Tropsch process.
- ii. Direct liquefaction of coal by catalytic hydrogenation of coal based on Bergius-Pier process. This method has not yet been commercialized.

2. Status of Coal Liquefaction Project in India :

Several Expert Committees were constituted by the Government earlier in the 1970s and 1980s under the chairmanship of eminent Scientists and academicians to advise and recommend on the issues of coal to liquid fuels in the country. However, no further action could be taken.

3. Feasibility Study Report under UNDP :

In 1985, a Techno-Economic report was prepared by Fluor Engineers Inc., California under UNDP/UNIDO project for a plant size of 1 million tonne/year of liquid product based on indirect coal liquefaction technologies.

Two coal sources from Raniganj and Singrauli were found to be suitable. The feed coal analysis indicated in the report is as follows:

Moisture: 6%, Ash: 25%; VM: 30%; FC: 39%; Hydrogen: 3.97%

As per this report, about 6.6 tonnes of coal is required for production of 1.0 tonne of liquid fuel.

Direct Coal Liquefaction Technology: R & D Effort/Programme of Oil India Limited (OIL)

Oil India Limited (OIL), in pursuit of alternate source of energy **commissioned in 1999 its 25 kg/day processing capacity coal conversion pilot plant at Duliajan, Assam** in collaboration with Axens NA of USA.

As per the study carried out by Axens NA, **about 1.5 tonne of Assam coal shall be required to produce 1.0 tonne of liquid fuel.**

Though results of the pilot plant studies with Axens NA's Technology have been found very promising, it is considered necessary to carry out studies with other contemporary technology more suitable to the North East coal with better economics.

Accordingly, OIL is also **considering** taking up Techno-Economic Feasibility Studies for a commercial plant for converting Assam coal to liquid fuels based on technology of M/s HTI (Hydrocarbon Technologies Inc.) USA. For this purpose, desired coal quality is indicated as:

Ash: 5-10%; VM: 40-45%; Moisture: 2-3%; Sulphur: 1.5-6%; FC: 47% (approx). Such type of coal generally contains Hydrogen in the range of 5.4-6.3%.

4. Action Taken by MOC/CIL on Coal Liquefaction

Consequent to the visit of an Indian delegation to South Africa in January 2000, and in order to explore the possibility of setting up Coal Liquefaction Plant in India, a global

tender was floated in 2001 by CMPDI for setting up a coal liquefaction plant in India based on high ash Indian coals for a nominal capacity of one million tonne of liquid and gaseous products per year. No response was received consequent to the global tender.

On a separate enquiry with M/s SASOL Technology (Pty.), South Africa, it could be ascertained that they are interested to consider possible cooperation on joint venture or equity participation basis. On further interaction, SASOL agreed to test a sample only for its suitability for gasification, which was not considered sufficient to evaluate the coal for conversion to liquid fuels.

In reference to the request of OIL, a study was taken up by CMPDI at the instance of Coal India Limited **for assessing the availability of coal from NEC to meet the likely requirement of coal for commercial direct liquefaction project to be set up by OIL**. The total production envisaged in this report is 3.50 Mt, from 2014-15 against OIL's requirement of 4 to 5 Mt, meeting about 70% of the requirement of 100% capacity utilization. At 85% capacity utilization, production will be 2.98 Mt.

Further interaction between CIL and OIL is going on the business initiatives of coal liquefaction project by way of creating a 'Joint Task Force'.

C. Carbon Sequestration

1. Preamble

The global climate change, as a result of environmental pollution, has been a major concern worldwide. The options for mitigating the risk of global climate change have so far focused on reducing emissions of carbon dioxide and other green house gases (GHGs). Much less attention has been given to the potential for storing (or "sequestering") significant amount of carbon in forests and other eco-systems as an alternative means of offsetting the effect of future emissions on GHG concentration in atmosphere. It is now being realized that tendency to overlook sequestration opportunities can lead to incorrect and overly pessimistic conclusions about both the cost and feasibility of addressing global climate changes in future.

◇ **Environmental Significance of GHGs:** The Earth's atmosphere contains carbon-dioxide (CO₂) and other green house gases (GHGs) that act as protective layer, causing the planet to be warmer than it would otherwise be. If the level of CO₂ rises, mean global temperatures are also expected to rise as increasing amounts of solar radiation are trapped inside the "greenhouse." The level of CO₂ in the atmosphere is determined by a continuous flow among the stores of carbon in the atmosphere, the oceans, the earth's biological system and its geological materials. As long as the amount of carbon flowing into the atmosphere (as CO₂) and out (in the form of plant material and dissolved carbon) are in balance, the level of carbon in the atmosphere remains constant.

Human activities—particularly the extraction and burning of fossil fuels and the depletion of forests – are causing the level of GHGs (primarily CO₂) in the atmosphere to rise. The primary source of the slow but steady increase in atmospheric carbon are fossil fuel combustion, which contributes approximately 5.5 gigatonnes (billion metric tonnes) of carbon per year, and land use changes, which account for another 1.1 gigatonnes. In contrast, the oceans absorb from the atmosphere approximately 2 more

gigatonnes of carbon than they release, and the earth's eco-systems appear to be accumulating another 1.2 gigatonnes annually. Overall, the atmosphere is annually absorbing approximately 3.4 gigatonnes of carbon more than it is releasing.

◇ **Environmental Significance:** While the annual net increase in atmospheric carbon may not sound large compared with the total amount of carbon stored in the atmosphere *i.e.* 750 gigatonnes - it adds up over time. It is estimated that if the current rate of carbon accumulation were to remain constant, there would be gain in atmospheric carbon of 25% over the next 50 years. In fact, the rate at which human activity contributes to increases in atmospheric carbon is accelerating. An emission from land use change has been growing at the global level, though not nearly as rapidly as emissions from fossil fuel combustion.

◇ **Addressal of the problem:** It may be possible to increase the rate at which ecosystems remove CO₂ from the atmosphere and store the carbon in plant material, decomposing detritus, and organic soil. In essence, forests and other highly productive ecosystems can become biological scrubbers by removing (sequestering) CO₂ from the atmosphere. Much of the current interest in carbon sequestration for mitigating significant shares of annual CO₂ emissions and related claims that this approach provides a relatively inexpensive means of addressing climate change.

The cost of carbon sequestration are typically expressed in terms of monetary amounts (dollars) per tone of carbon sequestered *i.e.* as the ratio of economic inputs to carbon mitigation outputs for a specific programme. The denominator, the carbon sequestered, in case of forest based programme, is determined by forest management practices, tree species, geographic location and characteristics, and disposition of forests *etc.*

2 Global Practices

A number of projects on carbon sequestration have been taken up in Australia, USA, Canada and China. Initially, the thrust had been on the forest based carbon sequestration. The development & commercialization of next generation technologies has provided another alternative called geological sequestration and mineral sequestration *etc.*

● **Forest Based Sequestration:** The forests are one of the major resources for carbon sequestration. A thought may be given for increasing the forest resources to enhance carbon sequestration. This may include afforestation on agriculture lands, reforestation of harvested or burnt forest land and also the modification of forest management practices. Forest based sequestration studies have been taken up in USA. The modification of forest management practices may consist of:

- Modification of forest composition to enhance carbon sequestration
- Adoption of low impact harvesting methods to reduce carbon release
- Lengthening of forest rotation cycles
- Preservation of forest land from conversion to alternate uses

● **Geological Sequestration:** Injection of CO₂ into the earth's subsurface offers potential for the permanent storage of very large quantities of CO₂ and is the most

comprehensively studied storage option. The CO₂ is compressed to a dense state, before being piped deep underground into natural geological reservoirs. An obvious site for geological sequestration is depleted oil & gas reservoir.

- **Saline Aquifers:** Storing large amount of CO₂ in deep saline water saturated reservoirs rocks also offers great potential. One major project is already being conducted by the Norwegian company Statoil. This is at the Sleipner field in the Norwegian section of North Sea where about 1 million tonnes a year of CO₂ are being injected at a depth about 800-1000 m below sea floor.

- **Mineral Carbonation:** It is a process whereby CO₂ is reacted with naturally occurring substances to create a product chemically equivalent to naturally occurring carbonate minerals. The weathering of alkaline rocks is a natural form of CO₂ storage which normally occurs over long periods of time. With this natural process, mineral storage speeds up the reactions and turns CO₂ into a solid, environmentally benign mineral. This process is still at the stage of laboratory development.

- **Enhanced Oil Recovery:** CO₂ is widely used in the oil industry to increase oil production – the CO₂ helps pumps oil out of the underground strata, so increasing the level of recovery from the field. Without such methods of enhanced production, many oil fields can only produce half or less of the original resource.

- **Enhanced Coal Bed Methane:** This is a potential opportunity for storing CO₂ in unmineable coal seams and obtaining improved production of coal bed methane as a valuable by-product.

3 Indian Scenario

The issue of carbon sequestration in our country is in conceptual stage. The issue requires detailed investigations for application in various areas.

4 Road Map for Carbon Sequestration

- Constituting a National Level Task Force comprising members of Planning Commission, concerned ministries like Ministry of Coal, Ministry of Power, Ministry of Environment & Forests, Geological Survey of India and concerned industries *etc.*
- Identifying the areas for carbons sequestration and carry our the feasibility of the identified practices.
- Assignment of the activities to various stakeholders for the carbon sequestration
- Implementation.
- Monitoring. and
- CBM/CMM Reserve Estimation.

5 Company level R & D Programme

CIL, SCCL and NLC have in-house R & D Budget to take up S & T Projctcs related to various areas of mining operation.

Projection for XIth Plan

Particulars	No. of projects	Provision required (Rs. in crores)
Spill over projects from Xth plan	35	24.0
New projects-Coal	20	76.0
-Lignite	13	38.4
High value (Rs 5 to 10 crores)	5	40.0
Medium value(Rs 2 to 5 crores)	5	20.0
Low value (upto 2 crores)	5	8.0

CHAPTER-11

SAFETY & WELFARE

11.1 Safety

Safety in coal mines is governed by the Mines Act, 1952 and the rules and regulations framed thereunder. 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 has been empowered to enforce the statutes relating to mine safety.

The Mines Act or any rule or regulation framed thereunder is amended from time to time as per necessity as deemed fit by the DGMS, in view of any recommendation of any Court of Inquiry into any major accident or otherwise. However from time to time circulars are issued by DGMS on safety issues for adoption in mine operation

At present the Mines Act and the Coal Mines Regulations are in the process of being amended.

There is a Standing Committee on Safety in Coal Mines which is chaired by Minister in Charge of Coal. This meeting 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.

11.2 Accident Scenario In Indian Coalmines

From the accident statistics since 1950, the safety status of Indian Coal (including lignite) Mines may be summarised as follows:

In coal mines, there has been a sharp decrease in the yearly average figure of 295 fatalities from 223 accidents during 1951-60 to 170 fatalities from 140 fatal accidents in 1991-2000 and the annual average figure in the first decade of the new millennium (upto 2005) is 115 fatalities from 92 fatal accidents.

Yearly average of fatality rate due to accidents per 1000 persons employed has also come down from 0.91 during 1951- 60 to 0.32 during 1991-2000 in coal mines but remained more or less static in the current decade which is a matter of concern.

Main factor behind this achievement is shift of production technology from conventional to mechanised/semimechanised underground mines and mechanised opencast in coal mines.

In coal mines, major concern is the **occurrence of disasters** at regular intervals in underground mines. The frequency of disasters due to inundation/explosion has been alarmingly increased in the recent past. There have been five disasters in the last five years, out of which three disasters were due to inundation.

For fatal accidents involving four or less fatalities per accident, roof fall in underground mines continues to be the area of major concern followed by accidents caused by dumpers in opencast mines.

11.3 Changing Scenario of Indian Mining Industry – Some Critical Issues

With the liberalization of Indian economy, the whole industrial society is facing certain challenges and mining industry is no exception. The critical & emerging issues relevant to mine safety are as follows:

- **Quantum Jump in coal production,**
- **Complex geo-mining conditions,**
- **Privatisation and outsourcing – entry of private and multinational players:**

Mining industry has been made open to the private entrepreneurs and lots of mines are being opened and operated by private operators. 148 coal blocks have been identified for allotment for captive mining out of which 123 coal blocks have so far been allotted, most of them to companies under the private sector. Lot of multinational companies are also entering in to the Indian mining industry for extraction of mineral. Outsourcing of certain operations and equipment is also becoming quite common in the large Public Sector or Private mines. But this is also adding some new dimension to the health and safety aspects of mining industry. These are:

- o Use of contractors has brought into sharp focus the suitability and effectiveness of existing mine management structures to control the interfaces for health & safety matters.
- o Big contractors award parts of the job to petty sub-contractors not having adequate capacity or concern for safety.
- o Large percentage of contractors' employees are purely temporary or migratory in nature who are not well conversant with mining activities or laws.
- o Contractor's workers are having more risk taking attitudes as earnings are directly connected with output.
- o Contractors have very little commitment for ensuring safety and health conditions of the work persons.
- o Privatisation and outsourcing can not be overruled in today's context. But these issues need special attention at the initial stage so that it does not bounce back to the objective of the mining industry. A suitable well defined & structured interface is to be established between the principal employer and the contractor, defining the responsibility in terms of maintaining safety and occupational health of the contractor's workers.

11.4 Safety Monitoring

In coal Companies implementation of safety norms is monitored at various levels as given below :

1. Line Management : The line management in the collieries constantly monitors safety at the work place in each mine through supervisors like Mining Sirdars and Overmen , the Assistant Manager in charge of the shift/ mine, the Colliery Manager, the Agent/ Sub-Area Manager/ Project Officer under the overall supervision guidance and control of the Area CGM/ GM. All supervisors and Under Managers/ Asstt. Managers/ Managers possess statutory certificates of competency issued by DGMS and have statutory safety responsibilities.
2. The Internal Safety Organisation (ISO) : A structured multi-disciplinary ISO exists at the apex level as well as at the subsidiary company level with representation in each Area/group of mines. The Internal Safety Organisation (ISO) of each subsidiary company, as well as at the apex level, inspects mines and reviews safety and advises the line management on safety related matters. The head of the ISO reports to a technical Director of the company.
3. Safety Audits : A Safety Audit of the mines conducted by mostly by external experts.
4. Worker's Participation in Safety :
 - a. Workmen's Inspectors : Statutory Workmen's Inspectors, nominated in consultation with the Trade Unions as laid down in the Mines Rules, inspect mines and make recommendations which are implemented.
 - b. Safety Committee : Safety in every mine is reviewed every month by the statutory Safety Committee, comprising five representatives of Trade Unions and five representatives of the management.
 - c. Area level committees : Area level Committees where Trade Union representatives participate also monitor safety in the mines in the Area.
 - d. Subsidiary Company level Tripartite Committees : Tripartite Committees comprising Trade Union representatives, DGMS representatives and management representatives also monitor safety in the mines of the company.
 - e. The CIL Safety Board : The CIL Safety Board, where Trade Union representatives, the DGMS, representatives of the management participate also reviews safety in coal mines of CIL bi-annually.
5. CMDs meets & Board of Directors of CIL : Safety is regularly reviewed in meetings of CMDs. The Board of Directors of CIL is apprised of the safety status from time to time.
6. A Sub Committee to monitor safety parameters of provide coal companies has been set by Ministry of Coal under the Standing Committee on Safety in Coal Mines.
7. In short term, Independent audit of safety matters of mines needs serious consideration. In medium to longterm, introduction of insurance of mines needs serious consideration for protecting property and improving safety standards of workings there by reducing accident proneness. Insurance companies may promote independent safety audits as per their requirements.

11.5 Safety Measures Being Adopted In Coal Companies

Coal India Limited

In addition to compliance with the requirements of mine safety laws CIL and its subsidiary companies are taking following measures to make mining operation more safe.

- a. Phased replacement of timber support by steel support.
- b. Mechanisation of loading operations to reduce exposure of workers to hazardous areas.
- c. Undertaking correlation survey to check the distance of the barrier against waterlogged workings.
- d. Regular monitoring of mining environment for detecting inflammable and noxious gases.
- e. Thrust on training and retraining of workforce to increase safety awareness.
- f. Workers participation in safety through various bodies from mine level to CIL Headquarter level.
- g. Regular safety audits of mines by experienced personnel and implementation of the recommendations.

Singareni Collieries Company Limited

- a. Application of advance technology in surveying and digitization of mine plans.
- b. Increasing mechanisation wherever feasible.
- c. Wider application of Roof Bolting
- d. Introduction of Man-riding systems in more number of mines.
- e. Steps taken to improve the safety standards in opencast mines.
- f. Better lighting through mobile towers with a cluster of lamps are provided in major opencast mines.
- g. Deployment of large capacity equipment to reduce traffic congestion.
- h. Preparing Risk Management Plans:
- i. Carrying out Geo-technical Investigations and analysis through expert national and international agencies for successful operation of Longwall panels.
- j. Upgradation of Rescue Services:

Neyveli Lignite Corporation

- a. Safety Working Procedures / Code of Practices are also enforced on the contractors to adhere to safety norms by their employees as per statute. The contractors are warned and counseled and penalized in case of any serious lapses observed.
- b. NLC conducts Internal Safety Audit once in a month and external audit once in 2 years, keeping up the regularity at uniform interval of time.
- c. Inter Unit Safety Assessments are also being carried out for every quarter to assess Safety Standards maintained as per statute.
- d. 'Structured Training' is being imparted for development of Safety Awareness and increasing effectiveness of Emergency Response amongst Miners / Front Line Supervisors / Executives.
- e. Safety Performance Appraisal is being submitted to the NLC Board every quarter as per recommendation of the IX Safety Conference.

11.6 Occupational Safety and Health (OSH)

Concept of workers participation in Safety management was introduced through Safety Committee and workman's Inspector. Now the present safety management system consists of three basic components, viz. Mine Operators, Regulatory Authorities, and National level Tripartite Committees.

- **Mine Operators:** For ensuring compliance of the statutory requirements and to maintain the desirable standard of OSH in mine, all the mines are placed under the control of a qualified Mine Managers assisted by numbers of qualified statutory persons. For coordinating the activities of mine level with corporate level, Agents are appointed with specific responsibilities. Owner of the mine is responsible for providing all facilities & assistances to mine level operators. Internal Safety Organisation (ISO) acts as a link between the corporate level and mine level operators exclusively on safety issues.
- **Enforcement authority:** The other important component of safety management system is the regulatory / enforcement authority overseeing compliance of minimum regulatory requirements in OSH aspects of mining. The DGMS is the regulatory body in mining in India.
- **Tripartite Bodies:** The third component of the safety management system is the Tripartite Committees involving all stake holders viz, mine management, regulatory organization and workers' representatives at various level to oversee the compliance of OSH aspects in a broader perspective and for strengthening the existing safety management system.
- **Constraints in the existing system in operator level:** Though there is a structured system and set up of safety management in the operator's level with specific responsibilities at various levels the outcome in terms of OSH standards in mines in India is not upto the desired mark. Some of the areas, which need attention, are:
- **Authority of mine manager:** Though mine managers are the key person in safety management system, their authorities have been reduced to a great extent over the years particularly in the nationalized coal sector.
- **Effectiveness of ISO:** The Internal Safety Organisation (ISO), a critical link between the corporate level and operators' grossly suffer from lack of organization, infrastructure and authority. In organized sector, unless this organization is put in the line function, with certain authority and responsibility, with scope of career growth, their efficiency cannot be improved, as the members of this organisation do not feel any motivation in serving this organization.
- **Training:** Most of the training centers provided under Mines Vocational Training Rules 1966 are lacking in infrastructure and competent trainers/ Instructors. The scenario in the unorganized sector is far below the expectation.
- **Lack of mechanization:** To improve the safety and health standards of the workforce, exposure of human being to hazardous areas need to be reduced. Suitable man riding system may be introduced for transportation of work persons to and from the working places in case of below ground mines to reduce fatigue and undue stress.

- There is a proposal to setup a National Board for Accreditation and Certification of institutions, professionals and services in occupational safety and health, which is a step forward in proper assessment risks involved.

11.7 Strategies for Action

In view of the anticipated changes in the technology & work culture, some of the important changes in the strategy for management of OSH in the coming decades are outlined below:

- **Conceptual change:** The concept of self-regulation need to be introduced gradually through risk management, including reducing dependence on external supervision to self supervision. Present system of External Supervision may need to be supplemented by the concept of Self Supervision and necessary skill up gradation for work place supervision by all classes of work person has to be taken up by a proper mechanism of training and retraining.
- **Development of Legislation:** With the fast changes in the mining technology and changing socio-political and socio-economic environment in the country, thrust may be given on development of guidelines, safe operating procedures and code of practices to bridge the gap between existing statutory provisions and emerging safety & health standards.
- **Planning & Technology:** Reducing exposure in high risk areas, including face operations in below ground mines, may be taken up on priority. This will include elimination of manual loading.
- Development and Extraction Plans have to be systematic with a long term objective keeping in mind the need for environment management and management of RRR (Reclamation, Rehabilitation & resettlement).
- In the context of import of equipment and machineries preference shall be given to safe, user-friendly and environment-friendly designs having in-built fail-safe mechanism.
- In view of possible import of technology and equipments, development of testing facilities of international standard (for all types of equipments) will be required to be developed in the country to test the performance under Indian operating condition.
- **Emergency Response & Disaster management:**
Emergency response system based on scenario planning, establishment of adequate infrastructure, training and motivation should be part of disaster management plan.
- **Human Resource Development:** Structured training and retraining at predetermined interval to upgrade the managerial and technical skills and OSH standards through better infrastructure, aggressive training programme, delivery and evaluation should be given due focus. Competence of managers and key supervisors need to be upgraded by strengthening the system for grant of competency certificates. This will call for review of curriculum of Degree/Diploma courses in mining. Special certificate courses in OSH need to be introduced for competent persons who do not require competency certificates.
- **R & D effort:**

There is a strong need to prepare accurate mine plans through application of Geographical Information System and connecting all of them with the National Grid for proper correlation so that the dangers from adjacent mines can be assessed properly to prevent transfer of dangers from one mine to other. It is also essential to evolve a suitable technology for identification of sub-surface water bodies and their extent with respect to the present mine workings to take suitable measures to prevent accidental connection. Modern analytical laboratories with facilities like, Gas Chromatograph must be established at least at each Area for analysis of mine air accurately and quickly for correct assessment of mine fire and for calibration of different gas detectors.

- **Other Measures**

- o **Safety management through risk assessment**

Existing safety management practices shall be supplemented by applying risk assessment techniques for hazard identification and corrective actions and also for monitoring them at regular intervals. This approach will integrate safety with the primary objectives of the organisation.

- o **Increasing awareness in the field of OSH:**

Awareness of the grass root level workers of the mining sector needs to be increased by publicity and propaganda. A suitable scheme may be designed to extend the awareness in the field of OSH beyond the mining sector also.

- o **Introduction of a certificate course in Occupational Safety Engineering in mining**

Safety engineering is a new subject where modern techniques of safety management is taught. Although there is competency examination for mine managers who are to some extent exposed to the subject of occupational health and safety. But other officials like engineers, medical officers engaged in the mining industry are not so exposed. It is suggested that a certificate course on safety engineering in mining should be started for the officials engaged in the mining industry.

- o **Making Internal Safety Organisation (ISO) Effective**

The internal safety organisation is existing in most of the organized mining sector. However, it is observed that the system of working of the organisation has not yielded the desired result. The common deficiencies found in the organisation is the lack of association and interest with the work assigned. Since no responsibility or any authority has been practically bestowed at every level of the organisation, its effectiveness is invisible. The responsibility of ISO need to be well defined and appropriate authority (administrative and financial) shall also be bestowed to make the organisation more effective. The selection criteria as well as the promotional procedures should be framed in such a way to make this cadre more attractive by bringing them under line of organizational structure. It is essential that the Internal Safety Organisations are suitably strengthened with adequate responsibility coupled with required authority. The persons working in ISO should invariably be exposed and trained on the subject for which he is deputed.

- o **Dissemination of information:**

The lessons learnt after all the accidents need to be disseminated to all the mines so that proactive measures can be taken to avoid recurrence of such accidents. In

addition, any good practice or bad practice in any part of the industry also needs to be circulated to all.

o **Safety Audit**

Safety audits have proved to be a very effective tool for assessing and eventually for improving safety and health conditions in mines. A system of Safety Audits by accredited mining experts should be developed who will help the mine management in the area.

- o Maximum possible investment should be made to ensure safety and welfare of the workers.

11.8 Identification Of Areas Of Application Of Information Technology In Safety

The following areas are proposed for application of Information Technology in Safety :

- **Computerised Telemonitoring of Mine Environment & Water Danger :**

Thirty eight fiery and degree III gassy mines have been identified for installation of Computerised Environmental Tele-Monitoring Systems (ETMS) with sensors for CO and CH₄ and these have been installed and are operating in 13 mines. It is proposed that such systems be introduced in all degree III & degree II gassy mines.

Additionally, it is proposed that mines attended with water-danger from underground sources be Identified for installation of flow-meters near barriers against waterlogged workings with suitable recording and alarm devices at surface office of mines.

- **Digitisation of Mine Plans** –This programme may be taken up in the 11th Plan period. This will benefit the cause of safety enormously and be of great help in preventing major accidents due to in-rush of water.
- **Electronic/Computerised Bio-identification enabled Attendance Systems for Contractor's Workers** : This is essential for prevention of engagement of contractor's workers in two or more shifts continuously, which would go a long way towards reduction of fatal accidents due to trucks and dumpers involving contractor's workers.
- **On-line roof-behavior monitoring systems** - Considerable sophistication in roof-behavior monitoring instrumentation is already available. These may be integrated into on-line systems, with provision for on-site as well as off-site audio-visual alarm systems, for installation in all longwall/depillaring districts.
- **Incorporation of Safety into the Integrated Coalnet Application Software & LAN with Internet/Intranet facilities :**

Safety requirements for workers and policy measures for the same

- **Revamping the Rescue Organisation** – The existing Rescue Organisation needs to be reviewed and revamped with state-of-the-art Rescue Equipment to cater to the additional requirements of new private coal mining companies.
- **Central Storage & maintenance of Emergency Equipment** – Equipment to be required in Emergency, high head/high capacity pumps, electricals, piping, fittings,

Emergency Winders, Large Dia Boring Machines, etc. should be maintained at a central location in each coalfield. Dedicated officials should be given responsibility for maintenance of the same. Inventory of the equipment and phone nos of the officials responsible for the same should be maintained at Control Rooms as required under the national Crisis Management Plan.

The Rescue Organisation and Emergency Stores should be connected by fail-proof communication systems and Coalnet WAN.

- **Revamping of Vocational Training Centres -** Vocational Training Centres may be reviewed and revamped. External globally reputed training organizations may be utilized for imparting quality training to workers, including large numbers of contractor's workers for prevention of mine accidents.

These institutes could be utilized for imparting training to workers of new private coal mining companies, for a fee. Also, these institutes could be utilized for imparting training in different trades to Project Affected People as a Corporate Social Responsibility. Additional funding for upgrading the VT Centres / Group-VTCs/CETIs may be provided.

- **Periodical Medical Examination of workers:** Periodicity of Medical Examination may be increased to 3 years from the present 5 yrs. The scope of medical examination may be broadened to include other occupational disease. Record keeping of PME and IME should be computerized and linked in data transfer systems.
- **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.
- **Mechanised Roof-bolting:** Roof-bolting systems have mostly been implemented. However, in view of the fact that 80 % of all fatalities in roof-bolting districts in 2005 took place during installation of roof-bolts or while drilling for roof-bolting/dislodging weak roof, and also for improving the quality of remote operated roof-bolting mechanized roof-bolting may be taken up as a thrust area in the 11th Plan period. This would reduce exposure of men to the treacherous green-roof area even further.
- **Man- riding Systems:** With view to reduce fatigue of workmen, Man-riding system is to be provided at below ground mines Where gradient of the seam is more than 1 in 4 and traveling distance is more than 1.5 km Where gradient is less than 1 in 4 but traveling distance is more than 3 km.

Suggested safety measures

- **Technological assistance:** Areas, wherever mining technological assistance is required, are to be identified and provisions are to be made accordingly.
- Conversion of underground mines into Opencast Mines wherever feasible.
- Introduction of Surface Miners to eliminate blasting operations.
- Risk assessment and Safety Audit of the mines by external agency.
- Hiring the services of scientists from NIRM / CMRI on long term basis including deputation to give extra push to the existing Strata Management Cells.

- Scientific studies for Induced Blasting in massive sand stowing strata with deep holes more than 2.7m and use of explosives more than 1 KG, which is presently permitted.
- Introduction of light weight modern cap lamps and suitable belts to avoid fatigue and lower back injuries during incidental fall.
- Establishment of Meditation Halls to impart training on Yoga and Meditation in coal fields.
- It is proposed to impart 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 in NLC in a phased manner.
- It is proposed for the Procurement / Installation of additional fire protective System – Smoke detectors, Linear Heat Sensors / Fire Hydrant facilities etc. for the improvement of fire protection system at Thermal Power Stations.
- In order to improve the Overall Safety Monitoring of Mining Machineries, Conveyors, Operational Areas, Dumping Yards, Subsidence checks etc., it is proposed to install Safety Monitoring System at the above functional areas under the Safety Management Plan.
- It is proposed to augment the 'Occupational Health Services' at NLC with the Modern / Latest Medical Equipments in accordance with ILO classification.
- Seismological studies/ monitoring system at NLC Mines.

11.9 Coal Mines (Conservation And Development) Act 1974

In a country like India with scarce energy resources and on an ascending curve of economic growth, conservation of a non-renewable source of energy like coal constituting only 0.8% of global reserve has been of paramount significance. Coal Board established in 1952 principally for promoting such efforts was dissolved after nationalization of coal mines. A new Act called Coal Mines (Conservation & Development) Act, 1974 came into being. Subsequently, Coal Mines (Conservation & Development) Rule, 1975 also came into force.

Objective:

The principal objectives of the Act seem to be providing some subsidy for carrying out stowing of voids in underground mines and various protective measures – all aimed towards conservation of coal. Additionally, the Act also seeks to offer some assistance towards development of roads and railway infrastructure in coalfields, application of new technologies, research and development activities, coal utilization etc.

Mode of Assistance:

- Assistance is given principally through the following stages:
- Collection of the stowing excise duty (SED).
- Disbursement of the funds created towards actual claims.

Collection of SED

Under Section 6 of the Act, excise duty (commonly termed as Stowing Excise Duty or S.E.D) is levied on the coal companies against coal despatched at rates, not exceeding Rs.10 per tonne, as may be fixed from time to time by notification. Current rate (effective from 26.06.2003 onwards) of such excise duty is Rs.10.00 per tonne of coal both for coking and non-coking. SEDs are realized from the consumers along with the coal sale bills raised by the coal companies. Within 90 days from the closure of the month during which despatches are made, the payment of excise duty needs to be made, followed by a statutory return within 30 days of such payment, to the Coal Controller. Final assessment is done by the Coal Controller after taking into consideration all relevant documents and accordingly short/excess payment is adjusted.

Disbursement of SED

In each financial year, SED so collected is disbursed by the Central Government to different coal companies for undertaking stowing, protective works and infrastructure development jobs. For the purpose of determining the procedure for the disbursement of the SED proceeds, the Central Government constituted an Advisory Committee called “ Coal Conservation and Development Advisory Committee” (CCDAC) to advise the Government regarding the formulation and implementation of National policy in relation to “ Coal Conservation & Development Activity ” (CCDA) and scientific utilization of coal seams of the country apart from recommending class and grade of coal, rates of SED, disbursement of SED proceeds to different coal companies etc.

Till 2005-06 the disbursement of funds under CCDA used to be through revenue budget of MOC. However, Ministry of finance has directed that the schemes of CCDA need to be considered as Plan schemes. Accordingly, the schemes under CCDA under two broad categories namely, Stowing & Protective Works and Road & Rail Infrastructure have been taken up as Plan schemes for consideration of competent authority.

The performance in terms of assistance already released during the past four years of X th five year Plan vis-à-vis the anticipated demand during its last year i.e. 2006-'07 (up to September'06 is nearly Rs. 180 crores which includes the resultant spill over of Rs. 74.71 crores of 2005-06) and the five years of XI th Five Year Plan under sand stowing / protective work combined head is as under:

Figures in Rs. crores

X th Five Year Plan	2002-03	2003-04	2004-05	2005-06	2006-07	5 years' total
Approved Demand Under X th Plan	99.82	77.85	87.45	105.78	148.02	518.92
Assistance Released	66.05	64.00	100.03	66.11	0.00	296.19
XI th Five year Plan	2007-08	2008-09	2009-10	2010-11	2011-12	
Projected Demand	131.89	136.17	138.70	141.68	144.51	692.95

The above projected demand during XI th Five Year Plan can be met through available resource e.g. SED collection during XI th Plan period. Year-wise anticipated collection of SED during 2007-2012 based on XI th Plan period production/despatch is as under:

XI Plan Period	2007-08	2008-09	2009-10	2010-11	2011-12	Total
Production/Despatch (Mt)	466.00	510.00	565.00	620.00	670.00	2831.00
Mobilization of fund from adequate resource available through SED collection on dispatched coal.	466.00	510.00	565.00	620.00	670.00	2831.00
Total projected demand on ST/PW works & Road/Rail Infrastructure Dev.	331.48	382.36	397.30	303.86	250.60	1665.60

It is to mention that during the past years, the accumulated corpus in Govt. A/C collected as SED but left undisbursed is about 1400 crores. Further it has been decided that a sum of Rs. 80 crores per year from Rs. 400 crores already accrued shall be given to CIL for Jharia-Raniganj coalfields under a Master Action Plan besides allocating Rs. 120 crores each year from current SED collection.

11.10 Welfare

Today, India is the third largest coal producer and CIL the largest coal producing company in the world. CIL started off with a modest production figures of 79 million tonnes which is poised to grow to 504.10 million tonnes by the end of the XIIth Plan period of 2007-2008 to 2011-2012.

CIL also has the distinction of being the largest corporate employer in the world with a workforce of nearly 4.50 lakh. General Motors, USA is second with a workforce of around 3.22 lakh employees.

Despite the many impediments, CIL continues and shall continue to focus on improving the Quality of Life of its employees in the coal fields. Apart from following all Central Acts in letter and in spirit, over the years seven National Coal Wage Agreements have been signed with five Central Trade Unions which provide complete coverage of welfare activities for employees of CIL. The statement indicating the Actual Capital Expenditure of CIL and with its subsidiary companies for consecutive five years from 2000-01 to 2004-05 and projected expenditure of XI Plan as being started from 2007-08 to 2011-2012 is at **Annexure-11.1**. Major features of welfare activities are :

11.11 Health

Table below shows the remarkable progress that CIL has made over the years :

SUBJECT	AT THE TIME OF NATIONALISATION	AS ON 01/07/2006
No. of Hospitals	49	86

Dispensary	197	430
Hospital Beds	1482	5875
Doctors	444	1618
Ambulances	42	674

In addition, traditional medicine has also been recognized by having 12 Ayurvedic Dispensaries and Ayurved Vaidyas.

Similarly, to extend medical facilities to remote village areas to attend tribal people and persons belong to BPL, 10 fully equipped mobile medical vans are operational.

CIL

- CIL is aware of its social responsibility as a number of people in and around the mining complex get affected by mining projects. CIL has formulated its own R&R Policy to address the problem of project-affected persons.
- All the project affected persons gets properly rehabilitated and resettled in order to minimize the hardship caused by setting of the project.
- CIL also takes up community development schemes to improve the environment in and around the habitat location around the mining complex.

SCCL

- SCCL believes that the stake holders of organization include among others, the community around the Company.
- SCCL has launched an innovative programme called 'Surrounding Habitat Assistance programme (SHAPE)'. The programme includes funding for development of roads, drainage schemes, protected drinking water supply including its distribution, educational infrastructure, community buildings and improvements to public health centres, street lighting, clean & green programme, water harvesting & conservation programmes, literacy and awareness programme against social evils etc. Expenditure details are given below –

2003 – 04	:	Rs. 48.00 Crores.
2004 – 05	:	Rs. 14.26 Crores.
2004 – 05	:	Rs. 15.40 Crores.
- SCCL has formed a registered society i.e Singareni Sewa Samithi (SSS) for implementation of community development activities such as imparting vocational training to children of SCCL employees/ex-employees/youth of surrounding villages and training for recruitment in Army/Police/Para-military forces.
- Mega medical and health camps are organized for the benefit of villagers around the mining projects. Mobile medical camps are also being organized.
- Voluntary services are provided through Bharat scouts and Guides association of SCCL, to provide assistance at Eye camps, Health camps, Pulse polio programmes etc.

Corporate Social Responsibility and welfare proposals of Coal India Limited

Medical Services :

The medical services are to be restructured to ensure quality services to the employees. Keeping this in mind it has been proposed that 5 (five) central hospitals will be developed as referral/super specialty hospitals of CIL.

These are -

- 1) Central Hospital, BCCL - to be developed as specialist center for Neurology, Neuro-Surgery and Ophthalmology.
- 2) The Central Hospital, CCL will be developed as a center for Gastroenterology and Nephrology,
- 3) The Central Hospital, ECL, shall be developed as advanced Orthopaedic centre
- 4) The Central Hospital, MCL, Talcher shall also be developed for Urology
- 5) The Central Hospital, NCL At Singrauli shall be developed for Urology and Lithotripsy.

EDUCATION :

Table below shows the progress that has been made in providing education:

Particulars	As on 01.07.2006
No. of project schools fully financed by company (total expenditure minus income of school)	60
No. of Project Schools for which company provides infrastructure	27
Privately managed schools getting recurring grants	298

In addition, meritorious wards of employees are paid scholarship to help their career development.

Water Supply:

Clean water supply a basic necessity for good health is given utmost priority in CIL. Thus, as compared to only 2.27 lakh population having access to potable water at the time of nationalization, at present, 22,82 lakh have been covered under the water supply scheme.

Housing :

There were only 118366 dwellings available for the workers at the time of Nationalization with housing satisfaction of only 21.07 %. The figure today as on 01/07/2006 is 412176 with a housing satisfaction percentage of 91.62 .

Co-Operatives And Banking:

CIL has helped in the formation of Co-operatives. There are 336 workers Co-operative Societies functioning very satisfactorily in different parts of the country.

Similarly, Banking services are now widely available which have brought radical changes in the lifestyle of workers. There is considerable increase in savings and traditional money lenders are fleeing the coalfields. As on 1/7/2006, 389 bank branches are functional. Almost 90% of the 4,50,000 employees are paid wages through banks.

Ecology and Environment:

Coal India is fully aware of its social responsibilities, specially towards improvement of ecology. As many as 2714000 saplings were planted during the last financial year alone. To improve environment, LP Gas is issued free of cost instead of coal for domestic use.

Community Development:

A comprehensive Community Development Policy has been formulated to fulfill the objectives of Community Development. However, care is taken in the process to include the Special Component Plan (SCP) for benefit of the Schedule Castes, Tribal Sub Plan (TSP) for benefit of the tribal groups and Community Development Plan (CDP) for benefit of the Community at large. Coal India has experience of implementation of World Bank aided Environmental & Social Mitigation project in 25 opencast mines.

These community development activities are over and above the regular welfare measures provided for the employees of CIL and its subsidiaries. These activities are also in addition to schemes adopted by the subsidiaries for rehabilitation and resettlement of the project affected people in the mining areas being taken up as per the R&R policy of the company.

The key areas of activities under this scheme are –

- 1) Creation of community assets (infrastructure): like provision for drinking water, construction of school buildings, check dams, village roads/ linked roads & culverts, dispensary & health center, Community centers, market place, etc.
- 2) Skill development & capacity building: like vocational training, income generation programmes, entrepreneurship development programme, literacy programme, adult education, assist formation of VWG, Mahilamandal. etc.
- 3) Awareness programme and community activities : like health camp medical aides, family welfare camps, AIDS awareness programme, immunization camp, Sports & cultural activities, plantation etc.

The beneficiaries of the Community Development plans are the inhabitants living in the periphery, normally within a distance of 8 K.M. from the mine boundary or any other location as decided by the Committee constituted for the purpose. The beneficiaries will include all communities including employees & non-employees, SCs & STs and all other communities living in the villages under consideration.

The fund for the CD activities is allocated by the corporate headquarters to different areas based on requirement proposed by the Area duly screened by the Welfare Board. To help the companies create a dedicated fund for the purpose, a sum of Re. 1 per tonne of coal produced will be set aside by all the subsidiaries. The loss making (BIFR) subsidiaries will be given a grant by CIL at the rate of Re. 1 per tonne of coal produced.

Efforts have been made to develop and harness the talents of the wards of the workers by providing scholarships to them so as to encourage literacy.

It has been CIL's constant endeavour to fulfill its social obligations with regard to its employees to the best of its ability. This could be illustrated by the actual expenditure figures of Rs. 848.18 crores spent on welfare like buildings, roads, water supply, medical facilities education, co-

operatives and on female education during 2004-05. As against this Rs. 903.16 crores were provided in the year 2005-06 for these expenditures.

The stride towards progress will continue during the XI Five Year plan also to meet the corporate social objectives.

CORPORATE SOCIAL RESPONSIBILITY AND WELFARE PROPOSALS OF SCCL

SCCL is always in the fore-front regarding welfare measures for its employees and corporate social responsibility.

The quarters available as on 31.03.2006 are 47656 with a satisfaction level at 58.06%. During 2004-05 tenders have been awarded for construction of 4057 Quarters at a cost of Rs. 186.35 Crores. During 2005-06 tenders have been awarded for construction of 460 Quarters at a cost of Rs. 30.27 Crores. The quarters are anticipated for completion in a phased manner by end of 31.03.2007.

Contribution of SCCL in development of social infrastructure in coal belt areas during 2005-06: -

About SHAPE programme:

SCCL has formulated Surrounding Habitat Assistance Programme (SHAPE) for development of Drinking water-supply, Education and Infrastructure development in the coal belt areas.

The programme was envisaged during the year 2003-04. Allocation of funds was made for three consecutive years (2003-04, 2004-05 and 2005-06).

Measures taken for improving civic amenities and townships :

Civic maintenance works like garbage lifting, cleaning of drains, sweeping of roads, cleaning of sewer lines etc., are offloaded by dividing the townships into 34 segments at an approximate annual revenue cost of Rs. 250.00 Lakhs.

The 47656 Nos. Company's quarters existing are repaired comprehensively at the rate of 20% per year since 2003. So far 20482 quarters are repaired.

The fly-ash generated from the power houses in the area is utilized for manufacture of fly-ash bricks. The traditional clay bricks are replaced with fly-ash bricks for construction purposes. On an average 1.09 Crore numbers of fly-ash bricks are used during 2005-06. The company was adorned with the "**National Award**" for the 'Exemplary Work' done towards utilization of fly-ash bricks / products in construction activities.

De-silting of tanks and construction of summer storage tanks taken up to pond water for domestic use and as also to raise the water table levels.

Sulabh toilets are constructed and maintained for better environment. 202 toilets are constructed at townships. The maintenance of each toilet complex is taken up by the company at a cost of Rs. 4000.00 per month per complex.

32 Parks in colonies are planned and developed.

74 Gardens in various areas are planned and developed.

Disposal of Garbage, cleaning of drains, sweeping roads, cleaning sewer lines etc., is taken up to maintain the hygienic conditions within the townships.

Community Buildings / Centres / Sports facilities.

In order to provide recreation / facilities, the company has constructed recreation clubs and community halls in the coal field areas.

No. of Community halls	:	10
No. of Recreation Clubs	:	32
No. of Play grounds	:	10
No. of Stadium	:	08
No. of Swimming Pools	:	14+01 under constn.

Banking facilities are available in every area and ATMs are provided in every Bank. Workmen salaries are paid through Banks and 80% of the salaries are withdrawn through ATMs only.

Area level, Regional level, Company level sports and games are being regularly conducted by SCCL.

SCCL Teams have participated in All India Public Sector Tournaments in Football at Allahabad, Cricket at Pune and Table Tennis

Women's welfare:

In order to create awareness of the company as well as of the outside the world among workmen and their families about savings habit, health and hygiene, literacy, children's education, safety, post retirement planning etc, an association called "**Singareni Employees Wives Association**" (SEWA) has been constituted in all the Areas with the active participation of Wives of employees.

Literacy Programme IN SCCL:

SCCL took up literacy classes in coordination with the concerned District Literacy Mission to make the illiterate workmen literate on time bound basis. Status about literacy of employees:

No. of illiterate-employee identified initially	No. of persons who became literate	No. of employees to be literate
33835	30318	3517

Status about literacy of employees' spouses:

No. of illiterate employee spouses	No. of persons who became literate	No. of persons to be literate	No. of persons under training
41310	6271	29557	5482

Medical & Health :

Every worker seeking employment in the Company is subjected to thorough medical examination at the time of initial employment. Thereafter, he undergoes Periodical Medical Examination once in a block of every 5 years.

SCCL is having 6 Area Hospitals, 1 Main Hospital at KGM and 40 Dispensaries having 1008 beds and 36 nos. (3+33) of ambulances provided.

Wherever specialized treatment is required either for the employees or their dependants, they are referred to Super Specialty Hospitals outside the Colliery areas.

Educational Facilities:

No.of High schools and Upper Primary Schools run by S.C. Educational Society	:	17
No. of Degree Colleges (Women)	:	1
No.of Junior Colleges (Women)	:	1

The above educational institutions are run by S.C. Education Society.

Grant of Scholarships to merit students, who are children of employees:

In order to encourage the sons and daughters of employees (NCWA / Executives) to excel in their studies and to seek admission in Engineering and Medical courses, a Scholarship of Rs.6000/- every year for the son / daughter of SCCL employees (NCWA employee / Executive cadre) is being sanctioned from the year 1998 in the event of he or she securing admission in the engineering and medical courses by getting a rank below 2000 in the EAMCET / IIT for a period of 4 / 5 years.

Free Supply of LPG to the Employees:

It has been made mandatory that all employees of SCCL including workers should go for LPG connection for their domestic use for which SCCL will reimburse the cost of 12 L.P.Gas cylinders in a year. Thus, the use of coal for cooking purposes in households is banned by not supplying coal to the SCCL employees. The SCCL arranged 19 Nos. LPG Distribution Points in all over the Collieries Areas for the benefit of the employees through Singareni Super Bazar.

Vocational Training for employees' children:-

Singareni Seva Samithi (SSS) being registered under Andhra Pradesh Public Societies Act shall take up all Educational Training Programmes, Self-employment Schemes, help for Army Recruitment etc., and other Educational Training programmes for the children of employees who have died in harness and unemployed youth which includes daughters and sons of employees & Ex-employees and also to spouses of Ex-employees only.

Corporate Social Responsibility and welfare proposals of NLC Limited

While emerging as a socially responsible Corporate Citizen and playing an active role in the society, NLC has contributed towards providing communication access, democratic development, educational opportunities, food, potable water, security and health opportunity.

Peripheral Development

As part of social responsibility of business, NLC has also been contributing to peripheral development in the adjoining villages with annual budgetary allocation.

NLC is implementing various welfare activities and need based (Peripheral Development) programmes such as providing drinking water, health care and basic educational facilities are carried out in a planned manner choosing needy villages situated within 8 km. radius of NLC complex based on the recommendations of Collector, Cuddalore Distt., with separate budgetary provision of Rs.100.0 lakhs annually for this purpose.

Surplus water from Mines is diverted to meet the water needs of both irrigation and domestic purposes of the villages. Several boreholes were also drilled in the nearby villages to meet the drinking water needs of the surrounding villages.

The Corporation has opened community welfare centre in the hutment colonies. These centres are well maintained with reading rooms, children parks, playgrounds, Radio and Television sets.

R&R Policy:

The government approved RAP envisages the following Resettlement and Rehabilitation measures to the Project Affected Persons (PAPs), over and above the disbursement of legal compensation for land and the related fixed assets.

- Development of well connected and conveniently located Resettlement Centres(RCs) with provision of infrastructure, amenities and services in the RCs
- Allotment of alternate house site to the Project Affected Families(PAFs) and payment of exgratia towards structure value to PAFs shifting from Government lands. All the PAFs are allowed to retrieve the re-usable materials, even though they have been paid with the value of structures. Payment is made as resettlement allowance towards the dismantling, transportation and re-erection charges. Over and above the legal / RAP entitlements for compensation and Resettlement, the RAP also envisages livelihood assistance.
- 60% of the vacancies arising in the unskilled category has been earmarked for PAPs. More than 40% of labours employed by contractors engaged by NLC Ltd are PAPs and hailing from nearby villages
- Every year special apprenticeship training at ITI, Diploma, Degree levels and under Medical Lab Technician Training Scheme is provided to PAPs/wards of PAPs. NLC is also imparting entrepreneurship Training for PAPS every year in batches in collaboration with Gandhi Gram Rural University
- Subject to meeting overall tender conditions, preference is given to PAPs Societies and PAP contractors registered under LA Scheme on a preferential basis with concessional terms in order to provide self-employment opportunities to the members of PAFs in awarding contracts.

- Besides, market Guaranteed Income Generating Scheme of cleaning material production & supply is in operation and three more Schemes – namely, canteen supplies, office supplies, construction material production and supply are contemplated.

The R&R policy is under discussion for quite sometime. In the meeting of the Standing Committee a view had emerged that R&R policy for coal mining or for that matter mining in general needs to be different from the R&R policy for land acquisition in other sectors. A final view needs to be taken on the matter. The absence of an acceptable R&R policy is proving to be a major impediment in acquisition of land in most of the coal companies. It is imperative that a consensus view in the matter emerges at the earliest.

CHAPTER - 12

ENVIRONMENTAL MANAGEMENT

12.1 Introduction:

All mining and allied activities related to both opening of new mines and expansion of operating coal mines are associated with both positive and negative impacts on environmental attributes including wide spectrum of the social aspect. On the positive side coal industry in order to ensure supply of coal to the nation, create infrastructure in remote areas, and generate much desired employment opportunities in the country besides creating other business opportunities. On the negative side, it has impact on land use, air quality, water quality, water availability, bio-diversity, forest cover and animal habitat. On the social front, it may lead to displacement of population, loss of livelihood etc. Since the nation needs to exploit its own coal resource, for industrial and economic growth, there is need to strike a balance between the negative and positive impacts of coal mining and ensure a harmony between the coal mining and preservation of environmental quality. This balance is envisaged to be achieved through taking appropriate measures at different steps of coal cycles *i.e.* exploration, planning, coal mining and post operational stage.

The environmental and social issues in Indian context are of special concern as coal reserves are located in river basins *i.e.* Damodar – Barakar, Sone, Wardha, Brahmani-Mahanadi, Hasdeo *etc.* which are rich in forest cover and they are habitat for tribal people and wildlife. The magnitude and significance of environmental impact due to coal mining depends on the method of mining, beneficiation, scale and concentration of mining activity; geological and geomorphologic setting of the area; nature of the deposits; land use pattern before the commencement of mining operations; and the natural resources existing in the area. Opencast mining operations disturb the terrain much more than underground mining. Due to high density of population, acquiring large tracts of land required for opencast mining is difficult and the issue of resettlement and rehabilitation of people gains immense significance.

Land is very important input mainly for opencast mining. Coal companies are required to excavate land in large measure for removal of overburden and coal. As a result the land is degraded substantially. On completion of mining it is necessary that such land is progressively restored to its original shape. Thereafter the land may be used for rehabilitation and resettlement of people displaced from acquisition of land elsewhere and/or for commercial plantation, creation of large pond for fish cultivation, etc. Through such means it would be possible to not only resettle the displaced but also rehabilitate them through adequate income generation and avoid at the same time giving direct employment.

For every new coal project and expansion of the existing one, environmental clearance from MoEF is essential. For this purpose, EIA/EMP document needs to be prepared and submitted to MoEF. Once the environmental clearance is accorded by MoEF, the project needs to comply with environmental clearance conditions and also other conditions stipulated by various regulatory bodies like 'consent to operate' etc. For meeting the environment related requirements of the coal sector, the future approach is suggested below.

12.2 Activities Involved in EMP

Baseline data Generation, subsidence prediction and solid waste management

- Baseline data is generated for proposed projects to study the pre-mining Environmental scenario. EIA/EMPs are prepared for all the new projects and Environmental Clearance (EC) is being obtained from MoEF.
- As per MoEF notification dt. 27.03.2000, subsidence prediction by 3D numerical modeling is being carried out for all the underground mines falling under forest land.
- Solid waste management reports are prepared for opencast mines involving diversion of forest land.

Post project Environmental Monitoring

CIL

- Post Project Environmental monitoring to study air quality, water quality and noise level monitoring is carried out comprehensively covering mines and allied activities in CIL.
- Presently, about 240 projects have been covered by CMPDI for monitoring of the environmental attributes.
- Land usage changes will be monitored through satellite imageries for new projects as stipulated by MoEF in EC conditions of CIL projects.

SCCL

- Post Project Environmental monitoring to study air and water quality monitoring is carried out comprehensively covering mines and allied activities in SCCL.
- Presently, 107 ambient air quality monitoring stations and 157 water quality monitoring stations are identified for monitoring in SCCL.
- Land usage changes are being monitored through satellite imageries for new projects as stipulated by MoEF in EC conditions of SCCL projects.

NLC

- The post project Environmental monitoring to study air and water quality and noise level monitoring are carried out covering the Mines and Power Plants. Presently eight Ambient Air Quality Stations are in service for monitoring air quality on 24 hours basis using High volume air samplers. Five more AAQ Stations are being commissioned taking into account the Expansion Projects.
- Land usages changes are monitored through satellite imagery studies as stipulated by MoE&F in its E.C. Conditions of N.L.C. Projects.
- Periodical monitoring of AAQ and stack emission by State Pollution Control Board are also being carried out to review and for any corrective action if necessary.

Plantation

- Plantation is being carried out on external dumps, vacant areas, office premises along approach roads and Townships in CIL and SCCL.
- Activities like development of flora and fauna and artificial lakes are also taken up in the mines to bring the mining area near to original habitat.
- Raising of Bio-diesel plantation is being given emphasis in SCCL & NLC.
- In N.L.C., mass tree plantation in the left out barren lands in Township as well as in the reclaimed area of Mines are being taken up regularly.

Reclamation of overburden dumps

CIL

Appropriate physical and biological reclamation of OB dumps will be taken up and indigenous plant species should be used for plantation. In all the mines, a system will be introduced for energy conservation. Waste recycling and its reuse will be encouraged and appropriate subsidence management system will be implemented wherever required.

SCCL

The Company has initiated Biological Engineering techniques for stabilization of overburden dumps. These techniques have yielded positive results by way of stabilization of slopes, greening / land-scaping and preventing soil erosion. The company will continue to follow these techniques for effective stabilization of dumps. Such techniques will be replicated in other opencast mines also.

NLC

Back filled area reclamation, afforestation and cultivation is continuously being carried out in Mines of N.L.C. The Company is having collaboration with Tamil Nadu Agricultural University for 2 major Projects in its Mines namely 'Integrated Farming System' and 'Slope Stabilisation Programme' in the reclaimed area and external dumps which are now under progress. Its annual plan for reclamation and afforestation is charted out regularly and being communicated to the Ministry.

Ground water monitoring and Rain water harvesting structures

CIL

- Quality of borewells and openwells around the mines are being monitored to have data of the impact of the mining activities on the ground water.
- The sump water is being utilized for domestic and industrial water requirement.
- Treatment and reutilization of the waste water is being practiced to reduce drawal of ground water.

SCCL

- In order to assess the impact of mining on Ground water regime, monitoring of phreatic levels in Pre-monsoon (May/June) and Post-monsoon (October) periods is being done

through 259 observation wells located in and around the coal mining areas on long-term basis.

- The piezometric surface is being monitored 4 times in a year through 55 wells in and around the mines.
- Ground water studies are being conducted through A.P. State Ground water department for obtaining clearance for the proposed/existing projects from ground water point of view.
- Rain water harvesting structures are constructed for conservation of rain water. Till date 641 structures have been constructed.

NLC

- Ground water monitoring is being carried out for water table and quality in and around Neyveli to the extent of 3000 Square KMs with 150 Nos. of Dug wells and 100 Nos. of Tube-wells in service.
- Observation wells are drilled along coastal area and being monitored regularly to check any sea water intrusion.
- Rainwater harvesting systems are almost completed in the Mines, Power Plants and Township.
- Check dams are constructed in the major nallas in the Township and facilities are provided for recharging of the sub-soil aquifers.
- Artificial recharging of groundwater in the catchments area are also taken up and are found very effective and purposeful. Further studies are under progress.

Sewage Treatment Plants (STP) and Effluent Treatment Plants (ETP)

CIL

- The effluent treatment and sewage treatment facilities have been installed for major projects.
- The treated effluent is being utilized for industrial and horticulture purpose.

SCCL

- SCCL has commissioned 14 ETPs and 2 STPs for treatment of effluents containing oil and grease in workshop effluents and domestic sewage from townships respectively and treated effluent from ETP is re-circulated for washing of HEMM. Effluent from STP is used for plantation.

NLC

- A modern Sewage Treatment Plant of 30MLD capacity for the entire Township has been completed and is in service.
- The Effluent Treatment Plants are installed and in operation in Thermal Power Plants and in the Mines including Workshop, Auto Yard and Industrial Canteen and treated effluent is being used for green belt development.

Environmental Awareness and Education

CIL

- Environmental Awareness is brought amongst the employees by observing World Environment Day and other days on Environmental related themes
- Special lecture by eminent faculty are frequently organized to make the people environmentally aware.
- Pamphlets, slogans, sign boards etc. are widely used with an aim to enhance awareness on protection of environment among one and all.

SCCL

- Environmental Awareness is brought amongst the employees by observing World Environment Day and other days on Environmental related themes and Vanamahostavams etc.
- Two multi-disciplinary Corporate Teams inspect the Mines and Units and select the Best Mines / Units during ENVAV celebrations. The Winning Mines / Units are awarded Prizes on Republic day by The Chairman & Managing Director.
- Environment has been introduced as a part of curriculum in the 22 schools managed by the Company. SCCL is perhaps the only PSU to have introduced Environment as part of curriculum in its Schools.
- Environment education has been introduced in the schools of the Company with the help of WWF, Bird Watchers Society of India and A.P. Forest Department covering 7000 students. As part of the Environmental Awareness Week (ENVAV), quiz competitions are held for students of SCCL schools. 98 Teachers were imparted training in environmental education. 17 Nature clubs have been formed in the SCCL Schools for which the Company has paid Rs. 40,000 towards membership fee for the students.
- Pamphlets, slogans, exhibition vans and other media with annual competitions are widely used with an aim to enhance awareness on protection of environment among one and all.

NLC

- World Environment Day and Environment Week are being observed every year. All the educational Institutions in Neyveli are also being involved by conducting various competitions and awareness programmes along with this for the benefit of students and Neyveli community.
- Besides this, N.L.C. is participating in various National level Seminars, Exhibitions, Workshops, etc. for propagating the various activities undertaken by N.L.C.

Training

CIL

- The employees of the CIL are sent on routine basis to various seminars and training programmes to get exposed to various facets of environmental management. For this purpose, training both internal and with external agencies are organised.
- The employees are also exposed to best management environmental management practices abroad.

SCCL

- Besides the various environmental training & seminars, the Company Environmental officers of the company shall visit other companies/places in the field of Environment Management to study the best practices being followed in that company.
- Managers, Project Officers and Environmental Officers have been trained in External / In-house training programmes on Environment Management is as follows:

i) External Training Programmes	..	054
ii) In-house Training Programmes	..	121

NLC

- N.L.C. is conducting in-house Training programmes exclusively on Environmental Management and Pollution Control measures. Separate programmes on Environmental Management System, EIA/EMP, Municipal Solid Waste Management, CDM, Bio-medical Disposal, etc. are being conducted both with the external faculties as well as internal faculties. The programmes are conducted to cover the entire Executives, Staff and workmen in the Organisation.
- Related employees in the respective areas are also being deputed to various external Seminars, Exhibitions and Training Programmes.

12.3 The Future Approach

The coal industry is committed to ensure supply of coal in required quantity and of desired quality with minimum short and long-term impact on environmental and socio-economic profile of the area. The coal industry envisages to take various steps for achieving the desired goal that include following.

- (A) **Change in Approach to planning:** The current practice lays stress on environmental planning of individual mines. This approach is associated with a limitation of neglecting the cumulative impact of other industrial and mining activities in the vicinity. This results into high environmental degradation in coalfields that are not anticipated at project planning stage. To avoid this situation in future, coal industry will take up an environmental planning at macro level *i.e.* coalfield level which will take stock of natural resource base of the area, and assess the environmental and social impact due to all mining and developmental activities projected in the area.

Based on such impact assessment, an optimal developmental plan will be evolved that will ensure balanced growth in all sectors of economy and also maintain environmental quality.

This regional plan will lay down series of recommendations and action plan for environmental protection that have to be rigorously implemented. Coal industry will prepare such regional environmental plan, for all coalfields in phases.

- (B) **Capacity Building:** Environmental planning of mines and implementation of environmental conservation measures would require capacity building in terms of highly skilled, dedicated, experienced and qualified manpower, environmental labs and remote sense mapping facilities. The coal industry has already established network of its own environmental labs, employed and trained the manpower at various level

competent to plan and operate the mines in environmentally safe manner. In future, lab facilities will be modernized and continuously upgraded to take up growing requirements and training shall be provided to the concerned personnel on advances in analytical techniques. Employment of environmental engineers in coal companies is to be taken up for capacity creation.

Similarly the manpower is being continuously exposed to new environmental technology through organizing trainings, workshops and seminars. The manpower will also be exposed to *best practice environmental management* in coal mines in some of the advanced countries of the world.

The coal industry will establish MOU with major scientific and research organizations in India and abroad to seek continuously technical innovations in the area of environmental mitigation measures appropriate to coal mining in India. The coal industry shall also develop best mining practices appropriate to coal mining industry.

- (C) **Research Support** : The environmental and ecological implications of coal mining activities in Indian context are being studied through a number of R&D projects undertaken by established research institutions and universities in the country & CMPDI. This helps in understanding the effect of mining on ecology and other environmental attributes and also evolving new technology and mitigation measures to assess the impact and to prevent and control environmental pollution, restore hydrological balance and land productivity, restore the faunal habitats etc. These efforts are to be continued and encouraged to cover emerging areas that are relevant to Indian coal mines.
- (D) **Reclamation of old worked out areas & control of mine fire** : The coal mining activities in India has a history of about 200 years. The early phase of coal mining (upto early seventies of last century) witnessed an unscientific mining that led to fires in coal seams. Land subsidence, degradation of land, air and water pollution mostly in Jharia & Raniganj coalfield is require utmost attention. The CIL has drawn an ambitious master plan for control of mine fires and land subsidence, reclamation of degraded land, prevention of environmental pollution and relocation and rehabilitation of population living in endangered areas. These measures will release coal reserve for mining that is otherwise locked and not available for mining.
- (E) **Eco Zoning** : Coal reserve in India are located over forest land, National Parks, Bio-reserve and other eco-sensitive zones. Current regulations restrict coal mining in such identified areas. This coal reserve occurring over such areas are not available for mining. In order that a realistic assessment of coal reserve available for mining, there is a need to identify and assess such coal reserves that are located in eco-sensitive areas. The coal industry will take-up an exercise to prepare a comprehensive plan showing the eco-sensitive areas and superimpose over it the coal reserve map. This will facilitate in identifications and assessment of coal reserves occurring over the restricted areas that will attract amendment of the existing Forest Conservation Act for coal mining in these areas.
- (F) **Mine Closure Plan** : In course of coal mining, number of facilities are created to facilitate coal mining, coal processing, dispatch etc. A number of such facilities also generate environmental pollution and disturb hydrological pattern of the area and they may also pose safety hazards. Appropriate measures have to be taken so that once the mine operators complete the mining operation and withdraw from the site, such

facilities, do not pose safety hazards and are non-polluting. The land disturbed by mining are to be properly reclaimed. For this purpose appropriate mine specific Mine Closure Plans will be prepared for all coal mines to address the above issue.

- (G) **Green House Gas Abatement:** Methane gas emission takes place due to burning of coal, generation of Carbon dioxide and its release to atmosphere. Also change in land use pattern and degradation of forest cover reduces the natural carbon sink and thereby affects the CO₂ balance in atmosphere. Coal industries will take-up different projects that would aim at reduction of CO₂ emissions in the atmosphere and also creating carbon sink for capturing atmospheric CO₂.
- (H) In this context coal industry would explore possibilities for taking-up projects for **Clean Development Mechanism (CDM)** and promote clean coal technology.

The environmental measures that are envisaged to be integrated with mining operations are likely to achieve the goal for eco-friendly mining of coal coupled with optimal utilization of natural resource and harmony with people living in the vicinity sharing the fruits of development.

- (I) Emphasis should be given on the reclamation of old workings. Builders may be encouraged to develop townships on such reclaimed lands.

12.4 Proposed Action Plan For XIth Plan Period:

1. Environment Impact Assessment (EIA) and Environment Management Plan (EMP)

The Environmental Impact Assessment & Environmental management Plan is required for all the coal project since they generally have lease area more than 5 hectares. Since coal mining is site specific in nature, site clearance from MoEF is taken.

2. Financial out lay for Environment management

Name of the company	Expenditure in X plan (Rs. Crore)	Budget for XI plan (Rs. Crore)
CIL	-	676.50
SCCL	8.85	25.07
NLC	111	191.87

3. Environment Management

Preparation of EIA/EMPs and Environmental clearances (For new projects & existing projects in XI plan)

a. CIL projects-

EIA/EMPs	XI plan
Mines	115

b. SCCL projects –

Sl. No.	Description		Year				
			2007-08	2008-09	2009-10	2010-11	2011-12
1	EIA/EMPs	New Projects	7	4	5	7	4
		Existing (Expansion) Projects	--	--	--	--	--
2	Environmental Clearances	New Projects	10	7	4	5	7
		Existing (Expansion) Projects	35	--	--	--	--

b. NLC projects-

EIA/EMPs	XI plan
Mines	4
Thermal power plants	4

2.5 Environmental Management System

In order to improve the implementation of environmental management systems, the following measures are suggested for the XIth Plan period.

- The system of environmental planning, implementation and monitoring shall be strengthened.
- Appropriate capacity building to address the emerging issues of mine environmental management, monitoring and mine closure.
- International exposure to best mining environmental management practice
- Develop in house capability to take up EIA/EMP studies
- General awareness programme amongst mine workers through various programmes
- Observance of "Environment Week"
- Earmarking of exclusive fund for environmental measures and allotment of separate cost code is in practice. Environmental Management System (EMS) will be introduced in phased manner.
- SCCL has obtained ISO – 14001 certification, 9001 certification and OHSAS 18001 series for Manuguru Opencast Project – II during 2005.
- SCCL received "Golden Peacock Innovation Management Award" from World Environment Foundation for the year 2005.
- SCCL received national level award for the year 2004-05 For Environmental Excellence from The Energy and Resources Institute (TERI) on 26th June, 2006 in New Delhi.
- SCCL received "National fly ash utilization Award" from Department of Science & Technology and Ministry of Environment & Forests, GoI in 2005.
- NLC has been formulating several projects outside Neyveli towards its expansion activities during XI-Plan for which separate budget of Rs.109.60 Crores has been allocated towards EIA/EMP reports/consultancy, Environmental measures like AAQ monitoring stations, Coal washeries plant installation, Green Belt development etc.

12.6 Scientific studies

The following are proposed –

CIL

- Development of Conservation Plan for floral and faunal species in the mining complexes.
- Quantification of environmental impacts of the mining projects
- GIS based environmental planning in the mining complexes
- Eco-restoration study in the mining areas
- Promoting technologies for carbon di-oxide capture and storage to ensure that development and security benefits of coal are delivered with near zero emissions. Development of such technologies will be taken up as a demonstration project.

SCCL

- The Indian Council of Forestry Research and Education (ICFRE) and the SCCL forestry department are exploring to develop a mitigation project case study to understand carbon sequestration potential and cost effectiveness of industrial plantations.
- SCCL & CMRI, Dhanbad has jointly taken up an S&T project funded by Ministry of Coal, GOI to study the impact of mining operations on hydrological cycle, Flora & Fauna and Forest Cover through out SCCL.

NLC

- Development and use of fly ash based pesticides.
- Survey and ecological conservation of NLC Environment through Bio-remediation with tree species.
- CO₂ Sequestration by biological methods.
- Production of Bio-Diesel from Jatropha
- Coal mine methane.
- Development of recharge area in Neyveli basin.

12.7 Mine Closure

CIL

- The drawl of mine closure plan both progressive and final has been made a requirement in Environment clearance of new projects. The fund for mine closure at Corporate Level has already been created by CIL. A sum of Rs 1/- per tonne of coal produced is being collected and deposited in the above fund for mine closure. Upon closure of the mines, suitable mine closure activities for making the site secure and environmentally compatible will be taken up in the XI Plan period.

SCCL

- Mine closure plan forms part of EMPs and is approved by MoEF. A detailed mine closure plan for each mine will be prepared five years in advance of closure with financial provision and is proposed to be submitted to MoEF.

NLC

- Mine closure plan prepared for all new mine projects as applicable under Act will be implemented as per schedule. However, during XI plan NLC has no plan for closure of Mines except the continuous back filling operation in the Mines.

It is now mandatory to prepare mine closure plan (progressive and final) for all coal and lignite sector projects. In many projects multi-seam reserves are planned to be extracted. During planning of such mines, the mine planners should plan in such a

manner that maximum amount of geological/mineable reserves are recovered with available mining technologies.

While preparing EIA, mine closure plan should be prepared taking into consideration of maximum possible extraction with available technologies.

12.8 Thrust areas for XI plan

CIL

The following thrust areas have been identified for the XI Plan period:

- Strengthening of Environmental Engineering Cadre
- Capacity building of the personnel working in environmental discipline including exposure to best environmental management practice
- Preparation of Regional Environmental Impact Assessment reports for 6 major coalfields
- Preparation of EIA/EMP document for new projects
- Quantification of environmental impacts for preparation of EIA reports.
- GIS based environmental planning in the mining complexes
- Water & energy conservation
- Installation of effluent and sewage treatment facilities in projects

SCCL

- Implementation of Biological Engineering techniques for stabilization of overburden dumps and reclamation in all opencast mines.
- Construction of STPs in all major SCCL townships.
- Green house gas abatement through extensive plantation.
- Raising of Bio-Diesel plants on large scale for production of Bio-Diesel.
- Energy conservation measures.
- Water conservation measures.
- Bringing about social awareness among employees, school children and general public on environment protection
- Effective implementation of R&R plan for project affected persons (PAPs) in proposed mining projects.
- Implementation of Environmental management system in all SCCL mines in phased manner.
- Systematic way of handling and disposing of Bio-Medical waste and other wastes including plastic are also planned in the Hospitals and Townships.

NLC

- **Mines:** Improving and maintenance of the dust suppression systems being operated in the mines.
- Slope stabilization and afforestation to be completed in a phased manner.
- Development of flora fauna in all the Mines.
- Cultivation of jatropha in the reclaimed areas of mines.

Thermal Power Plants:

- Installation of modern Dry Ash Collection System with Silos in the existing Power Plants.
- Treatment of Mines storm-water for the industrial use of the Power Plants
- Various promotional schemes for 100 % Fly Ash Utilisation

- Utilisation of Pond Ash for construction purposes and enhancing the capacity of existing Ash Ponds by raising the bund heights and inter-linking of ash ponds etc.

12.9 Major Policy Issues requiring attention during XI Plan Period

Substantial increase in coal production is envisaged during the XIth Plan period to meet the requirement of coal by various sectors. The factors which may affect the opening of new projects are forestry and environmental clearance of the projects. In addition, the capacity of the existing projects may be enhanced to meet the planned quantity of coal. This will further require forestry clearance (in case forest diversion is involved) as well as environmental clearance. The situation call for streamlining the forestry and environmental clearance related issues to facilitate opening of new projects in time. The following may be considered for the purpose:

A. Forestry Clearance:

- The Nodal Officer of the State Government should be empowered to forward proposal related to forest diversion directly to MoEF after receipt of finding from Divisional Forest Officer.
- Once the completeness of proposal has been examined and the same has been accepted, no fresh queries should be raised further.
- The movement status of proposals for forest diversion should be posted on website to provide information and transparency to the project proponent.
- A Tripartite Committee (comprising of user agency, concerned State Forest Department & monitoring cell of MoEF) may be constituted to resolve the reasons for delay. As and when requested by coal companies.
- In case where appropriate records in respect of forest land, jungle jhari etc. are not available, proposal for forestry clearance may be considered based on the information available. The NOC from District Collector should not be stressed upon.
- For exploration of coal, CMPDI has to apply for forestry clearance in prescribed format. This delays the start of the exploration activities. Since the data regarding availability of coal is available with Ministry of Coal, MoC & MoEF may take a decision for exploration in such areas in consultation with MoC. This will help reduce the delays in commencement of exploration activities.
- In order to avoid infructuous investment on drilling, MoEF may identify the areas where mining can not be carried out.
- A provision of drilling of drilling 15 BH/sq km for coal proving operation may be agreed upon by MoEF to keep proper assessment of coal reserve, structure, quality and its exploability.
- Limit of 40 Ha for forestry clearance at Regional Office of MoEF, be raised to 150 Ha.
- As per F (C) Act, 1980, the test drilling upto 10 boreholes of maximum 4-inch (101 mm) diameter per 100 sq kms without felling of trees shall not attract the provisions of the Act.

B. Net Present Value

An Expert Committee under the chairmanship of Professor Kanchan Chopara, Director, Institute of Economic Growth, Delhi has been constituted to examine the issues related to Net Present Value. This was in compliance to Hon'ble Supreme Court Directive dated 26th September, 2005 in IA No. 566 of 2000 in Writ Petition

(Civil) (200 of 1995). The basic issue was that NPV for forest land diverted for non-forest use should be worked out on economic principle. The Hon'ble Supreme Court has observed that the amount of NPV is required to be used for achieving the ecology plans and for the regeneration of forests and maintenance of ecological balance and eco-system. The payment of NPV is for protection of the environment and not in relation to any proprietary rights.

C. Environmental Clearance

As per the current practice, all the new coal projects and expansion of the existing ones require environmental clearance. The following are suggested to streamline the environmental clearance process:

- The capacity of the coal projects should be defined as total excavation and coal and overburden (OB)
- Based on the geological condition, the extraction of coal keep on varying. As such, fresh environmental clearance should not be insisted upon for increase in say 15% of the planned capacity of the projects.
- Fresh environmental clearance for expansion and/or modernization of projects should be called for only if the pollution load is likely to cross beyond the acceptable limits. The assessment of which would be drawn on the basis of the regional Environment Impact Assessment
- As per the Draft Final EIA Notification, TOR for preparation of EIA/EMP document should be finalized by EAC/SEAC. In order to save time, a Committee may be constituted to finalize the TOR for opencast and underground projects.
- For inter-state or inter-district projects, public hearing should be conducted in the state or district wherein larger portion of the project lies.
- For UG mines, a rational criterion may be fixed as 1000 Ha for seeking environmental clearance as it does not affect surface land usage.
- For environmental clearance, the environmental entities within 10 kms radius should be considered as per the prevalent practice.

D. Introduction of Green Credit System (Social Forestry)-

Mining companies while opening new projects in forest land, they have to show equivalent CA land and charges for its afforestation. It is proposed to have **Green Credits** for green belt development by individual or community as social forestry. These Green Credits can be purchased by mining companies in lieu of CA land and its afforestation at market price, which should be remunerative.

12.10 Budget for Environmental Management

CIL

A budget estimate for environmental management in different subsidiaries of Coal India Limited has been drawn. The break-up is as under:

Sl No.	Particular	Phasing of the budget (Rs. in crores)					
		2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
1	Preparation of EIA/EMP	5.0	10.0	5.0	2.0	3.0	25
2	Regional EIA/EMP (6 areas)	130	65	65	65	65	390
3	Training	50	30	25	25	20	150
4	Expansion & modernization of environmental labs.	1.50	1.50	1.0	0.5	0.5	5.0
5	Development and implementation of environment management system	30	20	15	20	15	100
6	Environmental Monitoring	1.0	1.0	1.0	1.0	1.0	5.0
7	Environmental Statement	0.3	0.3	0.3	0.3	0.3	1.5
	Total	217.8	127.8	112.3	113.8	104.8	676.5

SCCL

SL No.	Description of activity	Budget requirement for XI plan period (Rs. crores)					
		2007-08	2008-09	2009-10	2010-11	2011-12	Total
1	Establishment of Env't Lab	1.00	2.00				3.00
2	Post Project Environmental Monitoring	0.15	0.20	0.40	0.50	0.60	1.85
3	Environment Awareness & Education	0.10	0.10	0.12	0.14	0.16	0.62
4	Plantation	1.40	1.60	1.80	2.00	2.00	8.80
5	Environmental Studies	0.10	0.15	0.15	0.20	0.20	8.00
6	Construction of ETPs and STPS	1.00	1.50	2.00	2.50	3.00	10.00
	Total	3.75	5.55	4.47	5.34	5.96	25.07

NLC

SL No.	Description of activity	Budget requirement for XI plan period (Rs. crores)					
		2007-08	2008-09	2009-10	2010-11	2011-12	Total
1	Mines	5.4050	5.3050	5.1950	5.2350	5.2750	26.4150
2	Thermal Power Stations	18.7007	3.1500	4.3500	4.3500	4.3500	34.9007
3	Township	7.0700	1.6170	1.1400	1.1400	1.3000	12.2670
4	General	1.6150	2.8700	1.4900	1.5800	1.6700	9.2250
5	NLCs Expansion projects outside Neyveli	1.80	12.80	12.82	40.82	40.82	109.06
	Total	34.59087	26.7420	24.9950	53.1260	53.4150	191.8677

CHAPTER- 13

INFRASTRUCTURE DEVELOPMENT

13.1 This chapter deals with the requirement of infrastructural facilities other than those required for coal movement which have been discussed in Chapter-5. The major facilities that go into production build up are land requirement, power requirement, water requirement etc. The projected requirement of these critical inputs is discussed below:

A. CIL

The basic infrastructural facilities to realise the projected production plans of the Coal Companies of CIL during the XI Five Year Plan are tabulated below:-

SI No.	Subsidiary	XI Plan Proposals for		
		Land	Power	Water
		Area (Ha)	Max Demand (MVA)	Demand (MLD)
1	ECL	3924	26	--
2	BCCL	338	--	1.00
3	CCL	5566	63	--
4	WCL	3918	19	2.80
5	SECL	2302	60	3.80
6	NCL	2325	85	13.80
7	MCL	22921	154	21.50
CIL (Sub-total)		41294	407	42.90

B. SCCL

SCCL is operating 47 UG mines and 11 OC mines as on 01-04-2006. To meet the future increased demand, SCCL will be expanding its operations. During the XI plan and later years the likely requirement of forest land is around **8847.87 Ha.** (for completed new projects to be grounded, projects formulated and yet to be formulated).

Simplification of forestry clearance is urgently required as considerable time is being lost in obtaining the forestry clearances and there is a need for acquiring significant amount of forest land during the XI Plan.

SCCL's target production during 2006-07 is 37.5 MT this will go upto 40.8 MT 2011-12. The power consumption during the X Plan is as follows.

Year	Contract Maximum Demand (CMD) KVA	Total power consumption MKWH
2002-03	124,600	577.26
2003-04	126,150	601.45
2004-05	128,130	605.71
2005-06	127,630	623.15
2006-07	127,630	656.25

As on date around 12 % of the total annual power requirement will be met by Captive Power Generation and the remaining 88% is being purchased from APTRANSCO/NPDISCOM. The total capacity of the captive power plants is 31.7 MW. This is de-rated to 21 MW due to ageing, as they have completed 40 to 50 years of life. They are due for Renovation and Modernisation as per the Power Policy to be formulated for SCCL.

Consultancy work was awarded to M/s Power Finance Corporation to prepare the power policy for SCCL. The following are the terms of reference.

- 1) Captive generation
- 2) Joint Venture with NTPC/APGENCO
- 3) Power purchase directly from NTPC and APGENCO or other independent power projects.

XI PLAN EXPECTED POWER CONSUMPTION DETAILS

Year	CMD KVA	Total power consumption MKWH
2007-08	155,000	694.16
2008-09	165,000	736.68
2009-10	165,000	795.48
2010-11	170,000	819.58
2011-12	169,000	814.76

C. NLC

Requirement of Land, Water and Power during XI Plan is summarised below.

Description	Name of The Projects				
	BITHNOK	RIRI	GUJRAT	JAYAMKONDAM	MINE-III
Land (Ha) for Mines & Power station	1580	3010	4210	4210	4210
Water (cft/sec)	40	40	40 to 50	40 to 50	40 to 50
Construction Power/MVA	3 to 5	3 to 5	3 to 5	3 to 5	3 to 5

CHAPTER –14

MINING TECHNOLOGY

14.1 INTRODUCTION

As per the terms of reference, this chapter covers the topics – measures for alternative technologies for extraction of resources in geologically disturbed areas and deep seated coal resources; Underground Coal Gasification (UCG), Coalbed Methane (CBM) extraction; and alternative system of coal transportation.

14.2 NATIONAL COAL INVENTORY

On the basis of regional and detailed exploration, the total coal Inventory of India has been assessed by Geological Survey of India to be around 253 billion tonnes (January 2006). Out of this in-situ hard coal resource, around 93% occur at a depth 0 to 600m (64% within 300m depth and 29% within 300-600m depth (inclusive of Jharia CF)) and around 7% occur at depths more than 600m. A broad assessment (2005) indicates that around 21% of the geological resources (i.e. around 52 billion tonnes) can be extracted.

14.3 GEOLOGICALLY DISTURBED AREAS AND DEEP SEATED COAL RESOURCES

In India, the average depth of mining hovers around 300m and in some mines reaches beyond a depth of 500m. However, most of coal resources at depth more than 400m are yet to be exploited. Hence, coal deposits occurring at a depth beyond 400m are currently treated as deep-seated resources. The deep seated coal resources in India are generally characterized by:

- o Superior coal quality (around 20% coking & 35% superior grade non-coking coal),
- o Mostly associated with geological disturbances of higher degree,
- o Gassiness of higher degree,
- o Coal of lesser compressive strength,
- o Presence of overlying coal seams etc.

These resources have generally associated with geo-mining problems like

- o High stress related problems like bumps and rock bursts
- o High horizontal stresses causing instability of underground galleries
- o Higher concentration of methane
- o Higher make of water
- o Deterioration in mine climatic conditions like high in-situ rock temperature, high humidity etc.
- o Occurrence of more geological disturbances, like faults, dykes, sills, 'jhama' etc.
- o Steeper seam gradient (more than 1 in 4)
- o Occurrence of overlying waterlogged seams which may be exhausted & goaved, developed & standing on pillars, and/or under fire
- o Fire proneness
- o Presence of surface constraints etc.

Depending upon the intensity of the disturbances, the geologically disturbed areas can be categorized under the following two broad heads:

- o Mining areas with geological disturbances of moderate degree, and

- o Mining areas with geological disturbances of higher degree.

14.4 ALTERNATIVE TECHNOLOGY FOR MINING OF GEOLOGICALLY DISTURBED AREAS AND DEEP SEATED COAL RESOURCES BY OPENCAST (OC) MINING METHODS

Deep seated coal reserves are generally preferred to be mined by underground mining methods. However, it has limited mineability by opencast mining methods depending upon:

- o Depth of occurrence and stripping ratio,
- o Degree of geological disturbances,
- o Availability of land and surface mining rights,
- o Techno-economic viability, etc.

In addition to the basic problems associated with the opencast mining, the deep opencast mines may have additional operational problems like

- o Slope stability due to presence of high horizontal and vertical stresses,
- o Longer haul distance and haul road maintenance,
- o Ventilation related problems,
- o Water/ pumping problem: As deep OC mines will go well below the water-table, there will be corresponding problems associated with ground water.
- o Environmental & ecological problems,
- o Physical / surface constraints, etc.

The prevailing mining technologies deployed in the mechanized OC mines are basically various combination of Heavy Earth Moving Machinery (HEMM). Some of the popular combinations of HEMM are as follows:

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

Alternative Technology for opencast mining can be the following combinations of HEMM:

- o Shovel dumper/ dragline combination
- o Surface loader dumper combination
 - with creeper dumper haulers
 - with high angle conveyors/inclined skips
- o Shovel dumper/in-pit crusher/ conveyor combination
 - with creeper dumper haulers
 - with high angle conveyors/inclined skips
- o Shovel-dumper /surface miner/rock breaker-tipper combination
- o High wall mining

Shovel-dumper system is most flexible system. In-pit crushing-conveying system may be combined with shovel-dumper. Highwall mining may find its applicability depending upon the seam parameters and geo-mining conditions.

14.5 ALTERNATIVE TECHNOLOGY FOR MINING OF GEOLOGICALLY DISTURBED AREAS AND DEEP SEATED COAL RESOURCES BY UNDERGROUND (UG) MINING METHODS

The deep seated coal reserves are preferably mined by underground mining methods. Opencast Mining operations at such depth may become uneconomic/ impracticable due to high stripping ratios and other influencing factors such as geological constraints, physical/surface constraints, technological constraints and environmental considerations.

Selection of UG mining option will depend upon the various geo-mining as well as techno-economic parameters such as depth of occurrence of the mineable seams, amount of mineable coal reserves, seam thickness & its consistency, seam gradient, degree of gassiness, presence of geological disturbances, nature of roof & floor, status of overlying/underlying seams, mineable grade of coal & its selling price, etc. Evaluation of the mining projects necessitates projecting cost and sales realization as accurately as possible.

The mining technologies presently in vogue in the underground mines are as follows:

- i) Conventional Bord & Pillar system
- ii) Semi-mechanised Bord & Pillar system with Side Discharge Loaders (SDLs) /Load Haul Dumpers (LHDs)/ Universal Drilling Machines (UDMs)
- iii) Mechanised Bord & Pillar/Room & Pillar system with Continuous Miners (CMs)
- iv) Mechanised Longwall (PSLW) mining system
- v) Special methods (i.e. site specific methods) like Blasting Gallery (BG) method, Cable bolting method, wide & stall method, steep mining methods, etc.

Alternative technologies for extraction of resources by underground mining in geologically disturbed areas and deep seated coal resources will depend primarily on the intensity of geological disturbances and depth of occurrence. The prevailing technologies will also find their applicability in most cases with or without modifications. Some of the alternative mining technologies can be:

- 1 B&P with SDL/LHD/UDM (Universal drilling Machine)
- 2 PSLW/ Longwall Mining
- 3 CM Technology - Wongawilli method
- 4 Shortwall Mining
- 5 Special Methods:
 - (a) Blasting Gallery (BG) method
 - (b) Cable bolting method
 - (c) High pressure water jet mining (Hydro-mining)
 - (d) Integrated sub-level caving
 - (e) Sub-level caving with High Pressure Air Breaking System
 - (f) Short longwall method for extraction of standing pillars
 - (g) Longwall Top Coal Caving (LTCC) technique
 - (h) Jankowice Method (for Steeply dipping seams)
- 6 Stowing technology in conjunction with mining:
 - (a) Stowing with sand or alternative stowing materials
 - (b) High Conc. Fly-ash stowing (Paste-fill) technology
- 7 Underground Coal Gasification (UCG) for coal/lignite deposits which are conventionally not workable.

Additionally, some of the important issues related to adoption of alternative technology are:

- 1 **Pre-consolidation of rock mass:** Weak strata/ rock masses/ coal seams are pre-consolidated in-situ before their mining by injecting consolidating agents/ chemicals through boreholes. It can be applied in geologically disturbed weak rock zones at moderate depths. Efficacy of the system will mainly depend upon the accuracy of drilling boreholes to the targeted areas and their spacing.
- 2 **Hard roof management:** As massive sandstone roof is prevalent in Indian coal sector, thrust shall be given on hard roof management. Difficult caving conditions have been encountered in a number of underground mines in the country resulting in problems of air blast, overriding of pillars and there have been instances of failure of powered support in longwall workings. The methods to be used to control the hard roof can be by (i) stowing, (ii) induce caving, (iii) hydro-fracturing, (iv) slow acting expansion cement/chemicals etc.
- 3 **Dealing with underground mine fire:** To prevent occurrence of out-break of fire in left out coals, actions are needed to be taken to flush the caved goaves (like mud flushing with some chemical) in addition to blanketing of goaf surface with 'mutter'/soil.
- 4 **Improvement in mine environment:** Mining of deep seated coal resources will invariably be associated with stringent mine climatic conditions which will tend to create unfavourable working conditions. These mines will need suitable ventilation and air-conditioning system.
- 5 **Man riding system:** For mining deep seated coal resources under arduous mining conditions, transportation of work persons to the working faces needs to be implemented to gainfully utilize their work efficiencies. Man riding system needs to be proposed for these mines.
- 6 **Research schemes to evolve new mining technologies:** Indian geo-mining conditions for geologically disturbed and deep seated reserves may vary from those of other countries, which will require necessary R&D initiative for evolving new site-specific mining technologies.

14.6 TECHNOLOGY FOR UNDERGROUND COAL GASIFICATION (UCG)

UCG is a process of converting the coal in-situ into a combustible gas and so create a source of clean energy with minimal greenhouse gas emission. It offers a potential economic means of extracting energy from deep-seated deposits, which are not amenable to conventional physical extraction. It is more useful at greater depth without attendant problems of strata control, fire and other environmental problems.

Globally, Majuba mine of Eskoms, South Africa plans to explore 106 million tonnes of geologically disturbed coal reserves by UCG. Total energy expected to be produced from this project is 350 GW. The UCG plant in Angren, Uzbekistan is in operation since 1955.

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. Besides, within mineable depth also, there are many small isolated patches of coal occurrence, which are

presently not viable for mining and the same can be considered for UCG. Additionally, there is a huge occurrence of lignite 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.

Visualizing the opportunity, CIL Board has signed a MoU with ONGC for pursuing UCG under collaborative regime on 50:50 cost sharing. SCCL has also signed MoU with ONGC to carry out investigations on UCG in three blocks. Similarly, NLC has also entered into a MoU with ONGC for pursuing UCG in Gujarat. However, for substantial development of UCG in the country, the private parties/ users need to be also encouraged. For development of UCG identification of proper sites has to be undertaken by appropriate studies of the coal/lignite deposits.

14.7 TECHNOLOGY FOR EXTRACTION OF COAL BED METHANE (CBM), COAL MINE METHANE (CMM) AND ABANDONED MINE METHANE (AMM)

Extraction of Coal Bed Methane (CBM)

Coal Bed Method (CBM) is commercially being produced through wells, and collected over ground by various surface installations. Being a low pressure gas, mostly CBM have to be provided artificial lift to produce. As water is being drawn out from the formation, slowly methane starts flowing out by the combined mechanism of desorption, diffusion and Darcy flow, and brought to the surface normally through vertical wells.

Extraction Technology

There are two techniques to simulate CBM production:

- 1 Hydro-fracturing, and
- 2 In-seam horizontal drilling technique

Apart from above mentioned technologies, few more similar horizontal technology which are used mostly in USA and Australia with slight variation and modifications can be mentioned. These are:

- o Dimaxion (Australia)
- o Radial Horizontal Technology (Australia)
- o Z-Pinnate technology (in West Virginia by CDX Gas).

Global scenario:

- 1 USA is leader of CBM production producing around 7.6 billion cubic meters (BCM) per year.
- 2 China is targeting CBM recovery of 10 BCM per year by 2010.
- 3 Australia is likely to be the next producer of commercial quantities of CBM.

Almost all these technologies are originally developed for pre-mining gas drainage and can be used from mine face to in-seam or surface to in-seam (SIS) application. These technologies are typically useful for low permeability hard coal i.e. suitable for Indian coals of Gondwana Basin.

CBM in India:

In India, amongst various coal dependent non-conventional energy resources, CBM is now established as a fuel, because of fewer uncertainties involved in prediction of its presence and availability of technology for its production. CBM resources are prognosticated to be 3381 BCM extended over an area of 35326 sq. km.

Activities till date:

1. As per CBM policy (1997) guideline, Ministry of Petroleum & Natural Gas (MoP&NG) has been made the administrative ministry, and to facilitate delineation of blocks for development of CBM, a memorandum of understanding (MoU) was signed between MoC and MoP&NG. CMPDI has been nominated as the Nodal Agency.
2. For the exploitation of CBM from the deep lying coal deposits (VCBM), 16 blocks have so far been allotted to interested parties through two rounds of global bidding and additional 10 blocks are to be allotted in third bidding. A total of 50 core wells and 20 test/pilot wells have been drilled so far and have yielded encouraging results. CBM gas is being flared in at least 2 allotted blocks and operators are planning for commercial production from 2007.
3. ONGC is in advanced stage of implementation of a VCBM (Virgin CBM) Pilot Project in Jharia Block.

Constraints for development of CBM in India:

- Inadequate data base: In X Plan, a project to create data base related to CBM has been initiated. It is felt that this activity should continue in XI Plan also to facilitate delineation of additional CBM blocks.
- Availability of infrastructure:
 1. Limited availability of service providers in the country particularly for well drilling creates dependency on the expensive Foreign Service providers.
 2. Local players like MECL, CMPDI etc. needs to be encouraged to develop the capability.
 3. Local distribution network needs also to be developed as a prerequisite for development of CBM prospects.

As such, there should be a national policy in place to connect the CBM blocks to national pipeline grid, as is in practice in USA. This will facilitate the CBM producers to have a net-work for marketing

Proposed strategy for development of CBM in India:

- a) Generation of reservoir parameter by expeditious exploration
- b) Addition new prospects in the vicinity of identified prospects by initiating exploration to augment the resource base and to lower development cost
- c) Ensuring utilization potential near the identified blocks

Extraction of Coal Mine Methane (CMM)

Global Scenario

US are leading in CMM production. As per EPA estimates US mines captured about 40 billion cubic feet (Bcf) of CMM in 2001. Emission of methane from China's coal mines is 8-10 Bcf annually.

Status of CMM in India

As per the MoU signed between Ministry of Coal and Ministry of Petroleum & Natural Gas, the coal producing companies will have the right of CBM exploitation in their working mines including pre and post mining operations. Accordingly, steps were initiated by CMPDI on behalf of CIL towards the development of CMM. The assessed coal resource amounts to 23.9 billion tonnes without accounting for de-stressed coal, which could be available for CMM.

With a view to develop indigenous capacity in the field of CMM recovery, a GEF/UNDP aided demonstration project was undertaken by Gol on CBM recovery & utilization at 2 mines of BCCL.

Extraction Technology

- o Methane is recovered ahead of mining from the coal seams planned for mining by drilling surface boreholes.
- o Wells from surface ahead of mining through deep inseam drilling in coal and in strata above and below.

Indian coal Bed Methane Clearinghouse:

The objective of the clearinghouse would be to act as a technical and policy consultant to the industry and to the other stakeholders in recovery of CMM/CBM and to give impetus to production and utilization of CBM/CMM in India. It will also be helpful in creating network for information exchange and project development and connect potential developers with these contracts. A proposal for establishment of Coalbed Methane clearinghouse in association with US EPA is under consideration of Govt. of India.

Extraction of Abandoned Mine Methane (AMM)

Status of AMM in India

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 un-stowed UG mines having large spatial extent is limited in number.

Extraction Technology for AMM

Methane can be extracted from rock strata and pores in the coal and surrounding rock at the mine by drilling boreholes in the roof/floor strata of the working seams and from the gob areas.

Issues to be addressed for CMM /AMM development

- o Delineation of viable blocks
- o Capacity build up for resource modeling
- o Legal/ safety framework to be developed
- o Guidelines for ownership of the recovered gas/ carbon credit.
- o Setting up of infrastructure for transportation/utilization of recovered methane.
- o Working out the economics of CMM/ AMM exploitation.

Apart from the above, a model project is required to be developed with well defined functional areas for each of the stake holders, i.e. the coal producing company, company which is

assigned the role of recovery of methane, mine safety authorities and also to develop a mechanism where the administrative, legal and fiscal regime is well-defined for simultaneous coal mining and methane recovery.

14.8 ALTERNATE TECHNOLOGY FOR COAL TRANSPORTATION

During the year 2004-05, about 371 Mt of coal has been transported to various consumers in the country, which includes around 55% by rail, 19% by road, 23% by Merry-Go-Round (MGR), 2% by belt conveyor and 1% by ropeways. During 2004-05 in comparison to 2001-02, transport by rail increased by 22.72% whereas by road increased by 115.14%. The growth share of other modes of transport was Merry-Go-Round (MGR) by 30.24%, by belt conveyors by (-) 5.64% and ropeways by (-) 7.14%.

Indian coal industry is currently aiming to increase coal production by more than 50% by the terminal year of XI Plan period (refer Chapter-5). Transportation of such large volume is itself a gigantic task as bulk of coal has to be transported to power utility and other user industries. For transportation of such large volume of coal, the transport arrangements are suggested below:

Rail Transport : In view of large volume coal to be transported for various consumers in the coming years, in the country, the following may be suggested to improve/increase the coal transportation capacities by rail:

- i) Railways shall have to consider increasing payload of wagons and/ or the train size to have fast turn around cycle through dedicated railway corridor. Such network has to be constructed on BOO base by a consortium by user Industries utilizing freight corridor. The existing rake payload capacity can be increased by using electric ABB locos or diesel GM locos and cycle time can be reduced by using modern wagons for freight.
- ii) Augmentation of line capacities in congested routes such as Main Line beyond Mughalsarai, Main Line beyond Chakradharpur and East Coast Line beyond Cuttack.
- iii) The existing wagons can be replaced by aluminum wagons. The pay load capacity of the wagons can be increased from the present 58.8 tonnes to 63 tonnes. The freight movement can be increased by 7% without increasing the capacity of locos or strengthening the rail lines.
- iv) Dedicated rail lines comprising of special **north-south corridor** and **east-west corridor** for freight transport may have to be considered by railways as a long term measures. This could be built on public-private partnership basis.

Pit head power stations for reducing long haulage of coal: The coal instead of getting transported to long distances is transported to nearby power plants by Merry-Go-Round (MGR) systems. These systems basically operate between the coal project and the pit head power plants owned by the power generating companies. This is a very dependable system of transport. These systems can be utilized in a big way for transporting coal to power plants which can be located near the coal projects. Wherever feasible the MGR system should be linked with the national railway system for gainful utilization of available infrastructure.

Coal Slurry Pipeline Transportation: As an alternative economic means of transportation of coal, the option of coal slurry pipeline technology, as in vogue in USA (the Black Mesa Pipeline) for the transportation of coal requires to be perused for successful application of this technology in India through specific action plan. This area may be offered for the potential investors and private sectors.

Transportation via Sea Route/ Inland Water Ways: Transportation via sea route and water ways is the most economic means of transport. The following possibilities can be explored for easing the pressure on the Indian Railways.

1. Use of National Waterways for transportation of coal in the country: It needs to be explored whether available waterways like Haldia-Allahabad Waterway No.1, Sadiya-Dhubai Waterway No. 2, Kollam-Kottapuram Waterway No.3 etc. could be put in use for coal transportation.
2. Explore the potential for coal transport using sea route: Presently, coal from Talcher Coalfield is being transported to the southern region TPS (Thermal Power Stations) from Paradweep port through coastal shipment. This needs further augmentation to reduce transport by rail. Following measures need to be taken at ports which are amicable for coastal shipment:
 - Provision for cargo berths
 - Development of storage facilities
 - Installation of handling equipment.

Road Transport: It constitutes a very important link in transporting low to medium volumes of coal for short lead distances. With massive investments being made on the development of National Highways, this mode of transport will continue to grow in coming future. Highway coal haulers having the high payload capacity can be deployed in dedicated road routes.

14.9 THRUST AREAS FOR MINING TECHNOLOGY

Technological development to fulfil rapid growth objective

Meeting the coal demand poses a formidable challenge in increasing the coal production.

Rapid growth is an essential part of the strategy. This will need

- o Introduction of mass production technologies (like continuous miner technology, mechanized longwall technology, etc.) in mass scale;
- o Introduction of new technologies like high pressure water jet mining technology, high pressure air breaking technology, paste-fill technology for high concentration fly-ash stowing, mining technology with pre-consolidation of rock mass, etc.;
- o Technological development for working geologically disturbed and deep-seated resources by underground/opencast methods;
- o Thrust on strata control and hard roof management techniques;
- o Introduction of Underground Coal Gasification (UCG) for unapproachable/ economically non-viable underground mining projects;
- o Production of CBM/CMM/AMM by degasification of the gassy seams;
- o Introduction of surface miners, coal loaders and highwall miners in opencast mines;
- o Systematic dealing with coalmine fires to release underlying coal reserves;
- o Introduction of appropriate coal transportation system to handle the produced coal / gas;
- o Indigenous development of spare parts.

Government concerns

Areas requiring special thrust from Government are -

- o Foreign direct investors may be allowed to participate in our industrial growth, which will provide a valuable method of injecting resources into the economy, upgrading our technological standards and building international partnerships.

- o Suitable policy measures to facilitate private sector participation in coal mining through Joint Venture
- o Ensure flexibility in some of the labour laws to facilitate labour intensive industries operating at relatively lower skill levels;
- o Relaxation in laws for promoting out-sourcing and necessary amendments in Contract Labour (Regulation and Abolition) Act;
- o Improvement in Railway, Road and Port infrastructure to augment coal off-take from various coalfields, including augmentation of railway line capacities in congested routes,

Presently, under Indo-US Coal Working Group, one of the identified areas for cooperation is the extraction of steep Seams particularly for North-Eastern Coalfields.

CHAPTER-15

BENCHMARKING AND PRODUCTIVITY

15.1 INTRODUCTION

As per the terms of reference, this chapter covers the topics – establishment of benchmarks for different mining operations/ equipments comparable with international standards and measures for their achievement.

15.2 BENCHMARKING OF MINING OPERATIONS

Benchmarking is used for providing comparative framework for improving the performance of individual companies. It is a process of searching for, measuring and implementing better practices, through comparisons with other organizations (or with different parts of a single organization). It provides the reference point for assessment of the performance of unit operations with relation to geo-mining parameters.

No two mines are identical, so as the mining operations. It is rather difficult to standardize the mining operation due to the varied operational parameters such as geo-mining, techno-economical, administrative, operational and socio-political parameters. Thus, benchmarking of mining operation will have to be based on certain specific / generalized conditions or parameters.

The major areas, where benchmarking can be used as a tool for improving operational efficiency of the coal mining companies, are:

- a. Man productivity, and
- b. Machine Productivity.

Benchmarking based on these parameters/ factors can be effectively used in the mining industry for its improvement. In past also, adequate thrust had been put on these parameters and the coal companies have registered gradual improvement.

Benchmarking has a number of limitations, some of which are particularly relevant for the mining industry. Key requirement for fair benchmarking is to have comparison on like to like basis. Such comparisons are difficult to make when there are number of variables influencing the performance. Hence the initial benchmarking results require significant adjustment or qualification. In absence of data base of comparable companies in the coal sector, worldwide, such adjustment or qualification is also not very realistic.

Benchmarking is based on following broad considerations:

- o Standard mining conditions;
- o Best possible mechanization in all spheres of mining activities; and
- o As the geo-mining and socio-political conditions are quite different in Indian context, such benchmarking is established based on the performances within the country.
- o Productivity achieved globally is considered for references.

15.3 PRODUCTIVITY BENCHMARKS FOR UNDERGROUND MINING

Productivity of underground mines varies with the technology adopted for coal extraction, level of mechanization of mining subsystem, geo-mining conditions of the mine etc. Man productivity improves with mechanization. The type of mechanization adopted depends upon the prevailing

geo-mining condition of the mine. It is not possible to mechanize all the underground mines as in some of these mines geo-mining conditions may not favour mechanization.

INDIAN SCENARIO:

The company-wise technology-wise machine productivity per day per machine (on annual working basis) and man productivity achieved are shown in the table below:

Sl. No.	Type of machine/ mining system	Machine productivity achieved		Man productivity achieved (t)
		tpd/Mc	Mty	
SDL(Side Discharge Loader)/LHD (Load Haul Dumper)				
1.	SDL (Bucket capacity 1 m ³)			
	a) CIL (2003-04)	84	-	1.68 (max.)/0.21 (min.)
	b) SCCL (2003-04)	100	-	1.96 (max.)/0.92 (min.)
2.	LHD (Bucket capacity 1.5 m ³)			
	a) CIL (2003-04)	135	-	2.20 (max.)/0.67 (min.)
	b) SCCL (2003-04)	143	-	1.31 (max.)/0.94 (min.)
PSLW (Powered Support Longwall) + SDL				
3.	PSLW system			
	a) CIL (2003-04)	1020 (avr.)	-	2.10 (max.)/ 1.26 (min.)
	b) SCCL (2005-06)	680 (avr.)	-	6.71
CM (Continuous Miner)				
4.	CM (JOY 12CM 15 or equ.)	1491 (max.)/	-	5.36 (max.)/ 1.81 (min.)
	a) CIL (2003-04)	680 (min.)		
BG (Blasting Gallery)				
5.	BG with 5 LHDs (Bucket capacity 2.7 m ³)			
	a) SCCL (2005-06)	-	0.175 (avr.)	4.45 (max.)/ 2.58 (avr.)
NOTE: 'Max.' stands for 'Maximum', 'min.' for 'Minimum' and 'avr.' for 'Average'.				

The overall productivity in terms of Output per Manshift (OMS) envisaged for XI Plan (2007-12) for CIL is 5.54 tonnes (OCP-13.18 tonnes; UG-0.94 tonnes) and in SCCL 2.67 tonnes (OCP-8.4 tones; UG- 1.14 tones).

INTERNATIONAL SCENARIO:

Amongst UG mining methods, PSLW technology contributes some 50% of the global production and some 75% of total UG production worldwide. It is the most popular technology in leading coal producing countries all over the world (e.g. Kazakhstan, Ukraine, Russia, Germany, Poland - 100%, UK - 97%, China - 95%, Australia - 72%, USA - 45% & Canada - 43% of UG production obtained by longwall technology (1996)). On the other hand, highly mechanized room and pillar CM mining accounts for 92% in South African, 45% in USA and 15% in Australian UG production.

The productivity performance of different technologies achieved during last decade in some of the countries of the world is presented in the table below:

Sl. No.	Type of machine/ mining system	Machine productivity achieved		Man productivity achieved (t)
		tpd/Mc	Mty/set	
SDL (Side Discharge Loader)/LHD (Load Haul Dumper)				
1.	SDL	-	-	-
2.	LHD	-	-	-
3. PSLW (Powered Support Longwall) + Road Headers/ Continuous miners				
	a) USA	-	10.1 (max.)/ 3.4 (avr.) (2005)	81 (max.) (2004)
	b) Australia	-	6.6 (max.)/ 2.6 (avr.) (2005)	-
	c) China	-	10.6 (max.) (2005)	142 (max.) (2002)

4. CM (Continuous Miner)				
	a) USA	-	1.32 (max.)/ 0.84 (avr.) (2005)	56 (max.)/ 22 (avr.) (2004)
	b) South Africa	-	1.44 (max.)/ 0.78 (min.) (2005)	-
	c) Australia	-	0.72 (max.)/ 0.48 (avr.) (2005)	-
	d) China	-	2.40 (max.)/ 0.36 (avr.) (2005)	-
5.	BG (Blasting Gallery)	-	-	-

MACHINE & MAN PRODUCTIVITY BENCHMARKS:

Based on the experience in Indian mines and also considering the international benchmarks, the national benchmarks of the different mining system under standard geo-mining conditions can be as follows:

Sl. No.	Type of machine/ mining system	Machine productivity benchmark		Man productivity benchmark (t)
		tpd/Mc	Mty	
SDL(Side Discharge Loader)/LHD (Load Haul Dumper)				
1.	SDL (Bucket capacity 1 m ³)	120	0.036	1.30
2.	LHD (Bucket capacity 1.5 m ³)	150	0.045	1.50
3.	SDL (1 m ³ bucket) + UDM	135	0.040	1.60
4.	LHD (1.5 m ³ bucket) + UDM	170	0.050	2.00
PSLW (Powered 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 m ³)	825	0.250	4.00
* Considering 10 months operation and 2 months equipment salvaging/ shifting period in a year.				

Technology-wise standard geo-mining conditions considered are tabulated below:

Sl. No.	Standard geo-mining conditions	UG mining technologies considered for benchmarking			
		SDL/LHD	PSLW	CM	BG
1.	Height of working section (m)	3.0	3.0	3.0	8.0
2.	Gallery width (m)	4.2	4.8	6.0	4.8
3.	Pillar size (m x m)	30 x 30	-	30 x 30	30 x 30
4.	Panel length (m)	-	1500	-	-
5.	Panel width/ Face length (m)	-	150	-	-
6.	Seam gradient (1 in)	6(SDL)/8(LHD)	6	8	8
7.	Depth of cut (m)	-	0.8	-	-
8.	Min. Cutting speed (m/min)	-	6.0	-	-
9.	Mechanization	Semi-mechanized	Fully mechanized	Fully mechanized	Semi-mechanized
10.	Support	Roof bolts (cement/ resin capsules)	Powered support, Roof bolts (resin)	Roof bolts (resin capsules)	Horz. beams on hydraulic props
11.	Gassiness	No limit	No limit	No limit	Deg. I (CH ₄ emission ≤0.6 m ³ /t)
11.	Roof & Floor conditions	Favourable			
12.	Mine environment	Within comfort limits			

Deviation from the standard geo-mining condition will influence the aforesaid benchmarks and accordingly benchmarks will have to be re-estimated with various correction factors like:

Sl. No.	Basic Parameters	Standard Condition	Correction factor to be considered for variance in standard condition
SDL (Side Discharge Loader)/LHD (Load Haul Dumper)			
1.	Height of Extraction	3.0m	2.1-3.0m: 0.9; 1.8-2.1m: 0.85; < 1.8m: 0.7 (in case of Low height SDL/LHD)
2.	Gradient	1 in 6 (SDL)	Steeper than 1 in 6: 0.8 (i.e. upto 1 in 4 – for dip and upto 1 in 5 – for strike)
		1 in 8 (LHD)	Steeper than 1 in 8: 0.8 (i.e. upto 1 in 6 – for dip and upto 1 in 7 – for strike)
PSLW (Powered Support Longwall)			
1.	Length of LW Face	150 m	> 250m: 1.7; 200-250m: 1.5; 150-200m: 1.3; 100-150m: 0.8; < 100m: 0.7
2.	Length of LW Panel	1500 m	1000-1500m: 0.9; < 1000m: 0.7
3.	Height of Extraction	3.0m	2.5-3.0m: 0.9; 2.0-2.5m: 0.8; 1.5-2.0m: 0.7; < 1.5m: 0.5
4.	Gradient	1 in 6	Steeper than 1 in 6: 0.9; Steeper than 1 in 4: 0.7
CM (Continuous Miner)			
1.	Height of Extraction	3.0m	2.5-3.0m: 0.8; 2.0-2.5m: 0.7; < 2.0m: 0.6 (in case of Low Capacity CMs)
2.	Gradient	1 in 8	Steeper than 1 in 8: 0.8 (i.e. upto 1 in 6 – for dip and upto 1 in 7 – for strike)

BG (Blasting Gallery)			
1.	Height of Extraction	8.0m	8.0-11.0m: 1.1; 11.0-15.0m: 1.25
2.	Gradient	1 in 8 (LHD)	Steeper than 1 in 8: 0.8 (i.e. upto 1 in 6 – for dip and upto 1 in 7 – for strike)

NOTE: If more than one condition exist all the factors will apply. With the ageing of equipment/machine, benchmark figures will decrease.

Benchmarks for stowing mines will be the same as those of caving mines provided the rate of extraction of coal matches with the rate of stowing. Otherwise, new benchmarks need to be established on the basis of stowing capacity of the mine(s).

While planning new underground mining projects, the benchmarks need to be established afresh and the project performances should be compared with the same for their operational efficiencies as the same are site-specific.

15.4 PRODUCTIVITY BENCHMARKS FOR OPENCAST MINING

Unlike underground mines, output per manshift (OMS) as a measure of man productivity has little significance, as highly mechanized OC mines profitability is largely influenced by the performance of capital intensive, heavy earth moving machinery (HEMM). OMS in OC mines are largely influenced by geo-mining conditions and should not be used as a comparative index of performance, since the focus of planning and subsequent implementation of OC coal mining projects is to offer least cost solutions, rather than high OMS solutions which may not be cost effective beyond a certain limit.

INDIAN SCENARIO:

Performance of 10 cu. m shovels (both coal & OB) and draglines (OB) in SCCL mines during X Plan period is as given below.

Sl. No.	Type of Excavators	Parameters	Production performance of OC mines			
			2002-03	2003-04	2004-05	2005-06
1.	Shovel (10 cu. m)	No. of excavators	22	22	22	22
		Max. production of coal & OB (Mm ³ /year/Excr.)	1.99	2.20	2.31	2.54
		Min. production of coal & OB (Mm ³ /year/Excr.)	0.63	0.89	1.19	0.72
		Average production of coal & OB (Mm ³ /year/Excr.)	1.48	1.63	1.72	1.73
2.	Dragline (24/96)	No. of excavators	1	1	1	1
		Average production of coal & OB (Mm ³ /year/Excr.)	4.16	3.11	3.30	3.16
3.	Dragline (30/88)	No. of excavators	1	1	1	1
		Average production of coal & OB (Mm ³ /year/Excv.)	4.23	4.21	4.12	4.75

INTERNATIONAL SCENARIO:

Equipment-wise global production performance of various excavators are not available.

However, data available for the equipment/HEMM manufacturers are as follows:

1. Productivity of Excavator (6 cu. m capacity) (Caterpillar make): 350 m³/hr (i.e. 2.52 Mm³/annum) (with 7200 hrs of running per year)
2. Productivity of Excavator (14 cu. m capacity) (KPC, Indonesia make): 800 m³/hr (i.e. 5.76 Mm³/annum) (with 7200 hrs of running per year)

MACHINE PRODUCTIVITY BENCHMARKS:

Based on the experience in Indian mines and the recommendations of the Committee of MoC, the national benchmarks of the commonly used shovels-dumper and draglines under standard geo-mining conditions (considering 330 working days) are as follows:

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

Standard geo-mining conditions for Excavators can be considered as:

1. Standard OC bench height & width - which varies with the configuration of the equipment (particularly for shovels);
2. Optimum drilling & blasting with proper fragmentation of rock material;
3. Matching combination of excavators with transport equipments (particularly for shovels);
4. Appropriate gradient of the working bench and haul road (particularly for shovels), etc.

Deviation from the standard geo-mining condition will influence the aforesaid benchmarks. With the ageing & poor maintenance of equipment/machine, benchmark figures will decrease.

While planning new opencast mining projects, the benchmarks need to be established afresh and the project performances should be compared with the same for their operational efficiencies as the same are site-specific.

15.5 GENERAL COMMENTS

Effort has been made to establish benchmarks for both underground and opencast mining operations/ equipments in generalized mining conditions. It is suggested that initiative regarding conducting a comparative study on international benchmarking standards may be taken up during the XI Plan period.

15.6 THRUST AREAS FOR BENCHMARKING AND PRODUCTIVITY

Benchmarking of mining operations/ equipments

Except some operational norms, as such there is no benchmark in the country for different mining operations/equipments to be comparable with the international standards. That is why it has been felt to establish benchmarks for different mining operations/ equipments in Indian geo-mining conditions.

CHAPTER -16

PROJECT FORMULATION AND IMPLEMENTATION

16.1 INTRODUCTION

As per the terms of reference, this chapter covers the topics – measures for improved formulation and implementation of projects.

16.2 STATUS OF SANCTIONED PROJECTS - MINING & NON-MINING

Since nationalisation (1973) of the coal/lignite sector till March 2006, 639 mining projects and 308 non-mining projects were sanctioned and 571 mining projects and 300 non-mining projects were implemented/ are being implemented in public coal mining sector. In case of private coal companies, comprehensive data for all companies were not available.

In Coal India Limited (CIL), a total of 508 mining projects and 228 non-mining projects (costing Rs. 2 crores and above) has been sanctioned till March 2006 since nationalization of coal mines in 1973. These figures for the Singareni Collieries Company Limited (SCCL) are 116 mining projects and 27 non-mining projects respectively, out of which 19 mining projects were exhausted and closed. The corresponding mining and non-mining projects of Neyveli Lignite Corporation (NLC) are 7 and 6 respectively and of SAIL-ISP (the then IISCO) are 8 and 3 respectively.

16.3 MINING PROJECTS

Out of a total of 508 sanctioned mining projects of CIL each costing Rs. 2 crores and above, 324 projects stand completed (including projects where coal reserves have been exhausted). Out of remaining 184 projects, 79 projects are on schedule, 37 projects delayed and 68 projects dropped. The delayed projects represent 7.3% of the total sanctioned projects. In Singareni Collieries Company Limited (SCCL), out of total 116 mining projects, 76 have been completed, 25 are on schedule and 15 are delayed. For NLC, out of total 7 mining projects, 5 have been completed and 2 are on schedule. The company-wise details are given in Table-1 & Table-2.

Table-1: Company-wise Sanctioned Mining Projects (since nationalization (1973) till March 2006)

Company	Number of Mining Projects (since nationalisation) Costing			Total No. of projects #
	Rs. 100 Cr. & above	Between Rs. 20 to 100 Cr.	Rs. 20 Cr. & below	
CIL	36	162	310	508
SCCL	8	47	61	116
NLC	7	-	-	7
SAIL-ISP	2	5	1	8
Total	53	214	372	639
# Inclusive of projects where coal reserves have been exhausted.				

Table-2: Company-wise status of the coal mining projects since 1973 till March 2006

Coal Company	Project Sanctioned	Capital (Rs. Cr.)	Project Completed	Project dropped	On-going Projects		
					Total	On Schedule	Delayed
CIL	508	27489.69	324	68	116	79	37
SCCL	116	4932.28	76	-	40	25	15
NLC	7	6797.49	5	-	2	2	-

SAIL-ISP	8	623.14	1	-	7	4	3
Total	639	39842.60	406	68	165	110	55

16.4 NON-MINING PROJECTS

The non-mining projects include captive power plants, sand gathering and transport schemes, workshops, water supply schemes, fire-control schemes for washeries etc., which are not been considered in Project Reports.

Out of a total of 272 non-mining projects in CIL, 187 projects have been completed. As many as 51 projects are delayed against only 26 which are on schedule (8 projects being dropped). Similarly, in case of SCCL, out of 27 non-mining projects, 9 are completed and 18 are on schedule. No project is delayed so far. Out of 6 non-mining projects, NLC has 4 completed projects and 2 on-going projects, which are on schedule. In Case of SAIL-ISP, out of 3 non-mining projects, 1 is completed and 2 are on schedule. The company-wise details are shown in Table-3 & Table-4.

Table-3: Company-wise Sanctioned Non-mining Projects (since nationalization (1973) till Mar.'06)

Company	Number of Non-Mining Projects (since nationalisation) Costing			Total number of projects	Sanctioned Cost (Rs. Crores)
	Rs. 100 Crores & above	Between Rs. 20 to 100 Crores	Rs. 20 Crores & below		
CIL	3	24	245	272	3222.51 + ₹0.146 million
SCCL	-	4	23	27	345.20
NLC	6	-	-	6	6972.96
SAIL-ISP	-	1	2	3	44.02
Total	9	29	270	308	10584.69 + ₹0.146 million

Table 4: Status of Non-Mining Projects (Company-wise) (till March 2006)

Coal Company	Project Sanctioned	Capital Outlay (Rs. Crores)	Project Completed	Project on Schedule	Project Delayed	% of Delayed to Sanctioned Projects
CIL	272*	3222.51 + ₹0.146 million	187	26	51	18.75%
SCCL	27	345.20	9	18	-	0.00%
NLC	6	6972.96	4	2	-	0.00%
SAIL-ISP	3	44.02	1	2	-	0.00%
Total	308*	10584.69 + ₹0.146 million	201	48	51	16.56%
* 8 sanctioned projects have been withdrawn/ dropped.						

16.5 PROJECTS MONITORING AT GOVERNMENT LEVEL

On-going projects each costing Rs. 100 crores & above are being monitored at the Government level. As on March 2006, there are 13 such projects (mining / non-mining) under implementation in CIL and NLC. No project of SCCL & SAIL-ISP is being monitored at present (March 2006).

16.6 STATUS OF PROJECT FORMULATION AND IMPLEMENTATION

Formulation and implementation of projects suffered due to various reasons like adverse geo-mining conditions, in-adequate geological studies, improper contract management, land acquisition problems, equipment maintenance problems, etc. As a result of these, a number of projects were to be foreclosed even after incurring the allotted capital and the projects could attain 20% to 30% of the rated capacity. In view of this, a number of measures were taken for improving the formulation and implementation of the projects, which are as follows:

I. PROJECT FORMULATION

- i) **Linkage Status** – Once the demand-supply analysis justifies the need of a project, a firm consumer linkage should be established. The Memorandum of Understanding (MOU) with major consumers should be signed in advance.
- ii) **Exploration status** – In addition to conventional exploration of the deposits by drilling boreholes, deposit characteristics should also be assessed by modern geo-physical and geo-statistical surveying/analysis. Sophisticated geological and geophysical exploration techniques including in-seam seismic survey should be adopted for advance forecasting of geo-mining conditions and detection of structural discontinuities/ disturbances (faults, dykes, sills, pinch & swell structures, folds, shear zones etc) in deposits especially for adoption of mechanized mining technology.
- iii) **Borehole density** – Uniform drill spacing of 400m suggested in Indian Standard Practices (ISP), 1957 does not take into account the factor of geological complexity. Borehole (BH) density needs to be increased from the present level of 7 BHs/sq. km to:
 - o A minimum of 15 for opencast mining with proving of structures; and
 - o A minimum of 20 for underground mining with PSLW equipment.

The aforesaid borehole density should be considered seam-wise (in case of multi-seam deposits) in the in-crop area and beyond in-crop area as a better index of adequacy of exploration in comparison to overall borehole density.

The complex and heterogeneous deposits need to be explored through geophysical surveys/ borehole geophysics. Statistical analysis of borehole data (thickness, grade etc. in terms of mean, standard deviation, range, coefficient of variation, standard error of estimation for ascertaining proved reserves at 95% confidence level) and other geostatistical tools (such as Variograms) may be introduced to assist in deciding the level of exploration needed in defining proved and indicated reserves in terms of quantity and quality.

- iv) **Assessment and categorization of coal resources** –
 - o Aggregate in-place coal reserves of all categories (proved, indicated and inferred) in the country include the in-place reserves that have been depleted in past. Precise estimate of balance recoverable coal reserves in the country needs to be carried out to determine remaining life of the recoverable reserves.
 - o Geological information in a block could be obtained through geophysical surveys (electric, magnetic and seismic).
 - o Seam thickness-wise, technology-wise and depth-wise estimate of mineable/recoverable reserves/OB volumes must be presented in the Project Reports (PRs) of coal projects.

- o 100% of boreholes intersections for various seams need to be tested for coal quality as the grade of coal in a coal seam is highly heterogeneous.
 - o Geotechnical investigations, tests, studies on rock mechanical properties and washability studies are to be discussed adequately in the project reports.
 - o Area of the mine-take, over which coal reserves are planned to be extracted, sometimes differs from that of geological block. Justification for planning for developing mine-take boundaries different from geological block boundaries needs to be addressed in the PR.
 - o Relative techno-economics of the cost of relocation of certain surface features and the value of reserves sterilized (rendered unmineable) if these are not relocated should be worked out in PR.
 - o Precise amounts of reserves (not mineable due to presence of surface constraints) need to be indicated in the PR along with the strategies to be adopted and costs involved for implementing such strategies to reduce the loss of such reserves. In the absence of any surface constraints it should be imperative to indicate how and when the balance reserves would be extracted, if at all in future and at what cost.
 - o As coal and lignite reserves are capital assets of wasting nature, annual audit of reserves should be made a standard practice in the coal mines of the country (similar to that in Canadian mines) taking into account recoverable reserves depleted during the year, reserves added through exploration/mine development during the year and reserve changes if any through recalculation in the light of additional geological data becoming available.
- v) **Advance Action Proposals (AAP)** – Formulation and implementation of AAP is a prerequisite for final sanction of the Project Report (PR). Availability of land for at least 10 years of operation is to be ensured before sanction of PR. The limit of Rs.20 crores at the ministerial level needs to be enhanced due to NPV cost of land imposed by the Ministry of Environment & Forestry (MoEF). For better formulation and implementation of AAPs in coal sector projects, following points need to be covered in the project reports:
- o Activity-wise expenditures incurred year-wise on AAP and their status of implementation.
 - o Reasons for delay and part implementation of the AAPs.
- vi) **Suitable method of work** – Suitability of technology for working the project is to be considered in depth along with degasification to ease out ventilation problems in the highly gassy mines. Highwall mining should be a part of opencast mining project to improve upon recovery of reserves.
- vii) **Coal Beneficiation:** Coal beneficiation process research and development needs to be institutionalized. It would be necessary because majority of reserves are non-coking coal. When non-coking coal is being used in power generation, the emission of SO₂ and NO₂ increases. Low volatile high rank coal also needs to be beneficiated to add more value to the ROM coal, which in turn would reduce the import of such coal.
- Further, there is a need for bench scale/ pilot plant scale testing for washability studies on bulk samples (instead of sink and float tests only on a few borehole core samples) from various coal seams, where feasible, for finalization of process flow sheets of washery projects;
- viii) **Transport net-work:** While the growth of coal & lignite sectors is anticipated, the transportation net-work needs to be addressed while formulating the mining projects.

- ix) **Coal pricing index:** Pricing of coal product should be based on Gross Calorific Value Model as ultimate target. For an interim period Useful Heat Value based pricing can be adopted.
- x) **Economic viability** – The financial parameters should be given due consideration in the changed economic scenario. The guidelines issued by Ministry of Coal and CIL should form the basis for economic appraisal of the project. The availability of resources and funds for timely execution of the project should also be taken care of.

For improved project formulation, the mining project should explicitly spell out various assumptions made in estimation of capital and operating expenditure, like

- Prices of various inputs (like water, power, POL, explosives, other stores and spares etc.) adopted for estimating the operating costs together with specific consumption norms for these inputs;
- Exchange rate adopted for estimating FE (foreign exchange) component of the project, if any;
- Item-wise year-wise details of revenue expenditure capitalized net of revenue from sale of incidental coal production prior to capitalization of the mine;
- Definition of construction and capacity built up periods;
- Basis of opting for a particular timeframe for mine capitalization;
- Basis for calculating the financial cost/IDC (interest during construction) in terms of debt equity ratio assumed for implementing the project, interest rate and tenure of loans assumed in financing the initial capital cost of the green-field projects and in estimating the project viability, especially in case of RCE proposals; and
- In case of capacity expansion/ modernization and technical upgradation projects incremental viability analysis by preparing with and without project cash flows undertaken.

- xi) **Internal Rate of Return (IRR)** as an indicator for economic viability of the project needs to be estimated for alternatives - (i) mining by departmental means and (ii) mining by outsourcing. Both the alternatives should be analysed at the level of 12% IRR at 85% capacity utilization and economic viability may be established. Economically unviable projects can be taken up only in case of firmed up long term linkage on cost plus basis. Additionally, following points need to be considered to make the coal company capable of taking major financial decisions:

- (i) Coal mining to be declared as infrastructure sector and all benefits given to infrastructure sector should also be given at par to coal mining.
- (ii) Coal projects approval power equal to Mini Nav Ratan/ Nav Ratan i.e. up to Rs. 500 crores if implemented with internal resources only.
- (iii) Power to coal company Board for entering into JV (Joint Venture) or PPP (Public Private Partnership) or with another PSU company or private company.

As per PIB guidelines, Internal Rate of Return (IRR) for any new project is calculated on pre-taxation basis. IRR on post-taxation basis should also be calculated for new project during its formulation. Additionally, modern financial engineering techniques should be used for financial viability analysis. The terminologies like Debt Service Coverage Ratio (DSCR) and financial/ operational leveraging should also be evaluated for the proposed mining projects.

- xii) **Capitalization of coal mining projects** - Optimum mine design should place emphasis on mine development to be completed at the earliest with positive REC (revenue expenditure capitalized).
- xiii) **Assistance required** in exploration for improved project formulation: After demarcation of 'Yes' and 'No' areas for mining by the Forest Department, boreholes can be drilled. Present regulation of 10 boreholes per 100 sq. km related to drilling in forest area is very much inadequate for any meaningful assessment of coal resources on regional scale itself. It will require at least one borehole per square km. for regional exploration.

II. PROJECT IMPLEMENTATION

For effective project implementation, the State and Central Governments should act systematically to reduce the delays arising out of Forestry clearance, EMP clearance, acquisition of land, and implementation of R&R policies. Following are the some of the measures suggested to improve implementation of projects in coal industry.

1. **Forestry Clearance:**

Practically all coal deposits in India are at least partially under forest land and no Project can be cleared unless clearance is obtained for diversion of forest land for mining purposes. Following are the suggestions for cutting down delay in forestry clearance:

i) **Scrutiny of Proposals**

The entire process has to be made simpler and more expeditious by –

- (a) Cutting down the number of tables through which the proposals have to pass.
- (b) Specifying a time frame within which each office to which the proposal goes has to dispose it off either in the negative or in the affirmative. It should also be specified that in case the concerned office does not honour this time schedule, it would be presumed that this office has cleared the proposal.
- (c) It should also be mandated that before the case is turned down, the Applicant must be given an opportunity to rectify the defect/deficiency in his proposal.
- (d) Whenever deliberations of a Committee are involved, it should be specified that the Committee would meet once every month irrespective of the number of proposals to be examined.

ii) **Landscape Planning:** Immediate steps should be taken for Landscape Planning all over the country - on top priority for important Coal bearing States like Jharkhand, Chhattisgarh & Orissa. Based on this planning, priorities should be fixed as to the order in which areas may be diverted for mining. This would enable the Project proponents to select areas where diversion of forest land for mining would be easier and the Project construction would not get held up for delay in forestry clearance.

iii) **Land for compensatory afforestation:** The State Governments should be directed to identify land which is available for compensatory afforestation and for forming the Land Bank consisting of this land. The land required for compensatory afforestation should be made available from this bank against payment to be made by project proponents.

- iv) MoEF (Ministry of Environment and Forest) should declare **workable and non-workable forest areas** for coal mining.
- v) **Delay in processing of forest land proposals** - As per Forest Conservation Rules, 2004, a Maximum of 300 days (210 days for State Govt. and 90 days for MoEF) is prescribed for processing and approval of forest applications. But in most of the cases, the time period is not adhered to. Time frame so fixed should be adhered to for forest clearance by MoEF and State Govt.
- vi) **Modifications in the procedure of Forestry Clearance** – Suitable modifications in the procedure of forestry clearance may be enforced for timely clearance of the proposals.
- vii) **Regeneration of Forests:** Consideration should be given to clearance of forest diversion proposals on the basis that once the mining operations are completed, land will be reclaimed and handed over to the forest department for afforestation. The cost of afforestation would naturally be borne by the project proponent.
- viii) **Impact of Underground Mining:** In case of underground mining, it has been seen that even when subsidence takes place arising out of UG Mining, forest cover gets disturbed only temporarily and there is no permanent damage there to. In view of this, forestry clearance for Underground mining should be automatic with a provision that Project should pay compensation.
- ix) **Payment of NPV for underground mining** - As forest surface is neither disturbed nor lost due to UG mining, NPV should not be made chargeable for UG mining. Besides NPV, the coal companies have to pay the cost of compensatory afforestation double the area, cost of safety zone afforestation and fencing, cost of cutting and transportation of trees, levelling etc. The resultant cost thus goes to a much higher level than the NPV. The NPV should be commensurate with the future value of the product of the forest land had that land not been put to proposed use.

2. **EMP Clearance:**

As per the prevalent practice the application for EMP clearance is not even considered till forest clearance is obtained. Since the latter takes too much time, the process of consideration of EMP clearance also gets delayed and whatever time is required for EMP clearance gets added to the delay. Such delay can be reduced by:

- (i) EMP clearance may be granted in anticipation of forest clearance with a clear rider that EMP clearance will be utilized only when forestry clearance is received and that too after fulfillment of conditions imposed as part of the forest clearance.
- (ii) Single window concept for EMP clearance should be adopted by the Government machinery.
- (iii) Fresh Environmental Clearance for expansion of coal projects in terms of increase in production capacity should not be required if project proponent proves that, either the pollution load will not increase on expansion of project or the capacity of the mitigation measures provided in the original EMP is sufficient to deal with increase in production due to expansion. EMP should be prepared 1.15 times of capacity of the project.

3. **Land Acquisition:**

Land for Coal projects is acquired mainly under the two Acts viz. the Land Acquisition Act, 1894 (LA Act) and Coal Bearing Areas (Acquisition & Development) Act, 1957 (CBA Act). The Acts provide certain time limits for completion of acquisition process, but these time schedules are seldom adhered to as a result the proposals lapse at different stages due to time bar and the whole process has to start afresh. Further there is no time limit for completion of proceedings.

In so far as Government Coal companies are concerned, land acquisition is made under the provisions of the CBA Act, which is a centrally administered Act. As per the provisions of this Act, the Lease for Coal comes automatically to the concerned Government Coal Company. Problem is faced in getting physical possession of the land. Since some coal companies have a policy for providing employment against vacancy for acquisition of land, taking physical possession of the acquired land either under LA Act or CBA Act becomes difficult due to demand of employment beyond the norms of the policy guidelines.

Various measures to be taken are as follows:

- For forest land constant interaction with the MoEF and State Govt. to be maintained
- Vigorous follow up action with land acquisition officials of the State Governments to be actively done to expedite acquisition proceedings
- Regular meeting with the State Authorities viz. Land Revenue (LR) Commissioner, LR Secretary and Chief Secretary to sort out acute problems
- To overcome the problem of acquisition of land, forestry and environmental clearance, 'Advance Action' for projects costing Rs. 50 crores and above to be organized to initiate processes involved for various clearances before sanction of the projects by the Government.
- Offering one time monetary compensation in lieu of employment as per R&R Policy.

Suggestions:

- At present, there is no provision for de-notification of exhausted/surplus land acquired under CBA (A&D) Act, 1957. A section should be introduced in the Act for this purpose.
- It is felt that just as the Project proposal is submitted for approval by the Board of Directors of the concerned coal companies/Coal India & Public Investment Board (PIB), it should also be placed before the Committee headed by Chief Secretary of the State having the following as members for its information:-
 - (i) Land Reform & Development Commissioner
 - (ii) Collector of the concerned District
 - (iii) S.P. of the concerned district
 - (iv) Chief executive officers of the concerned district
 - (v) Representative of Ministry of Power and Ministry of Coal
 - (vi) Embers from Revenue Department, Environment & Forest Department etc.

The Project proponent should make a detailed presentation before this Committee indicating the land requirement and justification there for, compensation and other benefits, which would be available to the land oustees, Rehabilitation scheme and the benefits that would accrue to the State from the Project. Once this Committee is briefed about the Project, it will amount to a moral commitment from the State Government to help the Coal Company in land acquisition.

4. **Rehabilitation of Land Oustees and Project Affected People (PAP):**

- Central Government should formulate uniform and simple National R&R Policy, which should easily be understood and accepted by Land Oustees/ Project Affected Families (PAFs).
 - The National Policy should be adopted by all State Governments for uniformity in implementation.
 - Instead of providing employment to land oustees against acquisition of land, provision for lucrative monetary compensation should be made in the R&R policy.
 - PAP should be given training in different trades to enable them for self-employment.
 - Some percentage of royalty paid by the Coal Companies to the State Government should be earmarked by the State Government for community development and welfare activities for the PAFs.
5. **Help required from State Authority:**
 Apart from aforesaid helps required from the State Government, the following additional helps are required from various state governments:
- Development of infrastructure by State Govt. – Power supply and road to the project site should be provided by the State Govt.
 - In order to avoid delays for projects, State Government can delegate the power to the concerned District Collectors.
6. **Equipment Supply and turnkey Execution:** Regular follow up with public sector mining equipment manufacturers through measures like:
- Posting of coal company officials at the works for expediting the supplies
 - Frequent Senior Management level discussions
 - Regular review meeting at the Secretary level with concerned Ministries/Departments.
 - Simplified procurement procedure, tendering and less interference from vigilance,
 - Formulation of standard NIT (Notice Inviting Tender) for each proven technology to minimise time for procurement of equipment and subsequently project implementation
 - Having an approved vendor list for different works to reduce the time for tendering
 - CHP, Sub-station, Workshop should be awarded on turn-key basis.
 - Method adopted by NTPC & other companies shall be studied, etc.
 - Globally available technology should be considered with turnkey execution for reduction in project implementation time.
7. **Geo-mining constraints:** For quicker implementation of the projects, after promotional drilling, detailed drilling as well as mining operation can be suggested to run simultaneously.
8. For OC mining project, **financial assurances of environmental management** along with mine closure plan should be a necessity. Review of implementation would also be made mandatory.
9. **Project management:**
- A senior Officer in each company should have overall responsibility of project implementation.
 - Projects should be taken up only after detail examination of availability of land, state of preparedness and assured flow of funds.
 - The system monitoring at various levels is to be standardized.
 - Project wise PERT/CPM network (including resource base) for all activities –A standard CPM Chart remains an integral part of all the Project reports. Based on the Standard CPM

Chart, for each Project, monitoring of implementation of project is to be done at Area as well as at Headquarter level of the coal company. Project implementation group needs to be trained in project-oriented software for better control and monitoring of the project, entailing timely completion of the project.

- Out-sourcing – long term outsourcing should be considered.

10. **Competitive bidding process for unsolicited proposals:**

In case of unsolicited projects proposed *suo moto* by private entrepreneurs/ companies or singular bids, the merits of the proposal need to be evaluated by the Government to ensure fairness, impartiality and cost effectiveness. The 'Bonus System' (as adopted by Governments of Chile and Korea) or the 'Swiss Challenge System' (as adopted by Government of Philippines) of competitive bidding should be followed where the claims, veracity and global competitiveness of the unsolicited proposals could be put to open test by inviting competitive proposals from other market players.

16.7 THRUST AREAS FOR PROJECT FORMULATION AND IMPLEMENTATION

Areas requiring special thrust from Government are -

- o Need for national R & R policies,
- o Simplification of land acquisition and forest clearance procedures,
- o Ensure flexibility in some of the labour laws to facilitate labour intensive industries operating at relatively lower skill levels;
- o Strengthening of contract management

CHAPTER-17

REVIVAL OF LOSS MAKING COMPANIES

17.1 INTRODUCTION

As per the terms of reference, this chapter covers the topics – efficacy of reviving loss making coal companies and specific recommendations.

17.2 LOSS MAKING COAL COMPANIES

Three subsidiary companies of Coal India Limited (CIL) namely Eastern Coalfields Limited (ECL), Bharat Coking Coal Limited (BCCL) and Central Coalfields Limited (CCL) were the loss making companies at the terminal year of IX Plan period (2001-02). During IX Plan period, efforts had been made to achieve turn-around of the companies with little success. Consequently during X Plan period these companies have become statutorily sick and have been referred to BIFR for determination of their sickness & devising strategy/measures for their revival/rehabilitation. However, CCL has managed to come out of BIFR in the year 2005-06.

17.3 EASTERN COALFIELDS LIMITED (ECL)

ECL had been incurring loss since its inception. The reasons for losses are:

- c) Large number of underground mines having low production,
- d) ECL's share of UG production is 30%, which is the highest amongst all subsidiaries of CIL,
- e) Difficult geo-mining conditions,
- f) Limited scope of opencast mining in Raniganj Coalfield,
- g) Most of the mines have low productivity because of surplus manpower on surface,
- h) Most of the mines are very old where the working faces are far away from the entries,
- i) Most of the UG mines in ECL are stowing based,
- j) Resistance from the trade unions for closing down unviable mines.

ECL has been a loss making company since inception and was first registered as a sick company in FY '96-'97. The net worth was rendered positive by conversion of Rs.1179.45 Crores of loan into equity in 1997-98. However the losses continued and the net worth once again turned negative as on 31-3-99 and it was referred to BIFR again. As on March 31, 2006, its tangible net-worth was negative and projected at Rs (-) 3036.03 Crores.

Salient features of the revival scheme are as follows:

1. Incremental production of 18.91 million tonnes during 2003-04 to 2012-13.
2. Increase in UG production to 13.81 million tonnes by 2010-11 through introduction of:
 - (a) CM in 3 mines to produce @ 0.42 million tonne per year per machine.
 - (b) Introduction of PSLW at Jhanjra for a production of 1.70 million tonnes per year.
 - (c) Mechanisation of manual districts by Intermediate Technology SDLs & LHDs, and
 - (d) Completion of 6 underground projects i.e. Kumardihi A&B. Shankarpur, Bansra, Parasea-Dobrana, Bankola R-VI Seam and Khandra NKJ.
3. Increase in OC production to 33.70 million tonnes during 2012-13 through:
 - (a) Rajmahal Expansion from 10.5 Mty to 17.0 Mty.
 - (b) Opening of green field projects at Chuperbhita for 4.0 Mty & Hura-C for 3.0 Mty.
 - (c) Expansion of Sonapur Bazari from 3.0 Mty to 8.0 Mty.
 - (d) Expansion of Chitra OC from 1.22 Mty to 2.0 Mty.
4. Outsourcing of 17 opencast patches to produce 23.76 Mt from 2003-04 to 2010-11

5. Suspension of production at 9 non-viable underground mines
6. Waival of Unsecured Loan of Rs. 519 crore by CIL
7. Conversion of Current Account Balance of Rs. 1532 crore into Equity by CIL
8. Investment of Rs. 2591.40 crore through internal accrual for augmentation of prodn.
9. Reduction in manpower through natural attrition and VRS.

The main constraints in achieving the future production targets are as follows:

- o Gradual reduction of loader/worker strength in existing mines & completed projects;
- o Shortage of productive manpower in key categories with mismatch between the surface and the underground productive manpower;
- o Problem associated with land acquisition and rehabilitation measure, delay in forest land clearance and EMP clearance of the green-field projects like Chuperbhita OC, Hura'C' OC & thereby delay in approval of the above projects from Govt. level & subsequent implementation;
- o Delay in finalization of global tender for introduction of mass production technology by way of deploying Continuous Miners at Sarpi and Khottadih UG mines and powered support longwall at Jhanjra mine (Phase-II).

By implementing the Rehabilitation Scheme, during 2005-06 ECL produced 31.11 million tonnes with a growth of 14.18%, removed OB to the extent of 44.87 million cubic meters with a growth of 13.03%, and despatched 28.18 million tonnes with a growth of 5.65% compared to last year (2004-05). Company also achieved a productivity of 1.29 tonnes with a growth of 20.56% and capacity utilization of 86.59% with a growth of 6.90% over previous year. For the first time since its inception, Company made an operating profit of Rs. 363.86 crores.

As per the revised financial projections, the networth of ECL will become positive by 2009-10 with Rs. 82.74 Crores, after the waival of Unsecured Loan and conversion of Current Account balance into Equity by CIL. ECL is confident to make its net-worth positive by 2009-10 as per the approved scheme.

Recommendations for ECL:

Recommendations/suggestions for the revival of ECL as per the BIFR sanctioned rehabilitation scheme and as suggested by the company are as under:

- (a) Partial/full outsourcing of different/mining/mining related activities: Outsourcing of 17 projects for the period from 2003-04 to 2010-11 for a production of 23.76 million tonnes as a short-term measure.
- (b) Joint Venture with other companies: Two coal blocks (Brahmani and Chichro Patsimal) having a reserve of 2256 million tonnes are proposed to be operated by a 50 : 50 joint venture between CIL and NTPC. Final details are yet to be worked out. Production from this joint venture has not been taken into account in the Revival Plan.
- (c) Involving equipment supplier in risk/gain sharing:
 - (1) Introduction of Continuous Miner technology in Jhanjra, Khottadih and Sarpi mines
 - (2) Expansion of Rajmahal OCP from 10.5 to 17 Mty through private participation
 - (3) Working R-VI Seam (Sector-A) with PSLW Technology at Jhanjra UG Project
 - (4) Introduction of High Wall/Trench Mining at Sripur and Nimcha coleries.
- (d) Involving Trade Unions in revival strategy: The trade unions should be prevailed upon to allow ECL to suspend operation in 26 heavily loss making UG mines and to outsource opencast patches in the interest of revival of ECL.

- (e) Manpower management: VRS to be given to non-productive/ under utilized manpower
- (f) Product mix: The allocation of the resources available with the company to be so prioritized that mines with higher profit potential get higher priority
- (g) Coal despatch and marketability: The market scenario should be closely examined by ECL to make sure that the proposed increase in production does not add to the stock which will be detrimental to the company's financial health. The company should therefore examine possibility of locating new consumers for its coal in the state of West Bengal and other neighbouring states.
- (h) Concept of e-marketing: The concept of e-marketing of coal may be beneficial for the company to earn profit on short term basis, which may not be a foolproof system for long term implementation.

17.4 BHARAT COKING COAL LIMITED (BCCL)

BCCL has been a loss making company since inception and was first registered as a sick company in FY '96-'97. The net worth was rendered positive by conversion of Rs. 996 crores of loan into equity in 1997-98. However the losses continued and the net worth once again turned negative as on 31.3.2000 and it was referred to BIFR again. As on March 31, 2005, its tangible net-worth was negative and stood at Rs. (-) 4,926 crore.

BCCL had been incurring loss since its inception. The reasons for losses are:

- a) Decline in production due to shrinkage in mine capacity arising out of under-investment in mining equipment, which led to rise in average age of equipment well beyond economic life.
- b) Revision of Salaries & Wages beyond paying capacity
- c) Insufficient investment in mining equipment
- d) Non-availability of land
- e) Problem of working capital
- f) Difficult working condition etc.

The company has evolved its own Revival Strategy, envisaging the following activities:

- a) Modernization of UG mines through introduction of Side Discharge Loaders(SDL), Continuous Miners(CM) and Powered Support Longwalls(PSLW) in the Moonidih UG Project;
- b) Increased investment in Heavy Earth Moving Machine (HEMM) capacity in OC mines;
- c) Closure of heavy loss making mines;
- d) Continue deploying Hired HEMM (H/HEMM) in isolated patches;
- e) Open up a few large OC mines, to be operated by H/HEMM. The plans for such OC projects are in Phularitand, Akashkinaree-East Katras, Kumari Jore and Kalyaneswari mines/projects;
- f) Optimization of washery operations.

As a consequence of all the above measures, acting in tandem, the consistent fall of production over the last five years has been arrested and BCCL has produced 23.30 Mt of coal in 2005-06 as compared to 22.31 Mt in 2004-05 registering a profit of about Rs. 209 Crores as per provisional results, for the first time in its history in 2005-06.

BCCL is thriving hard to make its network positive by 20010-11 as per the approved scheme.

Recommendations for BCCL:

Recommendations/suggestions for the revival of BCCL as per the BIFR sanctioned rehabilitation scheme and as suggested by the company are as under:

- a) Partial/full outsourcing of different/mining/mining related activities: The scope of outsourcing should be widened as far as possible for mining small isolated opencast patches.
- b) Joint Venture with other companies: BCCL is entering into a joint venture with SAIL for financial support to meet the capital expenditure for replacement of longwall equipment and other associated infrastructure to enable it to take up its modernization plan at Moonidih.
- c) Revamping departmental capacity for Opencast mines: In order to restore the existing level of capacity and replace equipment due for survey-off, an action plan has been prepared requiring an amount of Rs. 762.90 Crs. to be invested along with Rs. 5.36 crores for up gradation of OC mines.
- d) Fire control below Dhanbad-Patherdih Railway Line while supplementing opencast capacity by Hired HEMM
- e) Closure of highly loss making underground mines and rapid reduction in work force: While broadly agreeing with the Revival Plan proposal, 41 highly loss making mines have been identified, out of which 15 mines have been proposed to be closed during 2006-07. Remaining 26 mines (10 mines in 2007-08, 10 mines in 2008-09 & 6 mines in 2009-10) are planned for closure. The consequential redundancy is expected to be absorbed through a high rate of natural attrition by 2011-12.
- f) Augmenting production by opening quick yielding Opencast Projects: Six projects viz. Shatabdi, Dahibari Basantimata, Goluckdih Chaptoria, BJ Section Damoda & Viswakarma have been identified of which first three OC projects have been implemented by hiring of HEMM in both Coal and OB. These quick yielding OC projects are targeted to build up a production capacity of 5.02 Mty.
- g) Modernization of coal washeries: The factors which have led to drop in washed coal production are:
 - o Inadequate availability of proper quality of raw coal, and
 - o Gradual deterioration in the condition of washeries arising out of inadequate fund for replacing old worn-out components and equipment.These washeries need to be modernised to improve their production efficiency.
- h) Improving sales realization: E-marketing has yielded good results from BCCL. It is recommended that more coal should be made available for e-marketing.
- i) Other recommendations:
 - ◆ Improving the age profile of the workforce, by further recruitment, as and when needed;
 - ◆ Strengthening and automating the costing system so that viability analysis of various initiatives and profitability analysis of product/mines can be carried out;
 - ◆ Investment in Information Technology for implementation of Enterprise-wide software solutions in the organization to improve the MIS to levels.

17.5 THRUST AREAS FOR REVIVAL OF LOSS MAKING COMPANIES

Technological development to fulfil rapid growth objective

Meeting the coal demand arising out of the revival strategies of the loss making coal companies will need

- o Introduction of mass production technologies (like continuous miner technology, mechanized longwall technology, etc.) in selected mines;

- o Introduction of new technologies like paste-fill technology for high concentration fly-ash stowing, mining technology with pre-consolidation of rock mass, etc.;
- o Systematic dealing with coalmine fires to release underlying coal reserves;
- o Indigenous development of spare parts.

Rationalization of coal pricing

Coal pricing and coal marketing need to be modernized. The e-marketing route which has been opened recently has worked well, and has helped to nudge consumers towards more rational coal pricing. The method of coal pricing needs to be rationalized by shifting to gross calorific value instead of useful heat value and by having more finely graded price bands.

Revival of loss making coal companies & Coal sector reform

- o Turn around of loss making coal companies – closure of uneconomic mines and private sector participation.
- o To expedite coal sector reforms including establishment of regulatory authority for coal;
- o Of utmost importance to Public Sector coal industry is the necessity to retain and improve its market shares at remunerative prices. This can be possible with entering into long term coal supply agreement with bonus-penalty provisions instead of present linkage system.

Utilization of manpower potential

Manpower is an important aspect in the rapid growth of the mining industry. The concern thrust areas include improvement in manpower productivity, cost reduction, upgradation of skills of workforce and rationalization of manpower.

Government concerns

- o Suitable policy measures to facilitate private sector participation in coal mining through Joint Venture
- o Taxes and duties to be made non-distortionary and internationally competitive;
- o Relaxation in laws for promoting out-sourcing and necessary amendments in Contract Labour (Regulation and Abolition) Act.
- o Need for National R&R policy.

CHAPTER- 18

POLICY INITIATIVES

18.1 REVIEW OF X FIVE YEAR PLAN

The Xth Five Year Plan made a number of recommendations. The recommendations, action taken and their present status are as follows:

1 In order to open up the coal sector, the Coal Mines (Nationalisation) Amendment Bill, 2000 was introduced in the Rajya Sabha on 24.4.2000 to make necessary amendments to the Coal Mines (Nationalisation) Act, 1973. Main objectives of the Bill are to allow Indian Companies to mine coal and lignite without the existing restriction of captive consumption and also to allow them to engage in exploration of coal and lignite without the existing restriction of captive mining. The Bill is pending in the Rajya Sabha.

2 There have been suggestions from time to time from different quarters to further restructure coal sector. The issue has been examined by various committees at various times.

The Expert Committee on the Road Map for Coal Sector Reforms has also been asked to examine the issue of restructuring of coal sector in order to make it a globally competitive coal company. The committee is yet to submit its recommendation on this matter.

3 The matter of setting up a Regulatory Authority is being considered by the Energy Coordination Committee. The Planning Commission will prepare a note on the subject for consideration of ECC.

4. Integrated Energy Policy has suggested to reduce Cross Subsidy surcharges imposed on freight traffic. The Expert Committee on Road Map for coal sector reforms has recommended that the Railway Tariff for coal should be subject to a detailed review by an independent agency.

5 As per the present import policy, coal is being freely imported by the consumers themselves. The basic custom duties on coal have seen drastic reduction. The current duty structure on CIF price of coking coal having ash upto 12% is NIL and for coking coal having ash more than 12% and non-coking coal is 5%.

6 In order to clear the accumulated outstanding dues of coal to CPSUs, Govt. of India formulated securitizations scheme for one time settlement of outstanding dues of SEBs. As per the scheme, the State Govts, were to issue bonds against the reconciled dues as on 30.9.2001 and interest payable by SEBs on over dues of CPSUs shall be written off to the extent of 60(Sixty) percent.

The process of securitisation is now over and the dues still remaining unsettled have to be settled out side of the securitisation scheme.

7 Production picture of the Tenth Plan placed emphasis on improving the performance of underground projects, adoption of appropriate technologies and taking up development of new

underground mines, wherever possible. The improvement in overall man productivity is basically because of increase in open cast productivity and larger share of OC production in the coal production.

8 At present promotional exploration work is done by CMPDI, Geological Survey of India and State Govt. Agencies. Out of current inventory of Indian Coal Reserves of 253 BT only 96 BT is under Proved category. The application of faster, cost economic and state of the art exploration technology is being explored to establish high confidence level proved coal reserves.

9 CIL made Joint venture with ONGC, GAIL etc for development of Coal Bed Methane and coal gasification. NTPC has taken up studies for carbon dioxide sequestration and results are yet to be issued.

10 For increasing availability of more washed coking coal, new washeries are being installed in the coal companies.

11 To explore the possibility to switch over from the existing system of classification of coal on Useful Heat Value (UHV) to more scientific and internationally practiced classification based on Gross Calorific Value (GCV). a Pilot Study on migration from UHV to GCV based gradation of coal has been carried out and completed by the Central Fuel Research Institute (CFRI). The report is being overviewed by a Committee comprising of members from the Ministry of Coal, CEA, NTPC, CIL & CFRI.

12 The Department of Consumer Affairs in the Ministry of Civil Supplies proposed for review of the list of essential commodities under the essential commodities act,1955. The Ministry of Coal has requested that coal could be deleted from the list of essential commodities as the Government, has no control over the price and distribution of the coal with the notification of the colliery Control Order 2000.

Since deletion of any commodity from the list of essential commodities requires amendment of the Essential Commodities Act,1955; the Department of Consumer Affairs is taking appropriate steps in the direction.

13 Considering the increasing demand for coal and lignite and since exploration and mining activities are subject to sector approvals / regulations the government has reviewed the policy on FDI. It has been decided to increase FDI caps to 100% and permit it under the automatic route.

14 The loss making coal companies are exploring the possibilities of setting up joint venture units to mobilize resources for fresh investments to augment their coal production.

15 Formation of Coal Videsh Ltd. a subsidiary of CIL to acquire coal equity abroad is already in process by MOC. A Proposal in this regard is under consideration of the Government.

16 For ECL and BCCL, a revival plan has been prepared by the coal companies and various steps have been taken. For financial restructuring, revival plan of ECL has been approved and proposal for BCCL I is under consideration of the Ministry of Coal.

17 National Policy on resettlement and rehabilitation of 2003 is under revision and is being discussed in the Committee of Secretaries.

18.2 RESTRUCTURING OF COAL INDIA LIMITED

1 There have been suggestions from time to time from different quarters to further restructure CIL. At one level, it is being argued that the main problem with the present structure is the high incidence of tax on the profit making companies on the one hand, and the acute scarcity of funds to rehabilitate the loss making companies, on the other. Therefore, the solution proposed is amalgamation of CIL and its subsidiaries into a single unified company, the contention being that this will result in considerable savings for CIL by setting off losses incurred by some units against the profits earned by other units, which can then be utilised to revitalise the loss making units. At another level, it is argued that CIL – the holding company – is indeed no more than a fifth wheel, and it is a drag on the rest of the group. Therefore, the holding company should be wound up, and the subsidiaries should be made independent companies.

2 The issue of restructuring of CIL has been examined by various Committees at various times.

3 The Planning Commission has also suggested for restructuring of Coal India Ltd. (CIL) by doing away with the holding company structure and extending autonomy to individual coal producing companies for promoting competition amongst the national coal companies.

4 The Expert Committee on the Road Map for Coal Sector Reforms has also been asked to examine the issue of restructuring of CIL in order to make it a globally competitive coal company. The Committee is yet to submit its recommendation on this matter.

5 Against the context cited above, the Sub Group found considerable merit in the suggestion made by the Indian Coal Forum that Coal India Limited must remain as one large entity to steer the coal sector. The operating companies must be made fully autonomous in execution and operation as in the “SAIL” model. There must be one apex Board for CIL and the subsidiary companies must become operating divisions headed by Managing Directors. Chairman CIL should also be the Chairman of the Boards of all its subsidiary companies. The feasibility of having a single balance sheet for CIL as a whole should also be considered.

6 CIL would handle broad policy formulation. Human Resource Development, standardization of equipments, central procurement of heavy capital equipments, imports, finalization of MOU’s and rate contracts with major suppliers, long term corporate planning and management policies should be the mandate of CIL. And execution of corporate plans, policies, production programmes should be left to the operating divisions.

7 The advantages of such an arrangement are fairly obvious. There would be a single chain of command. The decisions on all policy matters, coordination, budget, monitoring, investment, long-term planning, technological and scientific development, industrial relations, wage policy, personnel management, bulk purchases of high cost items etc. will be directly with the centralised management. This would facilitate faster decision making and economies in bulk procurements. The benefits and importance of size will accrue after the consolidation of CIL. If a common balance sheet approach becomes feasible, there could be substantial

savings in corporate tax and tax on dividend outgo. This would also prepare CIL to face upto emerging competition. The loss making subsidiaries would be able to receive considerable support from CIL for the implementation of their revival plans.

8 The Expert Committee is having more wide-ranging consultations with the interested stakeholders on this issue. The Integrated Energy Policy also mentions that the Sankar Committee is expected to study the restructuring of CIL in much greater detail. It would, therefore, be advisable for the Ministry of Coal to await the recommendations of the Expert Committee on the subject, before taking a final view in the matter.

18.3 OPENING OF COAL SECTOR

1 Under the existing legal framework, Government companies alone can undertake coal mining. The eligibility to do coal mining in the country has been laid down in the provisions in Section 3 (3) of the Coal Mines (Nationalisation) Act, 1973 (hereinafter referred to as the Act). Those eligible to do coal mining in India without the restriction of captive consumption are:

“The Central Government, a Government company (including a State Government company), a corporation owned, managed and controlled by the Central Government.”

2 By an amendment to the Act in 1976, two exceptions to policy were introduced viz., (i) captive mining by private companies engaged in production of iron and steel and (ii) sub-lease for coal mining to private parties in isolated small pockets not amenable to economic development and not requiring rail transport. The Act was further amended in 1993 to allow coal mining for captive consumption for generation of power, washing of coal obtained from a mine and other end uses to be notified by Government from time to time. By another Notification issued on 15.03.1996, captive mining of coal for production of cement was allowed. However, commercial mining by private sector entities is not permitted.

3 As per the projections made in the Vision Coal 2025, an additional investment of Rs. 95,000 crores in opencast mining and Rs. 23,000 crores in underground mining (Both at current prices) will be required to increase the production to the projected level by 2025. Investment of this order from public sector alone may not be feasible.

4 It is not possible for the public sector alone to meet the demand – supply gap. The coal production through captive coal mining in the private sector has not been substantial. Captive coal mining also suffers from the several inherent shortcomings.

5 Imports are constrained by port capacity and transportation problems to consumption points.

6 The Integrated Energy Policy underscores the critical importance of efficient and reliable energy supply for the economic growth of the country. It states that “India needs to sustain a 8% to 10% economic growth to eradicate poverty and meet its human development goals.

7 Therefore, there is a strong case for opening the coal sector for private investment in order to meet the challenges of growing demand for energy in a rapidly growing economy.

8 While making certain recommendations for the development of coal sector, the Planning Commission had advised to expedite passing of Coal Mines (Nationalisation) Amendment Bill 2000 which would permit private sector in non-captive mining in order to augment domestic coal production for meeting the rising coal demand.

9 While public sector coal companies should be strengthened, 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. Concerted efforts should be made to build up a consensus on this.

10 In the interim, captive coal mining should continue to be encouraged within the existing legal framework.

11 Mining companies could also be considered eligible for allocation of captive coal blocks, provided they have firm back-to-back tie up with specified end-users (power, steel, cement producers) for exclusive use of coal obtained from such mines in specified end uses only. This would offer new avenues of opening up the sector within the existing legal framework.

12 Competitive bidding system for allocation of coal blocks should be introduced. This would not only ensure optimal allocation of precious resources, but would also attract more serious players into coal sector.

13 An Institutionalized arrangement should be put in place to facilitate expeditious processing of various clearances, land acquisition, resettlement and rehabilitation matters by Government agencies.

14 Considering the increasing demand for coal and lignite and since exploration and mining activities are subject to sector approvals / regulations, the Government has reviewed the policy on FDI. It has been decided to increase FDI caps to 100% and permit it under the automatic route.

18.4 CAPTIVE COAL MINING

1 Under the Coal Mines (Nationalization) Act, 1973 coal mining was exclusively reserved for the public sector. By amendments effected to the Act in 1976 and 1993, captive mining of coal by private companies engaged in production of iron and steel, generation of power, and production of cement has been permitted.

2 Detailed guidelines have been evolved in regard to identification of coal blocks, allocation of captive blocks, terms and conditions of allocation etc. A Screening Committee headed by Secretary, Ministry of Coal, with representatives from other related Ministries/ Departments, related State Governments, and Coal Companies does the screening of applications/proposals received for captive mining.

3 So far 123 coal blocks have been allotted to various public/ private sector companies with geological reserves of 27.25 Bt and process of allotment of another 20 coal blocks and 8 lignite blocks is on.

4 Another 81 coal blocks have been identified with total geological reserves of about 20,022.27 Mt.

5 So far 7 lignite blocks have been allocated, out of which 4 blocks have been allocated to Commercial / Govt. dispensation and three for power companies.

6 The Expert Committee on Road Map for Coal Sector Reforms and the Integrated Energy Policy have made several suggestions to increase production from captive mines and to encourage and promote investment in captive mining:

7 Within the existing legal framework, private sector participation is possible only through the captive mining route. The Ministry of Coal has taken a number of measures to encourage and promote investment in captive mining. A few important ones are as follows:

- Detailed guidelines were prepared in order to make the system of allocation of coal blocks more rational and transparent. These were displayed on the Ministry's website.
- Identification of coal blocks for captive mining was carried out, and this information was also displayed on the website.
- A bar chart has been developed that lays down specific milestones for development of a captive mine in a time bound manner.
- Coal produced during the development phase of a captive mine is allowed to be disposed of to a local CIL subsidiary at an administratively determined transfer price.
- In order to ensure timely development of captive blocks, a system of bank guarantee has been introduced. A bank guarantee is obtained from the allocatee and amounts are deducted from it if the end use project or the mine development is delayed with respect to agreed milestones. On exhaustion of bank guarantee, the block is liable to be de-allocated and the mining lease cancelled.
- Applicants with smaller requirements are allowed to take up mining by forming consortiums or groups in a legally tenable format. This would be in the interest of conservation and scientific mining, the alternative to which would be small scale mining and wastages.
- An effective system of monitoring has been put in place. The Coal Controller's Organisation does monitoring on six-monthly basis. At the Ministry level also, a quarterly review is made with the allocatees.
- Introduction of competitive bidding system for allocation of coal blocks is under consideration, in order to make it more transparent and objective.

8 Introduction of competitive bidding system for allocation of captive blocks may be expedited.

9 Exploration of coal blocks identified for captive mining should be taken up on priority, so that these can be brought into production quickly.

10 An institutional arrangement be put in place to monitor the approvals and clearances to be provided by various Central and State authorities.

11 An empowered Committee of Secretaries may be set up to consider proposals for environmental clearances.

12 Incentives as well as punitive penalties should be evolved to encourage development of mining blocks allotted within a prescribed timeframe.

18.5 COAL PRICING AND RAIL FREIGHT RATIONALISATION

1 Integrated Energy Policy recommends promotion of transparent and competitive markets for all forms of energy supplies/services. Competitive market is capable of extracting the maximum efficiency gains from the sector and determines price effectively. However, competition on the supply side is essential for a competitive market. As a general rule, all commercial primary energy sources must be priced at trade parity prices at the point of sale but non-traded goods have to be handled differently. Prices of non-traded commercial energy supplies can be determined through competition among different producers (in case of multiple sources, low entry barriers and a competitive supply-demand balance) or independently regulated on a cost plus basis including reasonable returns (where competing supply sources are absent, entry barriers are high and demand exceeds available supply).

2 Ideally coal price should be determined in a competitive market. This, however, is not possible as long as the number of suppliers are limited and as long as for the largest coal consuming sector, i.e. power, coal cost is passed through and fully compensated in determining electricity tariff. However, since other users of coal are numerous and consume substantial quantities of coal, a strategy for competitive price discovery is possible.

3 Need for an independent regulator for the sector, differential pricing of coal for power sector, e-auction of coal and GCV based fully variable pricing system have also been recommended by the Expert Committee on Road Map for Coal Sector Reforms.

4 The Expert Committee on Road Map for Coal Sector Reforms has reiterated the recommendation of the Fuel Policy Committee, 1975 on pricing suggesting that fuel prices should ensure that the pattern of use of fuels is in keeping with the optimal pattern of production, determined with reference to the long term availability of fuels and their costs. It further recommended as follows:

- i) Increase the quantity of coal to be sold through E-auction over the next 2-3 years.
- ii) Coal prices may be regulated in light of the market realities.
- iii) Import parity price could increase dependence on imported coal, as many Indian consumers may prefer imported coal which may aggravate India's energy security concerns.

5 The Ministry of Coal vide letter dated 25.7.2005 had entrusted the Tariff Commission with a study on Mechanism for Coal Pricing. The terms of reference of the study was to recommend the price of coal for the power sector and to suggest modalities for pricing of coal for other sectors.

5.1 The Tariff Commission has submitted its report with certain recommendations for pricing of coal.

5.2 A detailed presentation was made by Dr.Kirit Parikh in the 6th Meeting of the Energy Coordination Committee held on 27th March 2006, outlining options of pricing of coal. The following pricing methodology was suggested, to provide for market determined price of coal

and, based on it, determination of coal price for sale under Fuel Supply and Transport Agreements (FSTAs) :

5.3 The small quantities of high quality coking/thermal coal could be sold at trade parity prices as determined by the import parity price at the nearest port minus 15%. This is the practice currently being adopted for supply of good quality coking coal to the steel industry.

5.4 Market determined prices based on e-auction of up to 20% of the production. Quantities to be sold through e-auction from different mines must be determined annually with a monthly mine-wise schedule to be independently monitored and enforced by a Coal Regulator.

5.5 The remaining coal to be sold under long term FSTAs. Regulated utilities to be allowed up to 100% of their certified requirement through FSTAs if so desired. Other bulk consumers to be allowed partial FSTAs based on coal availability. Any shortfalls to be met through e-auction supplies or imports. Pithead price of coal under the FSTAs would be revised annually by the coal Regulator based on a formula that reflects prices obtained through e-auctions, FOB price of imported coal (both adjusted for quality) and cost to produce based on efficiency standards.

Coal prices would be made fully variable based on gross calorific value (GCV) and other parameters of quality.

5.6 After detailed discussions, the Energy Co-ordination Committee took following decisions –

5.7.1 Planning Commission will, in consultation with Ministry of Coal and Ministry of Power, prepare a transition path in order to operationalise the pricing mechanism outlined above.

5.7.2 Steps should be initiated for developing the regime of a regulator for the coal sector. Planning Commission will prepare a paper on this issue and will finalise it after discussions with the Ministry of Power, Ministry of Coal and other concerned organizations.

5.7.3 The quantity of coal to be e-auctioned should be increased. The exact quantity can be worked out by Ministry of Coal keeping in view the demand of coal by power sector and overall availability.

5.7.4 Regulated utilities may be allowed up to 100% of their certified requirement through FSTAs if so desired.

5.8 The Planning Commission while furnishing their comments has stated that the Commission does not support the recommendations of the Tariff Commission on coal pricing and suggested Ministry of Coal to operationalise recommendations of the Energy Coordination Committee.

5.9 In view of the recommendations made by various committees, basic principles of coal pricing emerging under the present supply scenario are as follows:

5.9.1 Full requirement of the regulated commodity such power should be sold under long term FSTAs and price under FSTAs should be determined by taking into account the prices

obtained through e-auction, FOB price of imported coal (both adjusted for quality) and domestic production cost, inclusive of return based on efficiency standards.

5.9.2 The price of coal should vary with quality and its calorific content. Coal prices should be made fully variable based on Gross Calorific Value (GCV) and other quality parameters.

5.9.3 There is a need for an independent regulator for price determination and resetting mechanism under FSTAs.

5.9.4 Depending on the availability of balance coal after meeting the needs of power sector, partial requirement of other bulk consumers should be met under long term FSTAs.

5.9.5 The quantity of coal being sold in open market through e-marketing needs to be increased substantially.

5.10 **Freight Rationalisation:**

Given the distribution of coal resources within the country, coal has to be hauled over long distances, mainly by rail, to reach the consumers spread across the country. The Integrated Energy Policy has noted that the Railways cross subsidises passenger traffic with coal freight thereby making delivered price of coal 2-4 times the pit-head price of coal in States such as Punjab, Haryana, Rajasthan, Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Western U.P. and Delhi etc. It has, therefore, stressed that rail freight for coal transport should be rationalised. Cross subsidy surcharges imposed on freight traffic to benefit passenger fares must be reduced.

18.6 GOVERNMENT SUPPORT

1. Government support in terms of simplified procedures and single-window approach for granting various clearances and permissions, expeditious disposal of land acquisition cases, a well defined and homogenous R & R policy, closer coordination between the Centre and the State Governments etc. would go a long way in facilitating speedier execution of coalmining projects.

2. **Exploration**

At present promotional exploration work is done by CMPDIL, GSI and State Govt. agencies. Government agencies need to be provided with necessary budgetary support to increase the drilling capacity to undertake regional exploration on a much larger scale. This will help increase the total geological coal resources in the country. Allowing captive operators and private agencies to undertake exploration under the supervision of CMPDIL must also be examined and implemented. Most of India's coal resources – proved, indicated and inferred – are within 300 meter depth. This is more likely to be an outcome of insufficient exploration of deposits below 300 meters. We cannot afford to ignore, much less waste coal resources at higher depths. Therefore, detailed exploration beyond 300 mts. depths also needs to be taken up more vigorously.

3. **Depletion Allowance**

Coal and Lignite resources are depleting assets of capital nature and coal companies need to increase significant resources to explore new deposits. In order to incentivise the system it is important to introduce depletion allowance to reduce the tax burden of coal companies in line with International practices.

4. Methodology for early clearances of mining projects

A Special Task Force, constituted under the Secretary (Coal) must 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 & Forest, Finance, Home, Railways and Planning Commission should review the progress of important matters related to environment/ forest clearances, land acquisition, resettlement and rehabilitation, law and order etc.

5. R&R Policy

5.1 Coal India Ltd. evolved a Resettlement and Rehabilitation Policy and submitted to Ministry of Coal for approval in 2005. It was decided that CIL should not have a separate R & R Policy since the National Policy on Resettlement and Rehabilitation on 2003 is under revision and is being discussed in the Committee of Secretaries.

5.2 Formulation of a National Resettlement & Rehabilitation Policy, which would be acceptable to the State Governments, is of paramount importance. Land acquisition for mining projects and related rehabilitation issues are becoming increasingly more sensitive and problematic. These concerns need to be addressed with a much greater degree of urgency and the State Governments need to be taken on board while evolving a national policy.

5.3 Land for coal mining should be hired or leased instead of acquiring it from the owners. The owner of land will get regular income through rent or lease amount. Then, it may not be necessary for coal companies to provide employment. Land will be returned to the owner after expiry of lease period or even sooner i.e. on completion of mining operations. The land shall have to be fully restored / reclaimed for appropriate use such as agriculture, commercial plantation, creation of large pond for fish cultivation etc. before it is returned to the land owners. Through this arrangement, the problems associated with resettlement and rehabilitation of the land owners could be overcome, through adequate income generation and restoration of land to the owners. This is being suggested as an alternative option for coal companies to obtain surface rights over land, wherever feasible and acceptable to land owners.

6. Environmental Clearances

The environmental issues in respect of projects, which are important to achieve the XI and XII Plan targets, should be taken up on priority with the Ministry of Environment and Forest (MOEF). A Special Task Force with adequate powers should be set up for examining these on priority basis. Arrangements should be put in place to grant requisite clearance within four months. An exercise could be undertaken jointly with MOEF to identify critical areas needed in connection with rapid development of domestic energy resources and which have biodiversity and other special environmental features and take steps in advance to notifying them as such.

7. Forest Clearance

The State Governments must be requested to give clearances within six months failing which it should be deemed to have been approved. The rationale for fixing a standard rate for loss of revenue from forest lands, which are acquired for coal mining, besides insisting on compensatory afforestation, needs an objective view.

8. Infrastructure Status

For large power projects, mega power project status is given and become eligible for concessional excise and customs duties. These concessions offer economy in scale of operation and lead to more competitive power tariffs. Similar concessions for coal and lignite would enable coal producers to offer more competitive coal prices. So, coal and lignite industry should also be given infrastructure status. All the benefits and concessions especially for importing of technical know-how, equipment/machinery etc. extended to infrastructure sector should be extended to coal and lignite mining sector. This will attract more investment in the sector.

9 Outsourcing of Mining Activities

Owing to higher capital investment in procurement of heavy earth moving machineries, increasing labour costs etc., outsourcing of certain activities such as over burden removal and excavation of coal/lignite is now being resorted to in the mining industry. This helps in securing overall economy in operating costs in coal mining. Similarly, there are many other non-core activities such as maintenance, drainage works, canteen services, transport, afforestation, horticulture etc. that can be effectively outsourced.

There is some ambiguity about permissibility of outsourcing mining and allied activities, and questions have been raised about its legal validity. Hence a clear cut policy in this behalf is required to be enunciated, and statutory position clarified.

10. Amendment of Contract Labour Act

There is a need to consider amendment of the Contract Labour (Regulation and Abolition) Act of 1970 to permit hiring of equipment and allowing contract mining by experienced mining contractors. The coal mining companies may be exempted from the purview of the said Act.

11. Other Support

Government support in terms as listed below may further help in encouraging investment in coal mining by private/public sector players:

- The Coal Mines (Nationalization) Amendment Bill, 2000 pending in the Rajya Sabha may be taken up for consideration and passed.
- 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 and lignite industry and include coal and industry in the exemption clause under Section 65 of the Finance Act in line with other such

services. This would encourage outsourcing of mining activities, which in turn would help in securing efficiency gains and promoting competency outside the public sector.

18.7. REGULATORY BODY

1 The Planning Commission had recommended during a review undertaken on 25.7.03 that Coal sector should also work on credible and transparent regulatory framework. Establishment of a regulatory body for coal sector would bring in transparency in coal price fixation, provide reasonable returns to the Producers and would eliminate undue profiteering.

2 In the 5th meeting of Energy Coordination Committee held under the Chairmanship of Hon'ble Prime Minister, key recommendations made revamping the Coal Sector; inter-alia include setting up of coal regulator.

3 The Integrated Energy Policy recommends, "Coal prices should ideally be left to the market and trading of coal, nationally and internationally, should be free. Only a competitive free market can do efficient job of price determination. A competitive market requires that there are multiple producers and that there are no entry barriers to new producers or to imports. Pending creation of such a competitive market, independent regulation of coal prices becomes essential."

4 The Expert committee headed by Sh. T L Sankar has also observed that some degree of regulation of pricing at least in respect of power sector should be necessary.

5 In view of the above, it is felt that a regulatory mechanism should be put in place to ensure that coal and lignite pricing is done in a reasonable, transparent manner without ignoring the costs of inputs. The Coal Regulator could inter-alia, perform functions such as to regulate and determine the price for sale of coal to users (power, steel, cement etc.), to promote competition in the coal and lignite sector, to issue guidelines, evolve benchmarks to work out cost of production from new areas, to determine transfer pricing in respect of captive coal and mining by users and to specify standards of performance for the coal and lignite companies in line with the international practices.

18.8. COAL LINKAGE POLICY

1 Government of India constituted Standing Linkage Committee for the planning of coal supplies to thermal power stations, CPP's, IPP's and Cement Plants in view of the need to supply coal of appropriate quality to these consumers and at the same time to make the most economic use of the available capacity for the production and transport of coal. Standing Linkage Committee, Long Term and Short Term, functions under the Chairmanship of Additional Secretary, Ministry of coal with members from concern administrative Ministries, Planning Commission, CIL & its subsidiaries, SCCL, Railways etc.

2 Recommendation of Integrated Energy Policy, Expert Committee & Energy Coordination Committee:

2.1 The Integrated Energy Policy has recommended a Regulatory Body to facilitate replacement of current coal linkages for power plants with fuel supply agreements. As a step towards abolishing coal linkages completely, these linkages could be made tradable in the first instance. This is expected to make coal movements more optimal and responsive to market forces.

2.2 The Expert Committee has recommended that increasing proportion of all domestic coal (supported by imported coal where necessary) which is not earmarked for the Power Sector is to be brought into the E-Marketing market over the next 2 to 3 years. Willingness to meet the actual demand at a market driven price would go a long way in establishing transparent coal markets in India. In this regard the Committee stresses the need to replace the current system of loose linkages feeding the power sector with formal long-term Fuel Supply and Transport Agreements that include the Railways. Again, this exercise should be completed within the next 2 to 3 years.

3 Energy Co-ordination Committee recommendation:

The existing system of coal linkages was more in the form of a system for movement of coal. Instead of linkages, FSA's should be introduced which should have normal price revision clause so that the FSA prices and the spot prices converge. The power sector utilizes would have 100% linkages and they would execute FSAs period at least 20 years subject to a five yearly revision for logistical reasons. For other core sectors there would be linkage of 80% while the balance 20% would have to be procured by them through e-auction or import. The quantity of coal to be e-auctioned should be increased.

18.9. DEMAND SIDE MANAGEMENT

1 The importance of energy efficiency and demand side management has emerged from the various supply scenarios and is further underlined by rising energy prices. Coal is one of the major sources of energy, demand of which is higher than its availability. Efficiency in consumption and use of energy efficient technology by the consumers may help in bridging the gap to a certain extent.

2 Power Sector

2.1 The average gross efficiency of generation from coal power plants is 30.5%. The best plants in the world operate with super-critical boilers and get gross efficiency of 42%. It should be possible to get gross efficiency of 38-40% at an economically attractive cost for all new coal based plants. This alone can reduce coal requirement by 111 Mtoe of coal (278 Mts of Indian Coal). Thus, a very high priority should be given to developing or obtaining the technology for coal based plant of high efficiency.

2.2 NTPC and SEBs should acquire technology to enhance the fuel conversion efficiency of the existing population of thermal power stations from an average of 30% to 35%. No new thermal power plant should be allowed without a certified fuel conversion efficiency of at least 38-40%.

2.3 The Steam turbine efficiency should be increased by increase in unit size accompanied by increase in steam parameters.

2.4 Technologies such as FBC (Fluidised Bed Combustion) technology, Integrated Gasification Combined Cycle (IGCC) and Super Critical Technology should help in lesser fuel consumption.

2.5 The power plants which are operating at less Plant Load Factor and higher Specific Coal Consumption are required to undertake comprehensive Renovation and Modernisation of units / technology. Wherever possible, old and outdated technology based plants should be replaced by higher capacity ultra mega power plants with super critical technology, as such replacement would require lesser investment for infrastructure. Even 1% reduction in transportation and pilferage losses would make available a substantial quantity of coal.

3 Cement Industry

The Cement Industry may consider designing state of art energy efficient plant machinery and equipment, such as Vertical Roller Mills for grinding of coal and raw material, high efficiency separators, pre-calcinators, improved refractory bricks, high efficiency clinker coolers, pre-blending of coal, conversion from wet to dry system, use of alternate fuels and coal beneficiation etc.

4 Steel Industry

4.1 Steel plants should use CDI (Coal Dust Injection) technology and use of Coal Bed Methane(through production of which is not yet commercially started).

5. Energy Efficiency and conservation programme and standards should be established and enforced.

Mechanisms for independent monitoring and verification of achieved energy savings and cost effectiveness of programmes must be established.

18.10 SUGGESTIONS

1.0 RESTRUCTURING OF COAL INDIA LIMITED

1.1 Ministry of Coal should wait for the recommendations of the Expert Committee on the subject, before taking a final view on restructuring of Coal India Limited.

2.0 OPENING UP OF COAL SECTOR

2.1 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.

2.2 Decision to increase FDI caps to 100% and permit it under the automatic route for coal and lignite mines for captive consumption should be implemented and encouraged.

3.0 CAPTIVE COAL MINING

3.1 Mining companies could also be considered eligible for allocation of captive coal blocks, provided they have firm back-to-back tie up with specified end-users (power, steel, cement producers) for exclusive use of coal obtained from such mines in specified end uses only. This would offer new avenues of opening up the sector within the existing legal framework.

3.2 Competitive bidding system for allocation of coal blocks should be introduced. This would not only ensure optimal allocation of precious resources, but would also attract more serious players into coal sector.

3.3 Incentives as well as punitive penalties such as cancellation of block should be evolved to encourage development of mining blocks allotted within a prescribed timeframe.

4.0 COAL PRICING & RAIL FREIGHT RATIONALISATION

4.1 Market determined prices based on e-auction upto 20% of the production.

4.2 Regulated utilities to be allowed upto 100% of their certified requirement through FSTAs if so desired.

4.3 Other bulk consumers to be allowed partial FSTAs based on coal availability.

4.4 Switch over to a fully variable GCV based pricing system should be expedited.

4.5 Gradually, the quantity of coal to be sold in open market through e-marketing should be increased to discover market driven price for coal.

4.6 Rationalise rail freight and offer open access to rail lines for private movers which may make rail movements more efficient.

5.0 COAL LINKAGE POLICY

5.1 Enter into long term Fuel Supply and Transport Agreements (FSTA) with bulk consumers.

6.0 REGULATORY BODY

6.1 A regulatory mechanism should be put in place to ensure that coal pricing is done in a reasonable, transparent manner, to promote competition in the coal sector, to issue guidelines, evolve benchmarks to work out cost of production from new areas, to determine transfer pricing in respect of captive coal mining by users and to specify standards of performance for the coal companies in line with the international practices.

7.0 GOVERNMENT SUPPORT

7.1. Allocation of additional blocks from Government of India as well as State Governments for exploration, R&D and Environmental Friendly Technologies in lignite mining should be considered.

7.2 A Special Task Force, constituted under the Secretary (Coal) must 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 & Forest, Finance, Home, Railways and Planning Commission, review the progress of important matters related to Environment / Forest Clearances, land acquisitions, possessions, law and order etc.

7.3. The National Policy on Resettlement & Rehabilitation, 2003, which is under revision and discussion in the Committee of Secretaries, should be finalized at the earliest. It should be acceptable to all concerns, State Governments and Coal PSUs.

7.4 Land should be hired / leased for mining operations and return it after restoration / reclamation for appropriate use.

7.5 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.

7.6 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.

8.0 Demand Side Management

8.1 Energy Efficient and Conservation Programme and Standards should be established and enforced.

8.2 Mechanisms for independent monitoring and verification of achieved energy savings and cost effectiveness of programmes must be established.

RECOMMENDATIONS

COAL DEMAND & SUPPLY

- 1.0 During the process of reviewing the X Plan performance it is observed that lack of synergy in scheduling of capacity addition in utility sector and coal mining created strains in demand-supply chain. Under such circumstances legally implementable Fuel Supply Agreements are important.
- 2.0 Due to gradual deterioration of quality and decline of reserves of indigenous coking coal steel plants have been depending more on imported coal. There is a need to augment domestic coking coal supplies by opening new mines as well as washeries to address the quality issues.
- 3.0 Demand side management needs proper attention by the consuming sectors particularly in view of improvements in coal utilization technologies envisaged by them.
- 4.0 Augmenting the capacity of washed thermal coal supplies is an important area in the XI Plan.
- 5.0 Realisation of the projected coal demand is mainly subject to materialisation of envisaged coal based generation capacity programme.
- 6.0 The projected coal production capacity addition is subject to timely taking up and implementation of new projects.
- 7.0 The lignite production is poised to increase manifold during the XI Plan.
- 8.0 There are movement constraints due to which demand materialisation keeps suffering from time to time. The X Plan identified critical rail links are yet to be completed. In addition to this certain additional rail links have been identified for facilitating additional movement in the XI Plan. They need to be developed timely. Simultaneously alternative measures like developing inland waterways and promoting coastal shipment are equally important.
- 9.0 The Port infrastructure capacity would also need to be augmented to facilitate envisaged rise in import during the XI Plan.

COAL & LIGNITE EXPLORATION

- 10.0 There is a 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. The sub schemes of Promotional Exploration i.e. Integrated Coal Resource Information System and Lignite Resource Information System would also need to be continued for creating the required data base of coal and lignite resources in the Country as envisaged under UNFC Classification. Similarly, the scheme of CBM exploration also needs to be continued for assessing CBM potential of coalfields at the time of conducting Promotional Exploration.

- 11.0 In line with detailed drilling in non-CIL blocks a new scheme namely detailed drilling in non-NLC lignite blocks has been proposed for undertaking exploration in lignite blocks outside the purview of the NLC with budgetary support.
- 12.0 **Exploration in Forest Areas:** More and more coal bearing areas remaining to be explored in future are likely to fall below forest land. There is a 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.
- 13.0 **Exemption from the need for 'Prospecting License:** CMPDI and SCCL 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. Similarly, NLC may also be exempted from seeking prospecting licence as in the case with GSI/MECL.
- 14.0 In order to augment capacities it is proposed to outsource drilling activity under CMPDIL supervision. Reputed players both domestic and international should be involved in exploration activities.
- 15.0 A mechanism is to be evolved for the private block holders to share the exploration information with GSI/CMPDIL.
- 16.0 The proposed revolving fund mechanism for exploration does not appear to be feasible since exploration is not a self-sustaining activity and as such extension of budgetary support to various schemes under coal and lignite exploration is important.
- 17.0 Focus needs to be laid on exploration in North-Eastern Region in view of better quality of deposits.

INFORMATION TECHNOLOGY

- 18.0 E-corporate governance for promoting transparency and productivity.
- 19.0 Introduction of enterprise resource planning (ERP) to integrate different areas of operation for improved economics and productivity.
- 20.0 Introduction of IT for integrated safety, production and environmental monitoring in underground and opencast mines.

RESEARCH & DEVELOPMENT

- 21.0 Promotion of clean coal technologies including coal beneficiation, Insitu coal gasification, carbon capture and sequestration, coal bed methane/coal mine methane/abandoned mine methane, coal gasification, coal to oil etc.
- 22.0 Research efforts for industry oriented projects need to be promoted. Areas like extraction of steep and thick coal seams, opencast bench slope stability, strata control etc. need special attention.

- 23.0 Integrated Energy Policy has suggested for at least 0.4% of the annual turnover of energy producing companies would need to be spent on R&D activities. Coal Companies to strictly consider the recommendation.

ENVIRONMENTAL MANAGEMENT

- 24.0 As coal has to continue as a major energy resource, the demand must be met through safe and clean technologies for environmental sustainability.
- 25.0 Implementation of Jharia and Raniganj Action Plan for mitigating adverse impacts of fire and subsidence problems caused due to unscientific mining activities by erstwhile owners before nationalization needs to be expedited.
- 26.0 Capacity building in environment related areas in coal companies including training of manpower, creating lab facilities and infrastructure need to be developed.
- 27.0 Introduction of green credit system to encourage afforestation through social forestry for evolving land acquisition in Coal Companies.
- 28.0 Concerted efforts for addressing the issues related to decommissioning of mines/mine closure after exhaustion of reserves are required to be made.

SAFETY AND WELFARE

- 29.0 Thrust on improving safety of mine workings through appropriate ventilation, mechanization, supervision and training etc.
- 30.0 Strengthening internal safety organizations and rotation of manpower from safety department to production operations and vice-a-versa would provide incentives to persons working in safety department.
- 31.0 Independent audit of safety matters of mines needs serious consideration.
- 32.0 Strengthening the manpower of statutory inspecting organizations like DGMS needs consideration.
- 33.0 Online monitoring of underground environment to improve safety needs to be adopted.
- 34.0 Review of rescue and emergency response systems and strengthening of rescue infrastructure needs special emphasis.
- 35.0 Occupational safety and health – need for developing proper mechanism for management of OSH of miners.
- 36.0 Corporate social responsibility – need for evolving appropriate policy for fulfilling the aspirations of population living in and around coalfield areas and to promote environmentally sustainable mining practices.

- 37.0 The schemes under Coal Conservation and Development Act 1974 have been drawn as plan schemes under two broad categorization namely stowing and protective works and road and rail infrastructure development in coalfields.

MINING TECHNOLOGIES, BENCHMARKING, PROJECT FORMULATION, PROJECT IMPLEMENTATION AND REVIVAL OF LOSS MAKING COMPANIES

- 38.0 There is a need for adoption of latest technologies for improved productivity, safety and economics of operations.
- 39.0 Benchmarking of various operations for improving productivity and optimal utilization of resources needs attention of industry. While the availability and utilization norms for HEMM have been benchmarked by a Committee of MoC, the benchmarking of productivity of various underground machinery has been suggested. Effort has been made to establish benchmarks in generalized mining conditions. It is suggested that initiative regarding conducting a comparative study on international benchmarking standards may be taken up during the XI Plan period.
- 40.0 As coal/lignite reserves are capital assets of wasting nature, annual audit of reserves needs to be made a standard practice in the coal mines of the country taking into account recoverable reserves depleted during the year, reserves added through exploration/mine development during the year and reserve changes if any through recalculation in the light of additional geological data becoming available.
- 41.0 There is a need to improve project formulation on the basis of thorough geo-mining investigations in order to avoid infructuous capital investments eventually. Involvement of the equipment manufacturers in production planning process on risk/gain sharing basis has been suggested.
- 42.0 Improved procedures for environmental and forestry clearance are a must for reducing delays in taking of new projects.
- 43.0 Concerted efforts for rigorous monitoring are important for timely implementation of projects.
- 44.0 Strengthening project planning wings of coal companies and training of manpower in various technologies are required to improve the quality of project formulation and monitoring.
- 45.0 There is a need for reviewing purchase and contract procedures and to evolve new concepts (like the Bonus System or the Swiss Challenge System) for reducing time delays, ensuring cost competitiveness and improving implementation of operations.
- 46.0 There is a need for developing alternative modes of coal transportation like inland waterways, coastal shipping and slurry pipelines to ease out load on railway network.
- 47.0 While revival packages have been approved for the loss making ECL and BCCL, however, it is important to take certain of the measures like timely implementation of the envisaged new projects, strict monitoring, co-operation of local administration and trade unions in closing down the identified loss making mines etc. Both public and private companies need to be encouraged to enter into the Joint Ventures.
- 48.0 Shortage of mining professionals in the coal industry poses a potential threat to the industry. Recruitment of mining engineers/ professionals for statutory posts in the

coal/lignite mines need to be stressed upon. Their career prospects and good remuneration packages should be thought for their retention in the industry.

POLICY INITIATIVES

Restructuring of Coal India Limited

- 49.0 Ministry of Coal should wait for the recommendations of the Expert Committee on the subject, before taking a final view on restructuring of Coal India Limited.

OPENING UP OF COAL SECTOR

- 50.0 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.
- 51.0 Decision to increase FDI caps to 100% and permit it under the automatic route for coal and lignite mines for captive consumption should be implemented and encouraged.

CAPTIVE COAL MINING

- 52.0 Mining companies could also be considered eligible for allocation of captive coal blocks, provided they have firm back-to-back tie up with specified end-users (power, steel, cement producers) for exclusive use of coal obtained from such mines in specified end uses only. This would offer new avenues of opening up the sector within the existing legal framework.
- 53.0 Competitive bidding system for allocation of coal blocks should be introduced. This would not only ensure optimal allocation of precious resources, but would also attract more serious players into coal sector.
- 54.0 Incentives as well as punitive penalties such as cancellation of block should be evolved to encourage development of mining blocks allotted within a prescribed timeframe.

COAL PRICING & RAIL FREIGHT RATIONALISATION

- 55.0 Market determines prices based on e-auction upto 20% of the production.
- 56.0 Regulated utilities to be allowed upto 100% of their certified requirement through FSTAs if so desired.
- 57.0 Other bulk consumers to be allowed partial FSTAs based on coal availability.
- 58.0 Switch over to a fully variable GCV based pricing system should be expedited.
- 59.0 Gradually, the quantity of coal to be sold in open market through e-marketing should be increased to discover market driven price for coal.

- 60.0 Rationalise rail freight and offer open access to rail lines for private movers which may make rail movements more efficient.

COAL LINKAGE POLICY

- 61.0 Enter into long term Fuel Supply and Transport Agreements (FSTA) with bulk consumers.

REGULATORY BODY

- 62.0 A regulatory mechanism should be put in place to ensure that coal and lignite pricing is done in a reasonable, transparent manner, to promote competition in the coal and lignite sector, to issue guidelines, evolve benchmarks to work out cost of production from new areas, to determine transfer pricing in respect of captive coal/lignite mining by users and to specify standards of performance for the coal/lignite companies in line with the international practices.

GOVERNMENT SUPPORT

- 63.0 Allocation of additional blocks from Government of India as well as State Governments for exploration, R&D and Environmental Friendly Technologies in lignite mining should be considered.
- 64.0 A Special Task Force, constituted under the Secretary (Coal) must 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 & Forest, Finance, Home, Railways and Planning Commission, review the progress of important matters related to Environment / Forest Clearances, land acquisitions, possessions, law and order etc.
- 65.0 The National Policy on Resettlement & Rehabilitation, 2003, which is under revision and discussion in the Committee of Secretaries, should be finalized at the earliest. It should be acceptable to all concerns, State Governments and Coal and lignite PSUs.
- 66.0 Land should be hired/leased for mining operations and returned after restoration/reclamation for appropriate use.
- 67.0 All the benefits and concessions especially for importing of technical know-how, equipment/machinery etc. extended to Infrastructure industry may also be extended to coal and lignite sector. This will attract more investment in the sector.
- 68.0 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 and lignite sector and include coal and lignite sector in the exemption clause under Section 65 of the Finance Act.

- 69.0 Coal and Lignite resources are depleting assets of capital nature and coal companies need to increase significant resources to explore new deposits. In order to incentivise the system it is important to introduce depletion allowance to reduce the tax burden of coal companies in line with International practices.

DEMAND SIDE MANAGEMENT

- 70.0 Energy Efficient and Conservation Programme and Standards should be established and enforced.
- 71.0 Mechanisms for independent monitoring and verification of achieved energy savings and cost effectiveness of programmes must be established.

INVESTMENT REQUIREMENTS

- 72.0 The proposed Public Sector investment for the XI Plan for supporting their production plans is Rs. 34.259 crore (CIL Rs.15,875 crore; SCCL Rs.3340 crore; NLC Rs. 15,044 crore NLC Mines Rs.2993 crore; NLC Power Rs. 12051 crore). The outlay proposed for the XI Plan is about 115% more than the X Plan outlay (MTA) of Rs.15835.15 crore.
- 73.0 The proposed outlay for departmental schemes to be supported through domestic budgetary support is Rs. 7702 crore (Promotional Exploration Rs.383.50 crore; Detailed Drilling in non-CIL blocs Rs.780 crore; Detailed Drilling in non-NLC blocks Rs.33 crore; Coal Core Analysis Capacity Creation Rs.3.5 crore; (total exploration outlay Rs.1200 crore); R&D Rs.214.40 crore; EMSC/Jharia Action Plan Rs.4622 crore; and schemes under CCDA Rs 1665.60 crore - comprising of Rs. 692.95 crore for stowing and protective works and Rs. 972.65 crore for road and rail infrastructure).
- 74.0 Thus the total plan outlay proposed for MOC for the XI Five Year Plan is Rs. 41961 crore against the X Plan outlay of Rs. 18652.20 crores.

ANNEXURES

Annexure-1.1

COAL DEMAND & SUPPLY (SECTOR-WISE) IN IX PLAN

(IN MILLION TONNES)

Sector	1997-98		1998-99		1999-2000		2000-01		2001-02	
	Demand	Indigenous Supply	Demand	Indigenous Supply	Demand Rev. by P.Com	Indigenous Supply	Demand	Indigenous Supply	Demand	Indigenous Supply
POWER(U)	205.90	201.34	220.30	204.74	214.00	221.32	223.63	234.60	239.96	245.68
STEEL	41.40	22.78	36.83	21.97	36.83	18.80	37.50	19.67	34.12	18.73
CEMENT	18.20	9.50	15.00	8.62	10.00	9.51	15.42	10.33	17.00	11.85
OTHERS	57.88	66.62	53.25	56.51	51.00	57.80	57.30	55.07	63.21	54.68
TOTAL	323.38	300.23	325.38	291.84	311.83	307.42	333.85	319.67	354.29	330.94
GAP (Against Ind. Supply)		23.15		33.54		4.41		14.18		23.35
Import		16.44		16.54		19.70		20.93		20.55
Total Supply		316.67		308.38		327.12		340.60		351.49
Net Gap		6.71		17.00		-15.29		-6.75		2.80

COAL DEMAND & SUPPLY (SECTOR-WISE) IN X PLAN

(IN MILLION TONNES)

Sector	2002-03		2003-04		2004-05		2005-06		2006-07	
	Demand	Indigenous Supply	Demand	Indigenous Supply	Demand	Indigenous Supply	Demand	Indigenous Supply	Demand	Indigenous Supply
POWER(U)	249.50	252.18	256.00	265.61	279.52	270.17	303.56	289.45	322.00	
STEEL	34.40	17.66	36.16	16.68	33.98	17.51	42.05	16.69	43.70	
CEMENT	17.10	12.70	16.50	13.45	19.00	14.70	20.22	15.22	25.40	
OTHERS	62.30	57.55	72.24	63.49	71.69	77.47	79.82	75.30	83.08	
TOTAL	363.30	340.09	380.90	359.23	404.19	379.84	445.65	396.66	474.18	
GAP (Against Ind. Supply)		23.21		21.67		24.36		48.99		
Import		23.26		21.68		28.95		36.87		
Total Supply		363.35		380.91		408.79		433.53		
Net Gap		-0.05		-0.01		-4.60		12.13		

Note : Demand Assessed by Plg. Commission in Annual Plan.

Annexure : 1.3

Coal Demand vis-à-vis Materialisation during X Plan period (2002-07)

Million Tonnes

Sl. No.	Major Consuming Sectors	Terminal Year IXth Plan (2001-02)	2002-03		2003-04		2004-05		2005-06		2006-07
			Demand	Actual	Demand	Actual	Demand	Actual	Demand	(Provisional)	Demand
I	Coking Coal										
	Steel(Indigenous)	18.06	16.12	16.85	18.94	16.24	17.38	16.95	15.66	16.55	15.51
	Cokeries/Coke-Oven	0.67	1.50	0.82	0.81	0.44	0.71	0.56	2.50	0.14	3.00
	Import	11.11	16.78	12.95	16.41	12.99	15.89	16.93	23.89	17.11	25.19
	Total Coking	29.84	34.40	30.61	36.16	29.67	33.98	34.43	42.05	33.80	43.70
II	Non-Coking Coal										
1	Power Utility	249.23	249.50	255.47	256.00	268.21	279.52	288.52	303.56	299.89	322.00
	Middlings	(1.80)	(3.275)	(1.71)	(3.04)	(1.44)	(2.48)	(1.48)	(1.57)	(1.41)	
2	Cement	15.22	17.10	16.37	16.50	16.64	19.00	18.33	20.22	18.33	25.40
3	Fertiliser	3.20	3.50	2.53	3.14	2.07	2.81	2.18	3.43	1.57	3.52
4	Power Captive	16.02	21.15	17.01	22.49	16.12	24.90	24.92	27.35	24.13	28.26
	Middlings	(1.29)	(1.55)	(1.53)	(1.15)	(1.74)	(1.10)	(1.71)	(2.07)	(1.65)	
5	Others	36.61	35.15	39.87	44.96	46.88	42.52	39.23	47.75	54.25	48.80
	Middlings	(0.51)	(0.10)	(0.01)	(0.10)						
6	Colliery consumption	1.80	2.50	1.48	1.65	1.33	1.46	1.18	1.29	1.56	2.50
7	Total Non-Coking	322.07	328.90	332.74	344.74	351.24	370.21	374.35	403.60	399.72	430.48
Grand Total		351.91	363.30	363.35	380.90	380.91	404.19	408.79	445.65	433.53	474.18
Middlings		(3.60)	(4.925)	(3.25)	(4.29)	(3.18)	(3.58)	(3.19)	(3.60)	(3.06)	

Note : Actual All India Offtake figures are as per Coal Directory of India, published by Coal Controller's Organisation, Kolkata

FUEL WISE BREAK-UP OF CAPACITY ADDITION OF POWER PROJECTS

S. N.	Fuel Source	IX Plan (1997-02)		X Plan (02-07)		XI Plan	XII Plan
		Target as per IX Plan Docu.	Actual	Target as per X Plan Docu.	Expected	2007-12	2012-17
						Projected	Projected
1	Coal Based Power Project	15102	7930	18308	14645	46840	50000
2	Lignite Based Power Project	995	325	1745	1120	1375	3000
3	Gas/Naphtha/Diesel etc. Based Power Project	13448	5446	5363.6	4755	2022	6000
4	Hydro/PSS Projects	9820	4538	14393.2	9464	15727	25000
5	Nuclear Power Projects	880	880	1300	1400	3160	7000
6	Others, if any	0	0	0	0	0	0
	TOTAL ALL INDIA	40245	19119	41109.8	31384	69124	91000

Annexure-1.5

CAPACITY ADDITION OF COAL BASED POWER PROJECTS

SL. NO.	REGION	Existing Capacity as on 31.03.02	Projected Capacity Addition										
			Capacity addition X Plan Period (2002-07)			XI Plan (2007-12)					Total	XII Plan	XIII Plan
			Actual (1.04.02 to 31.08.06)	Ant. Remaining period in 06-07	Total	07-08	08-09	09-10	10-11	11-12		2012-17	2017-22
1	Northern	15302.5	2155	920	3075	600	1295	1480	1350	4000	8725		
2	Western	18667.5	500	3250	3750	1460	2060	4170	1660	4960	14310		
3	Southern	9782.5	1210	920	2130	0	1210	1515	1500	3800	8025		
4	Eastern	13392.5	2330	3360	5690	710	550	2070	4320	7380	15030		
5	North Eastern	240.0	0	0	0	0	0	0	250	500	750		
	Total	57385.0	6195	8450	14645	2770	5115	9235	9080	20640	46840	50000	67000

Coal based Installed Capacity (MW)	MW
-End of IX Plan	57385
-Addition of Capacity in X Plan	14645
-Total Installed Capacity at the end of X Plan	72030
-Projected Capacity addition XI Plan	46840

Annexure-1.6

CAPACITY ADDITION OF LIGNITE BASED POWER PROJECTS

CAPACITY ADDITION OF EXISTING POWER PROJECTS						Projected Capacity Addition							
SL. No.	REGION		Capacity addition X Plan Period (2002-07)			XI Plan (2007-12)					Total	XII Plan	XIII Plan
		Existing Capacity as on 31.03.02	Actual (1.04.02 to 31.08.06)	Ant. Remaining period in 06-07	Total	07-08	08-09	09-10	10-11	11-12		2012-17	2017-22
1	Northern	0	0	125	125	0	375	0	125	125	625		
2	Western	465	250	75	325	0	250	0	0	0	250		
3	Southern	2070	670	0	670	0	500	0	0	0	500		
4	Eastern	0	0	0	0	0	0	0	0	0	0		
5	North Eastern	0	0	0	0	0	0	0	0	0	0		
	Total	2535	920	200	1120	0	1125	0	125	125	1375	3000	5000

Lignite based Installed Capacity (MW)

	MW
-End of IX Plan	2535
-Addition of Capacity in X Plan	1120
-Total Installed Capacity at the end of X Plan	3655
-Projected Capacity addition XI Plan	1375

REGIONWISE COAL REQUIREMENT-SUMMARY
(Annexure-1.7)

S.No.	Region	10th Plan(Expected)			11th Plan(Projected)		
		Expected Cap.Addition during the plan period	Terminal year 06-07		Projected Cap.Addition during the plan period	Terminal year 2011-12	
			Energy Generation(BU)	Coal Requirement(MT)		Energy Generation(BU)	Coal Requirement(MT)
1	NR	3075	119	89	8565	170	133
2	WR	3750	135	104	10390	222	165
3	SR	2130	84	60	7050	130	91
4	ER &NER	5690	92	69	15930	211	153
	TOTAL	14645	429	322	41935	733	542

YEARWISE PROJECTION IN XI PLAN PERIOD

S.No.	Region	2007-08		2008-09		2009-10		2010-11		2011-12	
		Energy Generation	Coal Req.	Energy Generation	Coal Req.	Energy Generation	Coal Req.	Energy Generation	Coal Req.	Energy Generation	Coal Req.
1	NR	126	94	130	98	145	109	162	123	170	133
2	WR	157	124	176	134	193	146	207	155	222	165
3	SR	89	63	93	66	101	72	112	79	130	91
4	ER &NER	114	88	121	92	135	102	167	126	211	153
	TOTAL	486	369	520	390	574	429	648	483	733	542

Note:

1.It has been assumed that in first year,plant generates power at a PLF of 40% otherwise at 85%

2.Normative coal requirement of 5000Tonnes/MW/Year has been taken

YEARWISE POWER GENERATION DURING 11TH PLAN

Annexure 1.8

		3	3A	4	5	8	9	11	14	17	20	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	GEN.	GEN.	GEN.	GEN.	GEN.
Sl.No.	NAME OF TPS	CAP. MW AS ON 31.3.06	Gen. tar. for 06- 07(MUs)	CAP ADDITI ON MW 2006-07	TOTAL CAP. MW AS ON 31.3.07	CAP ADDITION MW 2007-08	TOTAL CAP.	CAP	CAP	CAP	CAP	COAL REQ.	COAL REQ.	COAL REQ.	COAL REQ.	COAL REQ.					
							MW	ADDITI ON	ADDITI ON	ADDITI ON	ADDITI ON	MT	MT	MT	MT	MT	MU	MU	MU	MU	MU
							AS ON	MW	MW	MW	MW	2007-08	2008-09	2009-10	2010-11	2011-12	2007-08	2008-09	2009-10	2010-11	2011-12
							31.3.08	2008-09	2009-10	2010-11	2011-12										
1	Badarpur	720	5200		720		720		490	490		4.0	4.0	5.2	7.7	9.0	5200	5200	6917	10566	12497
2	I.P. Stn.	247.5	950		248		248					1.0	1.0	1.0	1.0	1.0	950	950	950	950	950
3	Rajghat	135	800		135		135					0.8	0.8	0.8	0.8	0.8	800	800	800	800	800
4	Faridabad	180	870		180		180					0.9	0.9	0.9	0.9	0.9	870	870	870	870	870
5	Panipat	1360	9290		1360		1360					7.0	7.0	7.0	7.0	7.0	9290	9790	9790	9790	9790
6	Choturam(Y-ngr)	0			0	600	600					1.4	3.0	3.0	3.0	3.0	2102	4468	4468	4468	4468
7	Hissar				0		0		250	250	500	0.0	0.0	0.6	1.9	3.7	0	0	876	2738	5585
8	Bhatinda	440	2805	500	940		940					4.7	4.7	4.7	4.7	4.7	5873	5873	5873	5873	5873
9	Lehra Mahabbat	420	3220		420		420					2.4	2.4	2.4	2.4	2.4	3875	3875	3875	3875	3875
10	Ropar	1260	8900		1260		1260					6.4	6.4	6.4	6.4	6.4	8900	8900	8900	8900	8900
11	Kota	1045	8000		1045		1045	195				5.6	6.1	6.6	6.6	6.6	8000	8683	9452	9452	9452
12	Suratgarh	1250	9345		1250		1250	250				6.1	6.7	7.4	7.4	7.4	9345	8876	9862	11207	11207
13	Chabra				0		0	500				0.0	1.2	2.5	2.5	2.5	0	1752	3723	3723	3723
14	Anpara C				0		0			500	500	0.0	0.0	0.0	1.2	3.7	0	0	0	1752	3723
15	Anpara	1630	10580		1630		1630					8.6	8.6	8.6	8.6	8.6	10580	10580	10580	10580	10580
16	Harduaganj	450	770		450		450		500			1.1	1.1	2.3	3.6	3.6	770	770	2522	4493	4493
17	Obra	1550	6660		1550		1550					6.0	6.0	6.0	6.0	6.0	6660	6660	6660	6660	6660
18	Panki	220	1010		220		220					1.2	1.2	1.2	1.2	1.2	1010	1010	1010	1010	1010
19	Parichha	220	2750	420	640		640		500			3.2	3.2	4.4	5.7	5.7	4222	4222	5974	7945	7945
20	Chola,B.shaher				0					500		0.0	0.0	0.0	1.2	2.5	0	0	0	1752	3723
21	Tanda	440	3100		440		440					2.7	2.7	2.7	2.7	2.7	3100	3100	3100	3100	3100
22	Unchahar	840	6880	210	1050		1050					6.0	6.0	6.0	6.0	6.0	7708	7708	7708	7708	7708
23	Rihand	2000	14950		2000		2000					10.2	10.2	10.2	10.2	10.2	14950	14950	14950	14950	14950
24	Singrauli	2000	14750		2000		2000					10.4	10.4	10.4	10.4	10.4	14750	14750	14750	14750	14750
25	Dadri	840	6340		840		840		980			4.5	4.5	7.9	9.4	9.4	6340	6340	9774	13637	13637
26	Jhajjar	0	0		0		0		500	1000		0.0	0.0	1.2	4.9	7.5	0	0	1752	7227	11169
	TOTAL NR	17248	117170	1130	18378	600	18978	945	3220	2740	1000	94	98	109	123	133	125295	130127	145135	161547	170268

27	Ahemadabad	390	2950		390		390					1.8	1.8	1.8	1.8	1.8	2950	2950	2950	2950	2950
28	Gandhinagar	870	5533		870		870					4.4	4.4	4.4	4.4	4.4	5533	5533	5533	5533	5533
29	Sikka	240	1683		240		240			500		1.2	1.2	1.2	2.0	2.9	1683	1683	1683	3435	5406
30	Ukai	850	5058		850		850					4.4	4.4	4.4	4.4	4.4	5058	5058	5058	5058	5058
31	Wanakbori	1470	10733		1470		1470					8.0	8.0	8.0	8.0	8.0	10733	10733	10733	10733	10733
32	Amarkantak	300	1290	0	300	210	510					1.2	1.7	2.3	2.3	2.3	2026	2854	2854	2854	2854
33	Birsingpur	840	6105	500	1340		1340					6.7	6.7	6.7	6.7	6.7	6841	7669	7669	7669	7669
34	Satpura	1142.5	7680		1143		1143					6.8	6.8	6.8	6.8	6.8	7680	7680	7680	7680	7680
35	Malwa	0.0	0.0		0		0			1000		0.0	0.0	0.0	0.0	2.4	0	0	0	0	3504
36	Vindhyachal	2260	17610	1000	3260		3260					16.7	16.7	16.7	16.7	16.7	21552	21552	21552	21552	21552
37	Korba East	440	3635	500	940		940					4.8	4.8	4.8	4.8	4.8	5022	6993	6993	6993	6993
38	Korba West	840	5800	0	840		840		600			4.4	4.4	5.8	7.4	7.4	5800	5800	7902	10268	10268
39	Raigarh	0	0	250	250	750	1000					3.1	5.0	5.0	5.0	5.0	4490	7446	7446	7446	7446
40	Pathdi(Lanco)				0		0	300	300			0.0	0.7	2.2	3.0	3.0	0	1051	3285	4468	4468
41	Korba STPS	2100	15750		2100		2100		500			12.4	12.4	13.6	14.9	14.9	15750	15750	17502	19473	19473
42	Bhilai	0		0	0	500	500					1.2	2.5	2.5	2.5	2.5	1752	3723	3723	3723	3723
43	Sipat	0	20	1000	1000	660	1660	1320				6.6	11.5	14.9	14.9	14.9	9759	16986	22189	22189	22189
44	Mauda	0	0				0			1000		0.0	0.0	0.0	0.0	2.4	0	0	0	0	3504
45	Bhusawal	482	3352		482		482			1000		2.3	2.3	2.3	4.7	7.3	3352	3352	3352	6856	10798
46	Chandrapur	2340	14665		2340		2340					12.2	12.2	12.2	12.2	12.2	14665	14665	14665	14665	14665
47	Koradi	1100	6829		1100		1100					5.5	5.5	5.5	5.5	5.5	6829	6829	6829	6829	6829
48	Koradi Repl.	0	0	0	0		0			500		0.0	0.0	0.0	1.2	2.5	0	0	0	1752	3723
49	Khaperkheda	840	6200		840		840		500			4.9	4.9	6.1	7.4	7.4	6200	6220	7972	9943	9943
50	Nasik	910	6270		910		910					3.8	3.8	3.8	3.8	3.8	6270	6270	6270	6270	6270
51	Parli	690	6373	250	940		940	250				5.8	6.4	7.1	7.1	7.1	7359	8235	9221	9221	9221
52	Paras	63	1008	250	313		313	250				1.6	1.8	2.9	2.9	2.9	1994	2870	3856	3856	3856
53	Trombay	500	8820		500		500	250				1.9	2.3	2.8	2.8	2.8	0	876	1862	1862	1862
54	Dahanu	500	4128		500		500					2.0	2.0	2.0	2.0	2.0	4128	4128	4128	4128	4128
	TOTAL WR	19168	141492	3750	22918	2120	25038	2370	1900	2000	2000	124	134	146	155	165	157425	176905	192905	207403	222295
55	Kothagudem	1180	9695	0	1180		1180		500			6.7	6.7	7.9	9.2	9.2	9695	9695	11447	13418	13418
56	Ramagundam-B	62.5	433		63		63					0.3	0.3	0.3	0.3	0.3	433	433	433	433	433
57	Vijayawada	1260	9677		1260		1260	500				7.2	8.4	9.7	9.7	9.7	9677	11429	13400	13400	13400
58	Bhopalapally						0	500				0.0	1.2	2.5	2.5	2.5	0	1752	3723	3723	3723
59	Krishnapattanam						0			800		0.0	0.0	0.0	0.0	1.9	0	0	0	0	2803
60	R-gundam STPS	2600	19400		2600		2600					13	13	13	13	13	19400	19400	19400	19400	19400
61	Rayalaseema	420	4648	420	840		840					4.6	4.6	4.6	4.6	4.6	6304	6304	6304	6304	6304

62	Simhadri	1000	7550		1000		1000			500	500	5.6	5.6	5.6	6.8	9.3	7550	7550	7550	9302	13025
63	Raichur	1470	10360		1470		1470	250				7.0	7.6	8.3	8.3	8.3	10360	11236	12222	12222	12222
64	Bellary	500	250	500	500		500		500			2.5	2.5	3.7	5.0	5.0	3723	3723	5475	7446	7446
65	Ennore	450	1872		450		450					1.9	1.9	1.9	1.9	1.9	1872	1872	1872	1872	1872
66	Mettur	840	6700		840		840			500		4.9	4.9	4.9	6.1	7.4	6700	6700	6700	8452	10423
67	Tuticorin	1050	8280		1050		1050					5.6	5.6	5.6	5.6	5.6	8280	8280	8280	8280	8280
68	North Chennai	630	4535		630		630				500	3.6	3.6	3.6	3.6	4.8	4535	4535	4535	4535	6287
69	Ennore JV	0	0		0		0			500	500	0.0	0.0	0.0	1.2	3.7	0	0	0	1752	5475
70	Tuticorin JV	0	0		0		0			500	500	0.0	0.0	0.0	1.2	3.7	0	0	0	1752	5475
	TOTAL SR	11463	83400	920	11883	0	11883	1250	1000	2000	2800	63	66	72	79	91	88529	92909	101340	112290	129985
							0														
71	Barauni	320	300		320		320					1.0	1.0	1.0	1.0	1.0	300	300	300	300	300
72	Muzaffarpur	220	300		220		220					1.0	1.0	1.0	1.0	1.0	300	300	300	300	300
73	Barh				0		0	660	660	660	1320	0.0	1.6	4.9	8.2	13.1	0	2313	7227	12141	19380
74	Nabinagar				0		0			500	500	0.0	0.0	0.0	1.2	3.7	0	0	0	1752	5475
75	Patratu	840	2000		840		840					2.0	2.0	2.0	2.0	2.0	2000	2000	2000	2000	2000
76	Kahalgaon	840	7170	1500	2340		2340					14.0	14.0	14.0	14.0	14.0	18339	18339	18339	18339	18339
77	Tenughat	420	1400		420		420					1.2	1.2	1.2	1.2	1.2	1400	1400	1400	1400	1400
78	Maithan RB				0		0		500	500		0.0	0.0	1.2	3.7	5.0	0	0	1752	5475	7446
79	North K.Pura				0		0				1320	0.0	0.0	0.0	0.0	3.2	0	0	0	0	4625
80	Bokaro	802	3590		803		803					3.0	3.0	3.0	3.0	3.0	3590	3590	3590	3590	3590
81	Bokaro Repl.				0				500			0.0	0.0	1.2	2.5	2.5	0	0	1752	3723	3723
82	Kodarma				0		0			1000		0.0	0.0	0.0	2.4	5.0	0	0	0	3504	7446
83	Chandrapur	780	1988	0	780	500	1280					2.7	4.0	4.0	4.0	4.0	3740	5711	5711	5711	5711
84	Durgapur	350	1790		350		350					1.4	1.4	1.4	1.4	1.4	1790	1790	1790	1790	1790
85	Durgapur Steel	0	0							500	500	0.0	0.0	0.0	1.2	3.7	0	0	0	1752	5475
86	Raghunathpur	0	0								1000	0.0	0.0	0.0	0.0	2.4	0	0	0	0	3504
87	Mejia	840	6705	500	1340		1340		500	500		7.0	7.0	8.2	10.7	12.0	8457	8457	10209	13932	15903
88	Talcher	470	3380		470		470					2.9	2.9	2.9	2.9	2.9	3380	3380	3380	3380	3380
89	Talcher STPS	3000	22200		3000		3000					16.0	16.0	16.0	16.0	16.0	22200	22200	22200	22200	22200
90	Ib Valley	420	3311		420		420					2.8	2.8	2.8	2.8	2.8	3311	3311	3311	3311	3311
91	Daripali				0		0				800	0.0	0.0	0.0	0.0	1.9	0	0	0	0	2803
92	Bandel	540	2100		540		540					1.4	1.4	1.4	1.4	1.4	2100	2100	2100	2100	2100
93	Santal Dih	480	1275	250	730		730		250			2.3	2.3	2.9	3.6	3.6	2151	3137	4013	4999	4999
94	Kolaghat	1260	7210		1260		1260					5.5	5.5	5.5	5.5	5.5	7210	7210	7210	7210	7210
95	Bakreswar	630	4150	210	840	210	1050				500	2.9	3.5	3.5	3.5	4.7	6450	7277	7277	7277	9029

	96	Sagar Dighi	0	220	600	600		600			500	500	3.0	3.0	3.0	4.2	6.7	4468	4468	4468	6220	9943
	97	Jojobera	360	CPP		360																
	98	Calcutta	160	438		160		160					0.4	0.4	0.4	0.4	0.4	438	438	438	438	438
	99	Titagarh	240	1810		240		240					1.3	1.3	1.3	1.3	1.3	1810	1810	1810	1810	1810
	100	South Gen.	135	1005		135		135					0.7	0.7	0.7	0.7	0.7	1005	1005	1005	1005	1005
	101	Budge Budge	500	4207		500		500		250			2.5	2.5	3.1	3.8	3.8	4207	4207	5083	6069	6069
	102	Durgapur(DPL)	395	2400	300	695		695		300	500		3.3	3.3	4.0	7.8	8.1	4634	4634	5685	8620	10591
	103	Farakka STPS	1600	11500		1600		1600		500			10.0	10.0	11.2	12.7	12.7	11150	11150	12902	14873	14873
		TOTAL ER	15602	90449	3360	18963	710	19673	660	3460	4660	6440	88	92	102	124	151	114429	120526	135253	165220	206167
	104	Bongaigaon	240		0	240																
	105	Bongaigaon N	0	0		0					500	250	0	0	0	1.2	3.1	0	0	0	1752	4599
		TOTAL NER	240	0		240					500	250	0	0	0	1	3	0	0	0	1752	4599
		TOTAL ALL INDIA	63720	432511	9160	72380	3430	75570	5225	9580	11900	12490	369	390	429	483	542	485678	520467	574633	648213	733315

Annexure-1.9

COAL REQUIREMENT DURING 11TH PLAN (TPS Utilities wise)

SL	NAME OF TPS	TOTAL CAP.	CAP ADDITION	CAP ADDITION	CAP ADDITION	CAP ADDITION	CAP ADDITION	TOTAL COAL REQ.	TOTAL COAL REQ.	TOTAL COAL REQ.	TOTAL COAL REQ.	TOTAL COAL REQ.
NO		MW	MW	MW	MW	MW	MW	MT	MT	MT	MT	MT
		AS ON	2007-08	2008-09	2009-10	2010-11	2011-12	2007-08	2008-09	2009-10	2010-11	2011-12
		31.3.07										
1	Badarpur	720.0			490	490		4.0	4.0	5.2	7.7	9.0
2	I.P. Stn.	247.5						1.0	1.0	1.0	1.0	1.0
3	Raighat	135.0						0.8	0.8	0.8	0.8	0.8
4	Faridabad	180.0						0.9	0.9	0.9	0.9	0.9
5	Panipat	1360.0						7.0	7.0	7.0	7.0	7.0
6	Choturam(Y-ngr)	0.0	600					1.4	3.0	3.0	3.0	3.0
7	Hissar	0.0			250	250	500	0.0	0.0	0.6	1.9	3.7
8	Bhatinda	940.0						4.7	4.7	4.7	4.7	4.7
9	Lehra Mahabbat	420.0						2.4	2.4	2.4	2.4	2.4
10	Ropar	1260.0						6.4	6.4	6.4	6.4	6.4
11	Kota	1045.0		195				5.6	6.1	6.6	6.6	6.6
12	Suratgarh	1250.0		250				6.1	6.7	7.4	7.4	7.4
13	Chabra	0.0		500				0.0	1.2	2.5	2.5	2.5
14	Anpara C	0.0				500	500	0.0	0.0	0.0	1.2	3.7
15	Anpara	1630.0						8.6	8.6	8.6	8.6	8.6
16	Harduaganj	450.0			500			1.1	1.1	2.3	3.6	3.6
17	Obra	1550.0						6.0	6.0	6.0	6.0	6.0
18	Panki	220.0						1.2	1.2	1.2	1.2	1.2
19	Parichha	640.0			500			3.2	3.2	4.4	5.7	5.7
20	Chola,Bulandshaher	0.0				500		0.0	0.0	0.0	1.2	2.5
21	Tanda	440.0						2.7	2.7	2.7	2.7	2.7
22	Unchahar	1050.0						6.0	6.0	6.0	6.0	6.0
23	Rihand	2000.0						10.2	10.2	10.2	10.2	10.2
24	Singrauli	2000.0						10.4	10.4	10.4	10.4	10.4
25	Dadri	840.0			980			4.5	4.5	7.9	9.4	9.4
26	Jhajjar TPS	0.0			500	1000		0.0	0.0	1.2	4.9	7.5

	TOTAL NR	18377.5	600	945	3220	2740	1000	94	98	109	123	133
27	Ahemadabad	390.0						1.8	1.8	1.8	1.8	1.8
28	Gandhinagar	870.0						4.4	4.4	4.4	4.4	4.4
29	Sikka	240.0				500		1.2	1.2	1.2	2.0	2.9
30	Ukai	850.0						4.4	4.4	4.4	4.4	4.4
31	Wanakbori	1470.0						8.0	8.0	8.0	8.0	8.0
32	Amarkantak	300.0	210					1.2	1.7	2.3	2.3	2.3
33	Birsingpur	1340.0						6.7	6.7	6.7	6.7	6.7
34	Satpura	1142.5						6.8	6.8	6.8	6.8	6.8
35	Malwa	0.0					1000	0.0	0.0	0.0	0.0	2.4
36	Vindhyachal	3260.0						16.7	16.7	16.7	16.7	16.7
37	Korba East	940.0						4.8	4.8	4.8	4.8	4.8
38	Korba West	840.0			600			4.4	4.4	5.8	7.4	7.4
39	Raigarh	250.0	750					3.1	5.0	5.0	5.0	5.0
40	Pathdi(Lanco)	0.0		300	300			0.0	0.7	2.2	3.0	3.0
41	Korba STPS	2100.0			500			12.4	12.4	13.6	14.9	14.9
42	Bhilai	0.0	500					1.2	2.5	2.5	2.5	2.5
43	Sipat	1000.0	660	1320				6.6	11.5	14.9	14.9	14.9
44	Mauda	0.0					1000	0.0	0.0	0.0	0.0	2.4
45	Bhusawal	482.5				1000		2.3	2.3	2.3	4.7	7.3
46	Chandrapur	2340.0						12.2	12.2	12.2	12.2	12.2
47	Koradi	1100.0						5.5	5.5	5.5	5.5	5.5
48	Koradi Repl.	0.0				500		0.0	0.0	0.0	1.2	2.5
49	Khaperkheda	840.0			500			4.9	4.9	6.1	7.4	7.4
50	Nasik	910.0						3.8	3.8	3.8	3.8	3.8
51	Parli	940.0		250				5.8	6.4	7.1	7.1	7.1
52	Paras	312.5		250				1.6	1.8	2.9	2.9	2.9
53	Trombay	500.0		250				1.9	2.3	2.8	2.8	2.8
54	Dahanu	500.0						2.0	2.0	2.0	2.0	2.0
	TOTAL WR	22917.5	2120	2370	1900	2000	2000	124	134	146	155	165
55	Kothagudem	1180.0			500			6.7	6.7	7.9	9.2	9.2
56	Ramagundam-B	62.5						0.3	0.3	0.3	0.3	0.3
57	Vijayawada	1260.0		500				7.2	8.4	9.7	9.7	9.7

58	Bhopalapally	0.0		500				0.0	1.2	2.5	2.5	2.5
59	Krishnapattanam	0.0					800	0.0	0.0	0.0	0.0	1.9
60	R-gundam STPS	2600.0						13	13	13	13	13
61	Rayalaseema	840.0						4.6	4.6	4.6	4.6	4.6
62	Simhadri	1000.0				500	500	5.6	5.6	5.6	6.8	9.3
63	Raichur	1470.0		250				7.0	7.6	8.3	8.3	8.3
64	Bellary	500.0			500			2.5	2.5	3.7	5.0	5.0
65	Ennore	450.0						1.9	1.9	1.9	1.9	1.9
66	Mettur	840.0				500		4.9	4.9	4.9	6.1	7.4
67	Tuticorin	1050.0						5.6	5.6	5.6	5.6	5.6
68	North Chennai	630.0					500	3.6	3.6	3.6	3.6	4.8
69	Ennore JV	0.0				500	500	0.0	0.0	0.0	1.2	3.7
70	Tuticorin JV	0.0				500	500	0.0	0.0	0.0	1.2	3.7
	TOTAL SR	11882.5	0	1250	1000	2000	2800	63	66	72	79	91
71	Barauni	320.0						1.0	1.0	1.0	1.0	1.0
72	Muzaffarpur	220.0						1.0	1.0	1.0	1.0	1.0
73	Barh	0.0		660	660	660	1320	0.0	1.6	4.9	8.2	13.1
74	Nabinagar	0.0				500	500	0.0	0.0	0.0	1.2	3.7
75	Patratu	840.0						2.0	2.0	2.0	2.0	2.0
76	Kahalgaoon	2340.0						14.0	14.0	14.0	14.0	14.0
77	Tenughat	420.0						1.2	1.2	1.2	1.2	1.2
78	Maithan RB	0.0			500	500		0.0	0.0	1.2	3.7	5.0
79	North K.Pura	0.0					1320	0.0	0.0	0.0	0.0	3.2
80	Bokaro	802.5						3.0	3.0	3.0	3.0	3.0
81	Bokaro Repl.	0.0			500			0.0	0.0	1.2	2.5	2.5
82	Kodarma	0.0				1000		0.0	0.0	0.0	2.4	5.0
83	Chandrapura	780.0	500					2.7	4.0	4.0	4.0	4.0
84	Durgapur	350.0						1.4	1.4	1.4	1.4	1.4
85	Durgapur Steel	0.0				500	500	0.0	0.0	0.0	1.2	3.7
86	Raghunathpur	0.0					1000	0.0	0.0	0.0	0.0	2.4
87	Mejia	1340.0			500	500		7.0	7.0	8.2	10.7	12.0
88	Talcher	470.0						2.9	2.9	2.9	2.9	2.9
89	Talcher STPS	3000.0						16.0	16.0	16.0	16.0	16.0
90	Ib Valley	420.0						2.8	2.8	2.8	2.8	2.8
91	Daripali	0.0					800	0.0	0.0	0.0	0.0	1.9

92	Bandel	540.0						1.4	1.4	1.4	1.4	1.4
93	Santaldih	730.0			250			2.3	2.3	2.9	3.6	3.6
94	Kolaghat	1260.0						5.5	5.5	5.5	5.5	5.5
95	Bakreswar	840.0	210			500		2.9	3.5	3.5	3.5	4.7
96	Sagar Dighi	600.0				500	500	3.0	3.0	3.0	4.2	6.7
97	Jojobera	360.0	CPP									
98	Calcutta	160.0						0.4	0.4	0.4	0.4	0.4
99	Titagarh	240.0						1.3	1.3	1.3	1.3	1.3
100	South Gen.	135.0						0.7	0.7	0.7	0.7	0.7
101	Budge Budge	500.0			250			2.5	2.5	3.1	3.8	3.8
102	Durgapur(DPL)	695.0			300	500		3.3	3.3	4.0	7.8	8.1
103	Farakka STPS	1600.0			500			10.0	10.0	11.2	12.7	12.7
	TOTAL ER	18962.5	710	660	3460	4660	6440	88	92	102	124	151
104	Bongaigaon	240.0										
105	Bongaigaon N	0.0				500	250	0.0	0.0	0.0	1.2	3.1
	TOTAL NER	240.0	0	0	0	500	250	0	0	0	1	3
	TOTAL ALL INDIA	72380.0	3430	5225	9580	11900	12490	369	390	429	483	542

Annexure-1.10

LIST OF COAL BASED POWER PROJECTS FOR LIKELY BENEFITS DURING 11TH PLAN (TENTATIVE)																
Sl. No.	PLANT NAME	STATE	AGENCY	SECTOR	NO. of Units X Unit size	ULTIMATE CAPACITY (MW)	BENEFITS 11TH PLAN (2007-12)	LIKELY YEAR OF BENEFIT	Requirement Calculated (MT/annum)	Status of Linkage						
										Linkage Available	Linkage to be accorded	Block Allocated	Block agreed	Block to be Allocated	Imported Coal tied up	Imported Coal to be tied up
CENTRAL SECTOR																
1	DADRI EXT	UP	NTPC	C	2X490	980	980	2009-11	4.9		980					
2	SIPAT I (SECL)	CHG	NTPC	C	3x660	1980	1980	2008-10	9.9	1980						
3	BHILAI JV (SECL)	CHG	NTPC	C	2x250	500	500	2007-08	2.5	500						
4	KORBA III	CHG	NTPC	C	1X500	500	500	2009-10	2.5			500				
5	INTEGRATED PROJ. LARA	CHG	NTPC	C	5X800	4000	800	2011-12	4			800				
6	SIMADHARI-EXT	AP	NTPC	C	2X500	1000	1000	2010-11	5		1000					
7	ENNORE-JV	TN	NTPC+TNE B	C	2x500	1000	1000	2010-12	5		1000					
8	BARH (CCL)	BIH	NTPC	C	3x660	1980	1980	2009-11	9.9	1980						
9	BARH II	BIH	NTPC	C	2x660	1320	660	2011-12	3.3			660				
10	NABINAGAR (CCL)	BIH	NTPC	C	4x250	1000	1000	2009-12	5	1000						
11	NORTH K PURA (CCL)	JHAR	NTPC	C	3x660	1980	1980	2010-12	9.9	1980						
12	INTEGRATED PROJ. DARIPALI	ORS	NTPC	C	4x800	3200	800	2011-12	4			800				
13	FARAKKA STAGE-III (ECL)	WB	NTPC	C	1x500	500	500	2009-10	2.5	500						
14	BONGAIGAON	ASSAM	NTPC	C	3x250	750	750	2010-12	3.75		750					
15	CHANDERPUR	JHAR	DVC	C	2x250	500	500	2007-08	2.5	500						
16	MAITHAN RB (BCCL)	JHAR	DVC	C	2x500	1000	1000	2010-11	5	1000						
17	KODARMA	JHAR	DVC	C	2x500	1000	1000	2011-12	5					1000		
18	BOKARO	JHAR	DVC	C	2x250	500	500	2010-11	2.5					500		
19	BOKARO REPLACEMENT	JHAR	DVC	C	1x500	500	500	2010-11	2.5		500					
20	MEZIA EXT	WB	DVC	C	2X500	1000	1000	2011-12	5		1000					
21	TUTICORIN JV	TN	NLC+ TNEB	C	2x500	1000	1000	2010-12	5		1000					
	SUB-TOTAL					26190	19930		100	9440	6230	2760	0	1500	0	0
STATE SECTOR																
22	YAMUNA NAGAR (CCL)	HAR	HPGCL	S	2x300	600	600	2007-08	3	600						
23	HISSAR	HAR	HPGCL	S	2x500	1000	1000	2010-12	5		1000					
24	DELHI TPS	CHG/HAR	IPGCL	JV	2X500	1000	1000	2009-10	5					1000		
25	SURATGARH EXT	RAJ	RRVUNL	S	1x250	250	250	2010-11	1.25	250						
26	CHABRA TPS	RAJ	RRVUNL	S	2X250	500	500	2009-10	2.5	500						

27	KOTA U7	RAJ	RRVUNL	S	1x195	195	195	2009-10	0.975	195						
28	PARICHA EXT	UP	UPRVUNL	S	2x250	500	500	2009-11	2.5	500						
29	HARDUAGANJ EXT	UP	UPRVUNL	S	2x250	500	500	2009-11	2.5	500						
30	KORBA WEST EXT (SECL)	CHG	CSEB	S	2x300	600	600	2009-10	3	600						
31	IGTPP BHAIYATHAN	CHG	CSEB	S	2x660	1320	1320	2011-12	6.6			1320				
32	IFFCO SARGUJA	CHG	CSEB JV	S	2x500	1000	1000	2010-12	5			1000				
33	SIKKA EXT	GUJ	GSECL	S	2x250	500	500	2009-10	1.5							500
34	AMARKANTAK	MP	MPGENCO	S	1X210	210	210	2007-08	0.63	210						
35	MALWA	MP	MPGENCO	S	2x500	1000	1000	2011-12	5	1000						
36	KHAPER KHEDA EX	MAH	MAHA GEN	S	1x500	500	500	2009-10	2.5	500						
37	PARLI EXT U-2	MAH	MAHA GEN	S	1x250	250	250	2009-10	1.25	250						
38	PARAS EXT U-2	MAH	MAHA GEN	S	1x250	250	250	2009-10	1.25	250						
39	CHANDRAPUR	MAH	MAHA GEN	S	1x500	500	500	2010-11	2.5				500			
40	KORADI	MAH	MAHA GEN	S	3x500	1500	1500	2010-12	7.5				1500			
41	BHUSAWAL	MAH	MAHA GEN	S	2X500	1000	1000	2010-11	5	1000						
42	BHOPALAPALLY (SCCL)	AP	APGENCO	S	1x500	500	500	2008-09	2.5	500						
43	VIJAYWADA TPP (MCL)	AP	APGENCO	S	1x500	500	500	2008-09	2.5	500						
44	KOTHAGUDEM ST-V	AP	APGENCO	S	1x500	500	500	2010-11	2.5	500						
45	KRISHNAPATNAM	AP	APGENCO	S	2x800	1600	800	2011-12	4		800					
46	RAICHUR U 8	KAR	KPCL	S	1x210	210	210	2008-09	1.05	210						
47	BELLARY EXT	KAR	KPCL	S	1x500	500	500	2009-10	2.5				500			
48	METTUR EXP	TN	TNEB	S	1X500	500	500	2011-12	2.5		500					
49	NORTH CHENNAI EXT	TN	TNEB	S	1X500	500	500	2011-12	2.5		500					
50	IB VALLEY	ORS	OPGCL	S	2x250	500	500	2010-11	2.5					500		
51	BAKRESHWAR U-5 (ECL)	WB	WBPDC	S	1x210	210	210	2007-08	1.05	210						
52	BAKRESHWAR EXT	WB	WBPDC	S	1x500	500	500	2011-12	2.5				500			
53	SANTHALDIH EXT	WB	WBPDC	S	1x250	250	250	2010-11	1.25		250					
54	SAGARDIGHI EXT	WB	WBPDC	S	2x500	1000	500	2010-11	2.5				500			
55	DPL TPS	WB	WBPDC	S	1x300	300	300	2009-10	1.5					300		
56	DPL TPS	WB	WBPDC	S	1x500	500	500	2011-12	2.5					500		
	SUB-TOTAL					21245	19945		98	8275	3050	2320	3500	2300	0	500
PRIVATE SECTOR																
57	GOINDWAL SAHIB	PUN	IPP	P	2x300	600	600	2010-11	3			600				
58	ANPARA-C (NCL)	UP	IPP	P	2x500	1000	1000	2010-12	5	1000						
59	ROSA (CCL)	UP	ROSA P.C.	P	2x300	600	600	2008-09	3	600						
60	BULANDSHAHR	UP	TATAPOWE R	P	2X500	1000	1000	2010-12	5	1000						
61	PATHDI (LANCO) U1	CHG	LANCO-IPP	P	1x300	300	300	2008-09	1.5	300						
62	PATHDI (LANCO) PHASE II	CHG	LANCO-IPP	P	2x300	600	600	2010-11	3	600						
63	RAIGARH PH II	CHG	JIN. POWER	P	3x250	750	750	2007-09	3.75			750				

64	TROMBAY TPS	MAH	TATAPOWER	P	1x250	250	250	2009-10	0.75							250
65	NAGARJUNA TPP	KAR	NPCL-IPP	P	2x507.5	1015	1015	2009-10	3.045							1015
66	BUDGE-BUDGE EXT	WB	CESC	P	1x250	250	250	2009-10	1.25	250						
67	HALDIA	WB	CESC	P	2X300	600	600	2011-12	3		600					
	SUB-TOTAL					6965	6965		32	3750	600	1350	0	0	0	1265
	TOTAL						46840		230	21465	9880	6430	3500	3800	0	1765
	Additional Coal Requirement (calculated) during 11th PLAN						230.67			107.325	49.4	32.15	17.5	19	0	5.30
	SUMMARY															
					MW		QUANTITY				13680					
	Linkage Available				21465		107.33									
	Block Allocated				6430		32.15									
	Block agreed				3500		17.50									
	Imported Coal tied up				0		0.00									
	TOTAL AVAILABLE				31395		156.98									
	Linkage to be accorded				9880		49.40									
	Block to be Allocated				3800		19.00									
	Imported Coal to be tied up				1765		5.30									
	TOTAL TO BE TIED UP				15445		73.70									
	TOTAL COAL BASED				46840		230.67									

List of 11th Plan Project (Provisional)

Sl. No.	Name of TPS source-wise	State	Capacity (MW)	Coal Req. Million Tonnes during 2011-12	Year of Commissioning	Remarks
CCL						
1	Badarpur	Delhi	2x490= 980	5.0	2009-11	
2	Chotu Ram (Y-nagar)	Haryana	2x300= 600	3.0	2007-08	
3	Hissar*	Haryana	2x250 +1x500=1000	5.0	2009-12	
4	Jhajjar TPS	Haryana	3x500=1500	7.5	2009-11	
5	Parichha Ext.	U.P.	2x250= 500	2.5	2009-10	
6	Harduaganj Ext.	U.P.	2x250= 500	2.5	2009-10	
7	Dadri Ext.*	U.P.	2x490= 980	4.9	2009-10	
8	Chola, Bulandshar	U.P.	1x500=500	2.5	2010-11	
Total				32.9		
CCL Area (Pit-head)						
9	Barh	Bihar	3x660=1980	9.9	2008-11	
10	Barh Ext.	Bihar	2x660=1320	3.2	2011-12	
11	Nabinagar	Bihar	4x250=1000	5.0	2010-12	
12	North Karanpura	Jharkhand	2x660=1320	3.2	2011-12	
Total				21.3		
BCCL						
13	Bokaro Repl.	Jharkhand	2x250=500	2.5	2009-11	
14	Chandrapur (DVC)	Jharkhand	2x250=500	2.5	2007-08	
15	Durgapur Steel	Jharkhand	2x500=1000	5.0	2010-12	
16	Raghunathpur	Jharkhand	2x500=1000	2.4	2011-12	
Total				12.4		
BCCL Area (Pit-head)						
17	Maithon RB	Jharkhand	2x500=1000	5.0	2009-11	
18	Kodarma	Jharkhand	2x500=1000	5.0	2010-11	
19	Mejia Ext.*	Jharkhand	2x500=1000	5.0	2009-11	
Total				15.0		
ECL						
20	Bakreshwar U -5	W. Bengal	1x210=210	1.1	2007-08	
21	Bakreshwar Ext*.	W. Bengal	1x500=500	1.2	2011-12	
22	Sagardighi Ext.*	W. Bengal	2x500=1000	3.7	2010-12	
23	Santaldih Ext.	W. Bengal	1x250=250	1.2	2009-10	
24	Budge Budge Ext.	W. Bengal	1x250=250	1.2	2009-10	Block to be allocated
Total				8.4		
ECL Area (Pit-head)						

25	Farakka Stage III	West Bengal	1x500=500	2.5	2009-10	
	SECL					
26	Suratgarh Ext.	Rajasthan	1x250= 250	1.3	2019-10	
27	Chabra	Rajasthan	2x250= 500	2.5	2009-10	
28	Kota U-7	Rajasthan	1x195= 195	1.0	2009-10	
29	Amarkantak	MP	1x210=210	1.1	2007-08	
	Total			5.9		
	SECL (Pith –head)					
30	Sipat – I	Chattisgarh	3x660=1980	9.9	2007-09	
31	Bhilai JV	Chattisgarh	2x250=500	2.5	2007-08	
32	Korba West Ext.	Chattisgarh	2x300=600	3.0	2009-10	
33	Korba -III	Chattisgarh	1x500=500	2.5	2009-10	
34	Malwa	M.P.	2x500=1000	5.0	2011-12	
35	Raigarh Phase II	Chattisgarh	3x250=750	3.8	2007-08	Coal Block
36	Pathadi (Lanco) U-1	Chattisgarh	1x300=300	1.5	2008-09	
37	Pathadi (Lanco) Ph. II	Chattisgarh	2x300=600	3.0	2010-11	Coal Block
	Total			31.2		
	MCL					
38	Vijayawada Ext.	A.P.	1x500=500	2.5	2008-09	
39	Krishnapatnam*	A.P.	1x800=800	4.0	2011-12	
41	Raichur U – 8	Karnataka	1x250=250	1.3	2008-09	
42	Bellary Ext.	Karnataka	1x500=500	2.5	2009-10	Coal Block
43	Khaperkheda Ext.	Maharashtra	1x500=500	2.5	2009-10	
44	Parli Ext. U- 2	Maharashtra	1x250=250	1.3	2009-10	
45	Paras Ext. U- 2	Maharashtra	1x250=250	1.3	2009-10	
46	Koradi Repl.	Maharashtra	1x500=500	2.5	2010-11	
47	Bhusawal Ext.*	Maharashtra	2x500=1000	5.0	2010-11	
48	Simadhri Ext.*	A.P.	2x500=1000	5.0	2010-12	
49	Ennore JV*	Tamil Nadu	2x500=1000	3.7	2010-12	
50	Tuticorin JV*	Tamil Nadu	2x500=1000	3.7	2010-12	
51	Metture Ext.*	Tamil Nadu	2x250=500	2.5	2010-11	
52	North Chennai Ext.*	Tamil Nadu	2x250=500	1.2	2011-12	
53	DPL Ext.	West Bengal	1x300=300	3.3	2009-10	Block to be allocated
54	DPL Ext. Ph.II	West Bengal	1x500=500	2.5	2010-11	Block to be allocated
55	Integrated Project Daripali	Orissa	1x800=800	4.0	2011-12	Coal Block
	Total			30.9		
	MCL (Pith –head)					
56	Kothagudem Stage V	A.P.	1x500=500	2.5	2009-10	
	SCCL					
57	Bhopalapalli	A.P.	1x500=500	2.5	2008-09	

	NCL (Pit-head)					
58	Anpara C	U.P.	2x500=1000	5.0	2010-12	
	NEC					
59	Bongaigaon	Assam	3x250=750	3.8	2010-12	
	Total			3.8		

* Linkage to be accorded

ANNEXURE- 1.12

DETAILS OF COAL REQUIREMENT FOR STEEL SECTORS

(in Million Tonnes)

(As compiled from Ministry of Steel)

Sl No.	Items		XIth Plan				
			2007-08	2008-09	2009-10	2010-11	2011-12
			Proj	Proj	Proj	Proj	Proj
A	SAIL Plants (Bhilai, Durgapur, Rourkela, Bokaro & Bumpur)	Capacity	13.60	13.60	13.60	13.60	22.55
		Hot Metal Production	16.47	17.21	17.37	20.96	22.55
		Washed Coking Coal					
		PCC	2.00	2.00	2.50	2.50	2.50
		MCC	2.00	2.00	2.50	2.50	2.50
		Total Indigenous	4.00	4.00	5.00	5.00	5.00
		Imported	10.80	11.50	10.60	13.90	15.30
		Total Coking Coal	14.80	15.50	15.60	18.90	20.30
B	TATA STEEL LIMITED(TSL)	Capacity	6.80	6.80	6.80	8.00	10.00
		Hot Metal Production	5.56	7.20	7.20	8.00	10.00
		Indigenous Coking coal requirement	2.30	3.02	3.02	3.02	3.02
		Imported Coking coal requirement	1.73	2.27	2.27	3.00	4.20
		Total Coal Requirement	4.03	5.29	5.29	6.02	7.22
C	RINL, Visakhapatnam Steel Plant	Capacity					
		Hot Metal Production	4.30	4.63	6.15	7.35	8.00
		Indigenous Coking coal requirement	0.58	0.58	0.70	0.88	0.88
		Imported Coking coal requirement	3.31	3.30	3.98	5.00	5.02
		Total Coal Requirement	3.89	3.88	4.68	5.89	5.90
	Integrated Steel	Capacity	20.40	20.40	20.40	20.40	29.35
	Total	Hot Metal Production	26.33	29.04	30.72	35.51	37.75
		Indigenous Coking coal requirement	6.88	7.60	8.72	8.90	8.90
		Imported Coking coal requirement	15.84	17.07	16.85	21.18	22.59
		Total Coal Requirement	22.72	24.67	25.57	30.08	31.49
D	Others						
1	Ispat Industries Ltd., Dolvi, Maharashtra	Capacity					
		Hot Metal Production	2.00	2.00	4.00	4.40	4.40
		Indigenous Coking coal requirement	1.00	1.00	2.00	2.00	2.00
2	Jindal Steel & Power Ltd.	Capacity	2.40	2.40	2.40	2.40	2.40
		Hot Metal Production	1.25	1.25	1.25	1.25	1.25
		Indigenous Coking coal requirement					
		Imported Coking coal requirement	1.15	1.15	1.15	1.15	1.15

		Total Coking Coal Requirement	1.15	1.15	1.15	1.15	1.15
3	JSW Steel Ltd.	Capacity	4.00	7.00	7.00	7.00	7.00
		Hot Metal Production	4.00	7.00	7.00	7.00	7.00
		Imported Coking coal requirement	3.74	5.20	5.20	5.20	5.20
4	Essar Steel Ltd., Hazira	Capacity		3.30	3.30	3.30	3.30
		Hot Metal Production		2.30	2.80	3.30	3.30
		Imported Non-Coking coal requirement		2.60	3.50	3.80	3.80
		Imported Coking coal requirement					
5	Essar Steel Jharkhand Ltd., Chaibasa	Capacity			3.00	6.00	6.00
		Hot Metal Production			3.15	6.30	6.30
		Imported Coking coal requirement			3.10	6.30	6.30
6	Essar Steel Orissa Ltd., Paradeep	Capacity			2.00	4.00	4.00
		Hot Metal Production			2.10	4.20	4.20
		Imported Coking coal requirement			2.15	4.30	4.30
7	Essar Steel Chattisgarh Ltd., Dantewada	Capacity			3.20	3.20	3.20
		Hot Metal Production			3.50	3.50	3.50
		Imported Coking coal requirement			3.50	3.50	3.50
	Others	Capacity	6.40	12.70	20.90	25.90	25.80
		Hot Metal Production	7.25	12.55	23.80	29.75	29.75
		Indigenous Coking coal requirement	1.00	1.00	2.00	2.00	2.00
		Imported Coking coal requirement	4.89	6.35	15.10	20.20	20.20
		Total Coking Coal Requirement	5.89	7.35	17.10	22.20	22.20
	Total Coking Coal Requirement of Steel Plants	Capacity	26.80	33.10	41.30	46.30	58.45
		Hot Metal Production	33.58	41.59	54.52	65.26	70.30
		Indigenous Coking coal requirement	7.88	8.60	10.72	10.90	10.90
		Imported Coking coal requirement	20.73	23.42	31.95	41.38	44.72
		Total Coking Coal Requirement	28.61	32.02	42.67	52.28	55.62
		Imported Non-Coking coal requirement	0.00	2.60	3.50	3.80	3.80
F	Coal Requirement for Captive Power Plants of Steel Units	SAIL	6.90	8.50	11.50	12.00	12.00
		Ispat Industries Ltd., Dolvi, Maharashtra	0.28	0.28	0.56	0.56	0.56
		RINL, Vizag	1.63	1.75	2.33	2.78	3.03
		Jindal Steel & Power Ltd	2.40	2.40	5.18	5.18	5.18
		Essar Steel Ltd., Hazira	0.15	1.05	1.05	1.05	1.05
		Essar Steel Jharkhand Ltd., Chaibasa			3.00	3.00	6.00

	Essar Steel Chattisgarh Ltd., Dantewada			1.90	1.90	1.90
	Total Steel CPPs	11.36	13.98	25.52	26.47	29.72

Note: In addition to MTPA capacity from Jamshedpur Plant, TSL has also indicated capacity of 6MTPA from Kalinganagar Plant with a coal requirement of 10.63 Mt in 2011-12. However, MOS is of the opinion that the Plant is not likely to come up in next five-year period. Hence, demand has not been considered while projecting total coal demand of steel sector.

Annexure – 2.1

COMPANY-WISE COAL PRODUCTION PERFORMANCE - X PLAN PERIOD

Million Tonnes

Company	2002 - 2003		2003 - 2004			2004 - 2005			2005 - 2006			2006-2007		
	Target as per Plan doc. & AP	Actual	Target as per Plan document	Target as per AP	Actual	Target as per Plan document	Target as per AP 04-05	Actual	Target as per Plan document	Target as per AP 05-06	Actual	Tar. as per plan document	Target as per AP : 06-07	Anticipated
ECL	29.00	27.18	30.00	29.00	28.00	30.20	29.00	27.25	30.30	29.83	31.11	31.00	33.00	33.00
BCCL	28.00	24.15	29.00	27.50	22.68	30.00	25.20	22.32	31.50	24.22	23.31	33.00	25.20	24.20
CCL	34.25	36.98	35.00	35.50	37.34	37.00	40.00	37.39	38.00	40.40	40.51	38.50	42.00	42.00
Joint Venture									2.00			4.80		
NCL	44.00	45.10	46.00	46.50	47.03	47.00	47.50	49.95	49.00	50.80	51.52	52.00	52.00	52.00
WCL	37.00	37.82	37.00	37.25	39.53	37.20	38.00	41.41	37.30	41.90	43.20	37.50	42.00	42.00
SECL	65.25	66.60	70.00	69.00	71.01	74.00	74.50	78.55	78.30	83.00	83.02	84.55	88.50	88.50
MCL	48.00	52.23	51.00	53.10	60.05	57.00	59.00	66.08	62.50	72.00	69.60	68.00	80.00	80.50
NEC	0.50	0.63	0.50	0.65	0.73	0.60	0.80	0.63	0.60	0.85	1.10	0.65	1.10	1.60
CIL	286.00	290.69	298.50	298.50	306.37	313.00	314.00	323.58	331.50	343.00	343.39	350.00	363.80	363.80
SCCL	32.50	33.24	34.23	33.50	33.85	35.78	35.00	35.30	36.04	36.00	36.138	36.13	37.50	37.50
Other Public Sector *	2.13	1.51	2.20	2.15	1.61	2.30	1.54	1.90	2.40	2.02	1.81	2.40	1.90	1.91
Pvt Sector (TISCO)	5.47	5.92	4.97	5.70	6.15	4.76	5.91	6.37	5.51	6.36	6.52	5.24	6.88	6.24
Captive Mining #	5.50	5.52	5.90	5.20	7.83	5.96	8.20	10.11	6.21	12.50	13.59	6.73	15.02	17.55
Meghalaya	4.10	4.41	4.20	5.00	5.44	4.20	4.50	5.35	4.34	5.50	5.57	4.50	5.00	5.50
All India	335.70	341.27	350.00	350.05	361.25	366.00	369.15	382.61	386.00	405.38	407.01	405.00	430.10	432.50
Abs Growth		13.49			19.98			21.36			24.40		23.09	
Growth %		4.02%			5.85%			5.91%			6.38%		5.67%	
Expected Growth in X plan - Abs														104.71
ACGR													%	5.7

BECML (Bengal Emta)/JSPL/ICML/HIL/MIL/BLC/CML

* DVC/IISCO/JKML/JSMDCL

Annexure – 2.2

COMPANY WISE FIELDWISE COAL PRODUCTION PROGRAMME

Million Tonnes

in million tonnes									
Company	Coalfield	IX PLAN	X PLAN		Growth	XI PLAN - Projection			XII PLAN
		01-02	06-07			2011-12	Growth		2016-17
		Actual	Target	Antic		%	ABS	%	
ECL	Raniganj	16.17	16.42	16.41	0.30	21.70	5.29	5.75	21.32
	Mugma-Salanpur	3.08	4.08	4.09	5.84	3.30	-0.79	-4.20	3.18
	Rajmahal	9.30	12.50	12.50	6.09	21.00	8.50	10.93	23.50
	Sub Total	28.55	33.00	33.00	2.94	46.00	13.00	6.87	48.00
BCCL	Jharia	23.70	23.76	22.91	-0.68	27.34	4.43	3.60	29.58
	Ranigunj	1.55	1.44	1.29	-3.61	2.66	1.37	15.57	5.42
	Sub Total	25.25	25.20	24.20	-0.85	30.00	5.80	4.39	35.00
CCL	Giridih	0.21	0.25	0.30	7.39	0.30	0.00	0.00	0.10
	East Bokaro	7.21	8.10	8.87	4.23	13.58	4.71	8.89	18.83
	West Bokaro	4.21	6.19	5.92	7.06	8.49	2.57	7.48	14.79
	Ramgarh	1.48	1.45	1.20	-4.11	2.75	1.55	18.04	3.50
	South Karanpura	3.69	5.34	4.48	3.96	7.85	3.37	11.87	10.25
	North Karanpura	17.01	20.67	21.23	4.53	45.03	23.80	16.23	67.03
	Sub Total	33.81	42.00	42.00	4.43	78.00	36.00	13.18	115.00
NCL	Singrauli	42.46	52.00	52.00	4.14	70.00	18.00	6.13	80.50
WCL	Wardha Valley	23.19	27.09	26.68	2.84	27.67	0.99	0.73	28.26
	Umrer	3.53	3.66	3.64	0.62	3.94	0.30	1.60	4.29
	Patharkhera	2.90	2.94	3.04	0.95	2.34	-0.70	-5.10	1.70
	Pench-Kanhan	3.28	3.73	3.93	3.68	4.17	0.24	1.19	4.04
	Kamptee	4.11	4.59	4.72	2.81	6.88	2.16	7.83	6.71
	Sub Total	37.01	42.00	42.00	2.56	45.00	3.00	1.39	45.00
SECL	Central India (CIC)	21.10	25.46	25.46	3.83	26.32	0.86	0.67	33.73
	Korba &	43.02	60.07	60.07	7.94	80.06	19.99	5.91	81.12
	Raigarh		2.97	2.97		4.62	1.65	9.24	25.15
	Sub Total	64.12	88.50	88.50	6.66	111.00	22.50	4.63	140.00
MCL	IB Valley	14.70	25.87	25.87	11.97	45.66	19.79	12.03	72.00
	Talcher	33.11	54.13	54.63	10.53	91.34	36.71	10.83	125.00
	Sub Total	47.81	80.00	80.50	10.98	137.00	56.50	11.22	197.00
NEC	North Eastern CF	0.64	1.10	1.60	20.11	3.50	1.90	16.95	3.50
CIL Total		279.65	363.80	363.80	5.40	520.50	156.70	7.43	664.00
SCCL	Godavari	30.81	37.50	37.50	4.01	40.80	3.30	1.70	45.00
Other Public Sectors		2.06	1.90	1.91	-1.60	2.52	0.62	5.76	2.52
Pvt Sector (Tata Steel)		5.65	6.88	6.24	2.00	6.50	0.26	0.82	6.50
Captive Mining		4.46	15.02	17.55	31.52	104.08	86.53	42.76	331.38
Meghalaya		5.15	5.00	5.50	1.33	5.60	0.10	0.36	5.60
All India		327.79	430.10	432.50	5.70	680.00	247.51	9.47	1055.00
Absolute Growth				104.71		247.51			375.00

GROUP WISE COAL PRODUCTION PROGRAMME OF CIL AND SCCL

Fig in Mt.

Company	Group	X Plan 2006-07	XI Plan 2011-12	XII Plan 2016-17
		Target/Antic	Projection	Projection
ECL	Existing Mines & Completed Projects	32.42	25.49	23.98
	Ongoing Projects	0.34	0.44	0.34
	New Projects	0.24	20.07	23.68
	Total	33.00	46.00	48.00
BCCL	Existing Mines & Completed Projects	22.90	21.49	17.34
	Ongoing Projects	1.30	3.68	4.99
	New Projects		4.83	12.67
	Total	24.20	30.00	35.00
CCL	Existing Mines & Completed Projects	22.55	20.22	18.00
	Ongoing Projects	3.85	10.93	10.50
	New Projects	15.60	46.85	86.50
	Total	42.00	78.00	115.00
NCL	Existing Mines & Completed Projects	52.00	41.00	38.00
	Ongoing Projects		12.00	13.50
	New Projects		17.00	29.00
	Total	52.00	70.00	80.50
WCL	Existing Mines & Completed Projects	40.31	22.85	10.69
	Ongoing Projects	1.69	11.20	12.58
	New Projects		10.95	21.73
	Total	42.00	45.00	45.00
SECL	Existing Mines & Completed Projects	28.28	19.01	16.21
	Ongoing Projects	56.49	69.32	90.95
	New Projects	3.73	22.67	32.84
	Total	88.50	111.00	140.00
MCL	Existing Mines & Completed Projects	41.76	35.11	26.77
	Ongoing Projects	38.74	57.74	48.73
	New Projects	0.00	44.15	121.50
	Total	80.50	137.00	197.00
NEC	Existing Mines & Completed Projects	1.60	0.80	0.50
	Ongoing Projects			
	New Projects		2.70	3.00
	Total	1.60	3.50	3.50
CIL	Existing Mines & Completed Projects	241.82	185.97	151.49
	Ongoing Projects	102.41	165.31	181.59
	New Projects	19.57	169.22	330.92
	TOTAL	363.80	520.50	664.00
SCCL	Existing Mines & Completed Projects	29.641	18.855	6.98
	Ongoing Projects	7.859	13.615	6.34
	New Projects		8.33	31.68
	Total	37.50	40.80	45.00

TENTATIVE LIST OF XI PLAN PROJECTS OF CIL

Sl.		Type of		Projection
No	Name of the Company /Project	Mine	Capacity	XI Plan 11-12
		UG/ OC	(Mty)	(Mty)
	ECL			
1	BELBAID(DHASAL)	UG	0.20	0.20
2	CHITRA EXPANSION	OC	0.50	0.50
3	KHOTTADIH AUG.	OC	1.00	0.48
4	KUNUSTORIA (DOBRANA)	UG	0.30	0.18
5	RANGAMATI B	UG	0.60	
6	RANGAMATI A	UG	0.30	
7	SONEPUR BAZARI (Combined)	OC	5.50(INCR.)	3.70
8	TILABONI	UG	0.60	0.30
		Total(ECL)	9.00	5.36
	BCCL			
9	Block-IV	OC	2.00	0.69
10	Amalgamated Kharkharee Dharmaband Exten. Block	UG	0.84	
11	Moonidih XV Seam	UG	0.45	0.30
12	Kapuria	UG	2.00	0.05
13	Block-II OCP including SOCP & MOCP	OC	1.00	0.50
14	Reorganisation of Madhuband & Phularitand	UG	0.25	0.10
15	South Tisra/North Tisra Aug.- NC	OC	2.00	1.00
16	Kalyaneshwari	OC	4.00	0.80
17	Block II Aug.	OC	0.85	0.44
		Total(BCCL)	13.39	3.88
	CCL			
18	Aswa N-S	OC	2.00	
19	Chano-Rikba	OC	2.00	
20	DRD	OC	2.00	0.50
21	Godo	OC	1.00	
22	Gose-Parsabera Integrated	OC	2.00	
23	Kasiadih	OC	1.00	
24	Kedla EPR	OC	2.00	
25	Koed / Manatu	OC	3.00	
26	Pachra Integrated	OC	3.00	
27	Parej West	OC	1.00	0.50
28	Pichri / Pichri Extn	OC	1.00	
29	Purnadih East	OC	2.00	0.50
30	Ramgarh - II West	OC	1.00	
		Total(CCL)	23.00	1.50
	NCL			
31	Nigahi Expn .(Total 15.0 Mt)	OC	5.00(INCR)	5.00
32	Jayant Expn.(Total 15.0 Mt.)	OC	5.00(INCR)	1.00

33	Dudhichua Expn.(Total 15.0 Mt.)	OC	5.00(INCR)	1.00
		Total(NCL)	15.00	7.00
	WCL			
34	Antargaon	UG	0.50	
35	Antargaon	OC	1.60	
36	Bellora / Naigaon Deep	OC	0.75	0.60
37	Bhatadi - North - West	OC	0.65	0.05
38	Borda (N.of Ghonsa)	UG	0.54	0.54
39	Chikalgaon	OC	0.60	0.25
40	Chinchala	OC	1.00	0.25
41	Chincholi	OC	0.40	0.05
42	Dhankasa	UG	0.54	0.20
43	Dhanwa	UG	0.50	
44	Dhuptala	OC	0.60	0.25
45	Gandhigram	UG	0.50	
46	Gauri I & II Expn.	OC	1.80	1.20
47	Ghonsa Extn. (Including Parsoda UG)	OC	0.60	
48	Ghugus Deep	OC	1.50	1.49
49	Jamuniya	UG	0.50	0.02
50	Junakunada Deep	OC	0.60	
51	Kamptee Deep	OC	0.80	
52	Kolgaon Deep	OC	0.40	
53	Makardhokra III	OC	1.00	0.10
54	Maori Block with C.M. Package	UG	0.36	0.23
55	Mathra Incl. Extn.	UG	0.40	
56	Motaghat	OC	1.00	0.10
57	Mugoli Extension	OC	1.00	0.10
58	Mugoli/ Nigugda Deep	OC	1.50	
59	Murpar Expn.(Incl.Bhansuli & Surmanjari)	UG	1.50	
60	Nand - I	UG	0.40	0.05
61	New Majri Sector A Extn.	OC	1.50	
62	New Majri UG to OC	OC	0.60	0.05
63	Niljai Deep	OC	1.50	0.52
64	Padmapur Deep	OC	1.00	
65	Pauni Deep	OC	0.60	
66	Pauni Deep Expn.	UG	0.50	
67	Pauni-III	OC	1.00	0.10
68	Pisagaon	UG	0.24	
69	Saoner IV/Saoner Mine-I Expn.	UG	0.36	0.28
70	Sharda	UG	0.50	0.07
71	Thesgora - C	UG	0.30	
72	Ukni Deep	OC	1.50	1.10
73	Yekona - I Extn.	OC	0.60	0.05
74	Yekona - II Extn.	OC	0.60	0.05
		TOTAL(WCL)	32.34	7.70
	SECL			
75	AMBA	UG	0.18	0.10

76	AMBICA	OC	0.50	0.30
77	AMRITDHARA	UG	0.48	
78	BAKULMUNI	UG	0.36	0.20
79	BATURA	OC	1.50	
80	BIJARI	OC	2.00	
81	CHANGERA	OC	0.50	
82	CHIMTAPANI	OC	5.00	
83	DIPKA EXPN (25 MTY)	OC	5.00(INCR)	5.00
84	GEVRA EXPN (35 MTY)	OC	10.00(INCR)	10.00
85	GUMGARA	UG	0.36	
86	JAMDAI	UG	0.36	
87	JAMPALI OC	OC		0.70
88	JARWAHI	OC	0.50	
89	KARTALI EAST	UG	0.36	
90	KUSMUNDA EXPN (15 MTY)	OC	5.00(INCR)	5.00
91	KUSUMGHAT	OC	2.00	1.00
92	MAHAN III & IV	OC	3.00	
93	NAWAPARA EAST	UG	0.36	
94	PATHAKPUR	UG	0.36	
95	PELMA	OC	10.00	
96	RAI WEST	OC	1.00	0.27
97	VIJAY EAST	UG	0.40	
		TOTAL(SECL)	49.22	22.57
	MCL			
98	Ananta Extn.	OC	12.00	10.50
99	Balabhadra	OC	6.00	
100	Chhendipada Expn./Baitarani(E)	OC	5.00	
101	Gopalprasad + Utkal-A	OC	10.00	1.00
102	Hingula Extn.	OC	4.00	3.50
103	Kalinga (West)	OC	4.00	
104	Kalinga Extn. (Konark)	OC	2.00	
105	Kaniha-II	OC	10.00	1.00
106	Madhupur	OC	2.00	0.50
107	Siarmal	OC	8.00	2.00
108	Siarmal (West) Extn.	OC	6.00	1.00
109	Talabira-II & III	OC	15.00	1.00
		TOTAL(MCL)	84.00	20.50
	NEC			
110	Ledo Mech.	OC	0.30	0.25
111	Lekhapani	OC	0.30	0.20
112	PQ Block	OC	0.30	0.15
113	Tikak East Extn.	OC	1.50	1.00
114	Tipong	OC	1.00	0.50
		TOTAL(NEC)	3.40	2.10
	CIL (TOTAL)		229.35	70.61

Details of New Projects during XI Plan period of SCCL -

(Rs.Crores)

Sl. No.	Name of the Project/Mine	Type of mine UG/OC	PR/ RPR (MTY)	Sanc. Proj.cost	XI Plan period				
					2007-08	2008-09	2009-10	2010-11	2011-12
	New Projects								
1	5B Extn.	UG	0.150	37.50	0.00	0.00	0.00	0.00	1.00
2	Rampur	UG	1.500	270.00	0.00	0.00	0.00	25.00	25.00
3	JVR.OCP - I Extn.	OC	0.900	90.00	25.00	5.00	0.00	0.00	0.00
4	JVR.OCP - II	OC	4.000	472.14	0.00	0.00	30.00	88.00	70.00
5	JK 5 OC	OC	2.000	84.68	0.00	0.00	0.00	10.00	5.00
6	Koyagudem OC-II	OC	2.000	91.63	5.00	18.00	16.00	10.00	11.00
7	Kunavaram OCP	OC	0.650	7.51	2.70	2.80	1.00	1.00	0.00
8	OCP-II, MNG Extn.	OC	3.000	585.00	0.00	0.00	45.00	50.00	55.00
9	Continuous Miner at GDK 11A	UG	0.400	70.80	55.00	8.00	0.00	0.00	0.00
10	Peddampeta	UG	1.500	298.58	0.00	0.00	0.00	15.00	35.00
11	VKP-Block-A 2 Seam **	UG			0.00	50.00	100.00	0.00	0.00
12	Jallaram UG / VKP	UG	2.285	455.56	0.00	0.00	15.00	40.00	95.00
13	Adriyala	UG	1.820	302.62	40.00	180.00	80.00	0.00	0.00
14	RG. OC-III Dip side Extn. **	OC	4.300		0.00	0.00	20.00	40.00	40.00
15	RG.OC-II Extn. **	OC	3.500		0.00	0.00	20.00	20.00	60.00
16	KTK 8 LW	UG	2.100	525.00	0.00	0.00	0.00	52.50	105.00
17	KTK 9 LW	UG	2.100	525.00	0.00	0.00	0.00	0.00	5.00
18	KTK 5 LW	UG	2.100	525.00	0.00	0.00	0.00	0.00	10.00
19	Chandrupalli_Mahadevpur OC	OC	1.000	150.00	0.00	0.00	0.00	0.00	5.00
20	Manjur Nagar OC	OC	1.500	82.50	0.00	0.00	5.00	15.00	15.00
21	Peddapur Thick seam OC **	OC	1.500		0.00	0.00	0.00	0.00	10.00
22	Dorli OC-II	OC	0.700	47.67	6.18	16.43	13.27	3.19	0.00
23	BPA Town OC	OC	1.000	85.00	0.00	0.00	0.00	0.00	5.00
24	Mahaveer OC (MVK Group) **	OC	1.000		0.00	0.00	0.00	0.00	5.00
25	Sravanapalli OC	OC	2.000	94.00	0.00	0.00	15.00	35.00	40.00
26	RKP Shaft Block	UG	2.100	525.00	0.00	0.00	0.00	0.00	5.00
27	RKP OC I **	OC			0.00	0.00	0.00	0.00	10.00
28	RKP OC II **	OC			0.00	0.00	0.00	0.00	10.00
29	SRP OCP - I	OC	0.600	44.54	8.66	12.17	6.26	10.13	5.00
30	SRP OCP - II	OC	2.500	88.47	42.89	22.83	18.97	2.69	0.00
31	IK 1& 1A OC **	OC	1.200		0.00	0.00	15.00	25.00	30.00

32	CHNR OC **	OC	1.500		0.00	0.00	0.00	0.00	5.00
33	GDK 10A 2 Seam **	UG			20.00	80.00	0.00	0.00	0.00
34	Sivalingapuram OC	OC	3.000	540.00	0.00	0.00	0.00	10.00	10.00
35	Andrews OC	OC	0.500	60.00	0.00	0.00	0.00	0.00	3.00
36	Koyagudem UG-I	UG	0.500	90.00	0.00	0.00	0.00	0.00	10.00
37	Koyagudem UG-II	UG	0.500	90.00	0.00	0.00	0.00	0.00	5.00
38	Somagudem OC **	OC						15.00	35.00
	Total				205.43	395.23	400.50	467.51	725.00

** Not yet conceptualised

COAL MOVEMENT MATRIX FOR 2011-12												
Company	Coalfield	Raw Coal								Coal Products	R/C+PDTS	
		Rail	Coastal Ship	Total Rail	Road	MGR	Belt/ Rope	Colly. Cons.	Total Offtake	Rail	Desp by Rail	Wagon Loading
ECL	RNG	13.22	4.00	17.22	4.03	0.00	0.000	0.453	21.70		17.22	1845
	MG/SL	2.10	0.00	2.10	1.16	0.00	0.000	0.042	3.30		2.10	225
	RJM	1.93	0.00	1.93	0.25	18.82	0.000	0.005	21.00		1.93	206
ECL Total		17.24	4.00	21.24	5.44	18.82	0.000	0.500	46.00	0.000	21.24	2276
BCCL Total		22.00	0.00	22.00	7.70	0.00	0.000	0.300	30.00	5.800	27.80	2979
CCL	EB	4.48	0.00	4.48	9.05	0.00	0.000	0.050	13.58	2.620	7.10	761
	WB	2.77	0.00	2.77	5.71	0.00	0.000	0.010	8.49	0.950	3.72	399
	RAM	0.00	0.00	0.00	2.75	0.00	0.000	0.000	2.75	1.930	1.93	207
	GIR	0.19	0.00	0.19	0.11	0.00	0.000	0.000	0.30	0.000	0.19	20
	SK	4.80	0.00	4.80	3.01	0.00	0.000	0.040	7.85	0.750	5.55	595
	NK	29.07	0.00	29.07	15.96	0.00	0.000	0.000	45.03	5.050	34.12	3655
CCL Total		41.31	0.00	41.31	36.59	0.00	0.000	0.100	78.00	11.300	52.61	5637
NCL Total		14.45		14.45	2.24	49.56	3.751	0.000	70.00	2.918	17.37	1861
WCL	WAR	12.47		12.47	12.30	1.00	1.900	0.005	27.67		12.47	1336
	Km/Sy	4.68		4.68	0.90		1.300	0.005	6.88		4.68	501
	UMR	3.20		3.20	0.74			0.001	3.94		3.20	343
	Pe/Kn	2.74		2.74	0.70		0.720	0.010	4.17	0.605	3.34	358
	PTKR			0.00	1.34		1.000	0.002	2.34		0.00	0
WCL Total		23.08	0.00	23.08	15.98	1.00	4.920	0.023	45.00	0.605	23.69	2538
SECL	K/R	23.80	0.00	20.11	4.62	1.56	0.000	0.030	26.32		20.11	2155
	KRB	21.53	0.00	21.53	22.93	30.10	5.500	0.002	80.06		21.53	2307
	RAIGARH	9.99	0.00	2.61	2.01	0.00	0.000	0.000	4.62		2.61	280
SECL Total		55.32	0.00	44.25	29.56	31.66	5.500	0.032	111.00	0.000	44.25	4741
MCL	IB	25.38	4.00	29.38	8.68	3.00	4.600	0.000	45.66		29.38	3148
	TALCH	32.95	20.26	53.21	16.35	19.85	1.930	0.000	91.34		53.21	5701
MCL Total		58.33	24.26	82.59	25.03	22.85	6.530	0.000	137.00	0.000	82.59	8849
NEC Total		3.09	0.00	3.09	0.41	0.00	0.000	0.003	3.50	0.000	3.09	331
CIL Total		234.82	28.26	252.01	122.94	123.89	20.701	0.958	520.50	20.623	272.63	29211
SCCL Total		23.20	0.00	23.20	7.38	9.60	0.500	0.120	40.80	0.000	23.20	2486
Others Total		7.20	0.00	7.20	1.42	0.00	6.000	0.000	14.62	0.000	7.20	771
Captive Mining		39.75	0.00	39.75	58.83		5.500	0.000	104.08	0.000	39.75	4259
Grand Total		304.97	28.26	322.16	190.57	133.49	32.70	1.08	680.00	20.62	342.78	36728

Lignite Demand Perspective (XI & XII Five year Plan):

The state wise projected lignite demand during XI Plan and at the terminal year of XII Plan is given below:

Fig. in MT

	XI PLAN					XII PLAN
State	2007-08	2008-09	2009-10	2010-11	2011-12	2016-17
Tamil Nadu	20.407	21.398	24.288	24.577	24.516	38.096
Gujarat	13.300	15.450	17.410	19.750	23.730	37.830
Rajasthan	2.130	4.052	5.960	6.652	7.680	12.008
Total	35.837	40.900	47.658	50.979	55.926	87.934

(A) Projected lignite demand during XI Plan and at the terminal year of XII Plan for Tamil Nadu is given below:

The power projects listed below are programmed for commissioning during XI plan:

2X250 MW Expansion of NLC's TPS-II at Tamil nadu

500 MW capacity lignite based power project consisting two units of 250 MW each at Neyveli as an expansion to the Second Thermal Power Station with corresponding increase in the capacity of second mine from 10.5 MTPA to 15.0 MTPA. The mine production is scheduled to commence in the last quarter of 2008-2009 and the power units are programmed for commissioning during the last quarter of 2008-2009 and first quarter of 2009-2010.

Projected lignite requirement from Tamilnadu are as under :

Fig. in MT

	XI Plan					XII Plan
Projects	2007-08	2008-09	2009-10	2010-11	2011-12	2016-17
TPS-I	5.464	5.693	5.693	5.693	5.693	5.693
TPS-I Expansion	2.699	2.812	2.812	2.812	2.812	2.812
TPS-II	10.164	10.587	10.587	10.587	10.587	10.587
TPS-II Expansion	0.000	0.206	3.140	3.364	3.364	3.364
ST-CMS TPS (Pvt.)	1.780	1.800	1.756	1.821	1.760	1.800
Jayamkondam TPS	0.000	0.000	0.000	0.000	0.000	6.770
Neyveli Third TPS	0.000	0.000	0.000	0.000	0.000	6.770
Raw lignite sales	0.300	0.300	0.300	0.300	0.300	0.300
Total Tamil Nadu	20.407	21.398	24.288	24.577	24.516	38.096

The above consumption has been projected assuming a PLF of 72%.

(B) Gujarat::

The projected lignite demand for power sector and other sectors in Gujarat State is given below:

(in Million Tonnes)

SECTOR	XI Plan					XII Plan
	2007 - 08	2008-09	2009 - 10	2010 - 11	2011 - 12	2016-17
Power sector	5.85	7.00	7.85	8.92	11.46	19.46
Other sectors	7.45	8.45	9.56	10.83	12.27	18.37
Total	13.30	15.45	17.41	19.75	23.73	37.83

Demand From Power Sector:

The power projects listed below are programmed for commissioning during XI plan:

1. 1X75 MW Expansion of power station at Kutch in Bharuch District (GEB)
2. 2X125 MW Expansion of power station at Mangrol in Surat District (GIPCL)
3. 2X125 MW power station at Padva in Bhavnagar District (GPCL-Nirma)
4. 2X125 MW power station in Bhavnagar District (GPCI-GMDC JVC)

(in Million Tonnes)

Projects	Capaci in MW	XI Plan					XII Plan
		2007-08	2008 - 09	2009- 10	2010-11	2011-12	2016-17
Kutch Lignite TPS (GEB)	2 x 70 + 1 x 75	1.60	1.60	1.60	1.60	1.60	1.60
Kutch Lignite TPS expn. (GEB)	1x75	0.40	0.55	0.60	0.60	0.60	0.60
Akrimota TPS (GMDC)	2 x 125	1.50	1.50	1.50	1.50	1.50	1.50
Akrimota TPS Expn. (GMDC)	2 x 125	0.00	0.00	0.00	0.00	0.00	1.50
Surat Lignite TPS (GIPCL)	2 x 125	1.80	1.80	1.80	1.80	1.80	1.80
Surat Lignite TPS expn. (GIPCL)	2 x 125	0.00	1.00	1.80	1.80	1.80	1.80
Bhavnagar (GPCL-GMDC JVC)	2 x 125	0.00	0.00	0.00	0.45	1.67	1.67
Padva TPS in Bhavnagar (GPCL-Nirma)	2 x 125	0.00	0.00	0.00	0.62	1.94	1.94
Valia Lignite TPS (NLC-COG JVC)	2 x 500	0.00	0.00	0.00	0.00	0.00	6.50
GHCL	14	0.55	0.55	0.55	0.55	0.55	0.55
Total	2554	5.85	7.00	7.85	8.92	11.46	19.46

Demand From Other Sectors:

(in Million Tonnes)

Year	Cement	Paper	Soda ash and Chemicals	Bricks/ Ceramics	Textiles	Misc. & others	Total
2007-08	0.75	0.20	1.00	0.50	1.50	3.50	7.45
2008-09	0.83	0.21	1.10	0.55	1.73	4.03	8.45
2009-10	0.91	0.22	1.21	0.61	1.98	4.63	9.56
2010-11	1.00	0.23	1.33	0.67	2.28	5.32	10.83
2011-12	1.10	0.24	1.46	0.73	2.62	6.12	12.27
XII Plan 2016-17	1.65	0.30	2.20	1.10	3.94	9.18	18.37

(C) Rajasthan:

Projected lignite demand for power sector and other sectors in Rajasthan State is given below:

(in Million Tonnes)

SECTOR	2007- 08	2008-09	2009- 10	2010- 11	2011- 12	2016-17
Power sector	1.60	3.252	5.060	5.752	6.780	11.008
Other sectors	0.53	0.80	0.90	0.90	0.90	1.000
Total	2.13	4.052	5.960	6.652	7.680	12.008

The power projects listed below are programmed for commissioning during XI plan:

- 2X125 MW power station at Barsingsar in Bikaner District
250 MW capacity lignite based power project consisting two units of 125 MW each at Barsingsar in Bikaner district of Rajasthan with a captive lignite mine of 2.1 MTPA. The mine production is scheduled to commence in the third quarter of 2008-2009 and the power units are programmed for commissioning during the third and fourth quarters of 2008-2009.
- 1X125 MW power station at Sonari in Barmer District
- 1X125 MW power station at Shivkar in Barmer District
- 1X100 MW power station at Gurah in Bikaner District
- 2X125 MW power station at Bithnakh in Bikaner District
- 1X50 MW power station at Matasukh in Nagaur District

Projected Lignite requirement for Power Sector :

(in Million Tonnes)

Projects	Capacity in MW	2007-08	2008 -09	2009-10	2010-11	2011-12	2016 -17
Giral (Barmer)	1 x 125	1.00	1.00	1.00	1.00	1.00	1.00
Matasukh	1 x 50	0.30	0.30	0.30	0.30	0.30	0.30
Sonari (Barmer)	1 x 125	0.30	1.00	1.00	1.00	1.00	1.00
Shivkar (Barmer)	1 x 125	-	-	0.50	1.00	1.00	1.00
Gurah (W) (Bikaner)	1 x 100	-	0.70	0.70	0.70	0.70	0.70
Barsingsar TPS (NLC)	2 x 125		0.252	1.560	1.752	1.752	1.752
Bithnakh TPS (NLC)	2 x 125	-	-	-	-	1.028	1.72
Riri TPS (NLC)	2 x 250	-	-	-	-		3.504
Total	15525	1.60	3.252	5.060	5.752	6.78	11.008

Projected Lignite requirement for other Sectors:

(in Million Tonnes)

Year	Cement	Paper	Solvent Extraction	Bricks/ Ceramics	Textiles	Captive power generation	Total
2007-08	-	0.005	0.025	0.20	0.20	0.10	0.53
2008-09	-	0.01	0.04	0.25	0.20	0.30	0.80
2009-10	-	0.01	0.04	0.30	0.20	0.35	0.90
2010-11	-	0.01	0.04	0.30	0.20	0.35	0.90
2011-12	-	0.01	0.04	0.30	0.20	0.35	0.90

Lignite Based Capacity:

Envisaged available capacity at the end of X plan is 3594 MW.

Projected Capacity addition during XI Plan - 2225 MW , XII Plan – 3750 MW

The state wise projected lignite based power generation capacity during the XI plan and at the terminal year of XII Plan is given below:

Fig. in MW

	XI Plan					XII Plan
Projects	2007-08	2008-09	2009-10	2010-11	2011-12	2016-17
<u>Tamil Nadu</u>						
NLC	2490	2740	2990	2990	2990	4990
Private	250	250	250	250	250	250
<u>Total Tamil Nadu</u>	2740	2990	3240	3240	3240	5240
<u>Gujarat</u>						
GEB	290	290	290	290	290	290
GMDC	250	250	250	250	250	500
GIPCL	250	375	500	500	500	500
GPCL	0	0	0	250	500	500
GHCL	14	14	14	14	14	14
NLC	0	0	0	0	0	1000
<u>Total Gujarat</u>	804	929	1054	1304	1554	2804
Rajasthan						
RVUNL	175	400	525	525	525	525
NLC	0	125	250	250	500	1000
<u>Total Rajasthan</u>	175	525	775	775	1025	1525
<u>Total - India</u>	3719	4444	5069	5319	5819	9569

Lignite Production Projection:

The state wise projected lignite production during XI Plan and at the terminal year of XII Plan in the country i.e. in the states of TamilNadu, Gujarat and Rajasthan is given below:

Fig. in Mt.

	XI Plan					XII Plan
State	2007-08	2008-09	2009-10	2010-11	2011-12	2016-17
Tamilnadu	20.05	21.20	24.225	24.225	24.225	37.82
Gujarat	11.35	14.10	16.40	19.27	22.26	32.06
Rajasthan	1.90	4.20	6.185	6.685	7.713	19.69
Total XI Plan	33.65	39.50	46.810	50.18	54.203	89.58

Incremental Lignite production projection XI Plan – 24.283 Mt., XII Plan : 35.377Mt

The mine wise anticipated lignite production during XI Five Year Plan and at the terminal year of XII Plan in the states of Tamil Nadu, Gujarat and Rajasthan is given below

(A) Tamilnadu (NLC):

Fig. in Mt.

	XI Plan					XII Plan
Projects	2007-08	2008-09	2009-10	2010-11	2011-12	2016-17
Mine-I & Mine-I expn.	8.925	8.925	8.925	8.925	8.925	8.925
Mine-1A	2.550	2.550	2.550	2.550	2.550	2.550
Mine-II	8.575	8.575	8.925	8.925	8.925	8.925
Mine-II Expan.		1.150	3.825	3.825	3.825	3.825
Mine at Jayamkondam	0.000	0.000	0.000	0.000	0.000	6.800
Mine –III	0.000	0.000	0.000	0.000	0.000	6.800
Total Tamil Nadu	20.05	21.20	24.225	24.225	24.225	37.825

The above production has been projected assuming a capacity utilization of 85%.

(B) Gujarat::**Fig. in MT**

	XI Plan					XII Plan
Projects	2007-08	2008-09	2009-10	2010-11	2011-12	2016-17
Panandhro (GMDC)	2.50	2.50	2.00	2.00	2.00	1.00
Akrimota (GMDC)	0.00	0.00	0.00	0.50	0.50	1.25
Umarsar (GMDC)	0.00	0.50	1.50	1.00	1.00	1.25
Surka-I (GPCL-GMDC)	0.00	0.00	0.00	0.45	1.67	1.67
Khadsaliya-II (GPCL-Nirma)	0.00	0.00	0.00	0.00	0.90	0.90
Khadsaliya-I (GPCL-Nirma)	0.00	0.00	0.00	0.62	1.04	1.04
Khadsaliya (GHCL)	0.55	0.55	0.55	0.55	0.55	0.55
Vastan (GIPCL)	1.80	1.80	1.80	1.80	1.80	1.80
Valia-Mangrol (GIPCL)	0.00	1.00	1.80	1.80	1.80	1.80
Lakhpat (GMDC)	0.00	0.00	0.00	0.00	0.00	0.50
Panandhro (N) (GMDC)	0.00	0.00	0.00	0.00	0.00	0.50
Valia Mine (NLC –GOG JVC)	0.00	0.00	0.00	0.00	0.00	6.80
Sub-Total (Power)	4.85	6.35	7.65	8.72	11.26	19.06
Panandhro (GMDC)	2.00	1.00	1.00	1.00	1.00	0.00
Mata no math (GMDC)	1.00	1.00	1.00	1.50	1.50	1.50
Umarsar (GMDC)	0.00	0.00	0.00	0.50	0.50	0.75
Surka (North) (GMDC)	1.00	2.00	3.00	3.00	3.00	3.00
Tadkeshwar (GMDC)	1.00	1.50	1.50	1.50	2.00	2.00
Akri Mota (GMDC)	0.00	0.00	0.00	0.50	1.00	0.75
Lakhpat (GMDC)	0.00	0.00	0.00	0.00	0.00	0.50
Panandhro (N) (GMDC)	0.00	0.00	0.00	0.00	0.00	0.50
Amod (GMDC)	1.00	1.00	1.00	1.00	1.00	1.00
Moran (GMDC)	0.00	0.00	0.00	0.25	1.00	1.50
Ghala (GMDC)	0.00	0.00	0.00	0.00	0.00	1.50
Surkha-1 (GPCL GMDC)	0.50	1.25	1.25	1.30	0.00	0.00
Sub-Total (Others)	6.50	7.75	8.75	10.55	11.00	13.00
Total Gujarat	11.35	14.10	16.40	19.27	22.26	32.06

(c) Rajasthan:

	XI Plan					Fig. in Mt. XII Plan
MINES	2007-08	2000-09	2009-10	2010-11	2011-12	2016-17
Giral (Barmer)	1.00	1.00	1.00	1.00	1.00	1.00
Matasukh Kasnau (Nagaur)	0.60	0.60	0.60	0.60	0.60	0.60
Sonari (Barmer)	0.30	1.00	1.00	1.00	1.00	1.00
Gurah (W) (Bikaner)	-	1.00	1.00	1.00	1.00	1.00
Mokhla (Nagaur)	-	0.30	0.30	0.30	0.30	0.30
Shivkar (Barmer)	-	-	0.50	1.00	1.00	1.00
Barsingsar (NLC) (Bikaner)	-	0.30	1.785	1.785	1.785	1.785
Bithnokh (NLC) (Bikaner)	-	-	-	-	1.028	1.785
Riri (Nlc) (Bikaner)	-	-	-	-	-	3.825
Total	1.90	4.20	6.185	6.685	7.713	19.690

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 XI Plan by about 6.26 MT, which calls for additional production from the existing mines and/or advancing of the implementation of new mines in the state of Gujarat.

Capital Investment in Lignite Sector

(1) Details of capital investment during IX & X Plan are as under :

Rs Crores

	Ninth Plan		Tenth Plan		
	Approved by NDA	Actual Expenditure	Approved Outlay	Revised in Mid Term Appraisal (MTA)	Antic. Expenditure
• NLC – Mines	2581.80	2097.14	6125.84	2130.26	1113.73
• NLC - Power	1866.36	1055.30	8007.64	2992.91	1067.85
TOTAL NLC	4448.16	3152.44	14133.48	5123.17	2181.58

(2) Details of capital investment required during XI Plan are as under :

(i) **Assumptions:**

Following assumptions have been made by the Group for estimating the investment requirement in respect of the projects for which details are not available.

(A) **NLC's Projects In Tamilnadu, Gujarat & Rajasthan**

- a. Specific investment cost of mine : Rs 1300/tonne of lignite.
with mixed (departmental & contract) mining
- b. Specific investment of power project : Rs 4.5 Crores/MW installed
for unit size of 500 MW and above
- c. Specific investment of power project : Rs 5.0 Crores/MW installed
for unit size below 500 MW
- d. Funding pattern : 30:70 (Equity: Debt)

(B) **Gujarat & Rajasthan.**

In Gujarat and Rajasthan, contract mining with shovel dumper combination is practiced and the investment required from the State PSUs is less compared to that of NLC. The X Plan document estimated requirement of funds for its mining projects. From the figures, it is observed that the state PSUs in Gujarat and Rajasthan would go for only contract mining in future and the entire requirement of funds would be met out of their internal resources. The specific investment rate assumed by the X Plan document was Rs.340/tonne of lignite. Taking into account the inflation and assuming a cumulative escalation of 6% per annum in the prices over the five years, a specific investment rate of Rs.450/tonne of lignite has been assumed to estimate the investment required to implement the mining projects in the states of Gujarat and Rajasthan. Regarding the power projects to be taken up in Gujarat and Rajasthan, a specific investment cost of Rs.5.0 crore per MW has been assumed since the units are of only 125 MW and less size. Further it is also assumed that the entire fund for the mining projects would be met by the state PSUs out of their internal resources and for the power projects, the funding pattern will be 70:30 (Debt:Equity) .

(ii) **Investment by NLC:**

(A) Investment required during XI Plan for the projects of NLC (under implementation) in Tamil Nadu & Rajasthan

The lignite production would increase from the present level of 24.0 MT to 28.5 MT by the year 2009-10 once the on-going Mine-II expansion project is completed. It would further increase to 36.5 MT during XII Plan. The increase in production would be achieved by expanding the present Mine-II from 10.5 MTPA to 15.0 MTPA and by developing a new mine of 8 MTPA capacity mine at Jayamkondam in Tamilnadu. Similarly the power generation potential at Neyveli would increase from the present level of 2490 MW to 2990 MW by the year 2009-10, 3990 MW during XII Plan.

NLC is implementing the Mine-II and TPS-II expansion projects and Barsingsar Mine and Thermal Power Projects on its own, partly with its internal accruals and partly with loan from domestic & international markets. The funding pattern proposed is 70:30 (Debt: Internal Resources). The total approved cost is Rs.5561 crores. The internal resources work out to Rs.1668.00 Crores and the loan component is Rs.3893.00 Crores. Out of Rs.3893 Crores, Foreign Exchange requirement is Rs. 1446.00 Crores. However, the requirement during XI Plan is only Rs.5078 crores as given under:

Project	Capacity	Approved Project cost (Rs. Crores)	Anticipated cost (Rs. Crores)	Reqt. In XI Plan (Rs. Crores)
Mine – II Expansion at Neyveli	4.5 MTPA	2161	2039	1506
Barsingsar mine at Rajasthan	2.1 MTPA	254	309	229
Total for Coal Sector		2415	2348	1735
TPS – II Expansion at Neyveli	500 MW	2031	2411	2040
Barsingsar TPS at Rajasthan	250 MW	1115	1598	1303
Total for Power Sector		3146	4009	3343
Total		5561	6357	5078

(B) New Projects of NLC (lignite)

(a) In Tamil Nadu

Project	Capacity	Project Cost (Rs. Crores)	Equity/Internal Resources (Rs. Crores)	Loan (Rs. Crores)	Requirement In XI Plan (Rs. Crores)
Jayankondam Mine	8.0 MTPA	1200	360	840	270
Jayankondam TPS	1000 MW	4500	1350	3150	1800
Total for Tamilnadu		5700	1710	3990	2070

(b) In Gujarat:

In respect of Valia Mine and Power Projects in Gujarat the total investment required is Rs.5640 Crores and NLC proposes to implement these projects under joint venture with a company nominated by the Government of Gujarat and with a funding pattern of 70:30 (Debt : Equity). The equity requirement would be Rs.1692 Crores, out of which the contribution from NLC would be about Rs. 1269 Crores assuming 75% stake. However, the requirement during XI Plan is only Rs.1157 crores.

Project	Capacity	Project Cost (Rs. Crores)	Equity/Internal Resources (Rs. Crores)	Loan (Rs. Crores)	Reqt. In XI Plan (Rs. Crores)
Valia Mine	8.0 MTPA	1140	342	798	257
Valia TPS	1000 MW	4500	1350	3150	900
Total for Gujarat		5640	1692	3948	1157

(c) In Rajasthan:

Further, NLC has planned for the following additional lignite mines and lignite based power plants for implementation during the XI Plan.

Project	Capacity	Project Cost (Rs. Crores)	Equity/Internal Resources (Rs. Crores)	Loan (Rs. Crores)	Reqt. In XI Plan (Rs. Crores)
Bithnok Mine	2.1 MTPA	440	132	308	352
Riri Mine	4.5 MTPA	810	243	567	182
Bithnok TPS	250 MW	1250	375	875	1000
Riri TPS	500 MW	2250	675	1575	900
Total for Rajasthan		4750	1425	3325	2434

The total investment envisaged during XI Plan period for **lignite mine and power projects by NLC** in Tamilnadu, Gujarat & Rajasthan is **Rs.10739 Crores**.

(iii) NEW PROJECTS

(A) Coal Based TPS by NLC

	Reqt. In XI Plan (Rs. Crores)
Talabira II & III	25
Orissa TPS	360
Tuticorin TPS	3684
MP TPS	25
Jarkhand TPS	25
Total	4119

Apart from the above an amount of Rs.10 Crores is earmarked for expenditure towards Mine – III / TPS-III Projects during XI Plan. Further certain expenditure (Rupees 176.08 Crores) will be incurred for Mine IA, TPS – I Expansion, Science & Technology, Geological Investigation and others spill over payment (land) etc.

To take-up the above new/expansion proposals, the investment required by NLC has been estimated to be about Rs.15044 Crores which would be spread over during XI Plan Period. Out of Rs.15044 Crores, about Rs.5078 Crores would be required for the on-going Mine-II and TPS-II expansion projects at Neyveli and Barsingsar Mine and Thermal Power Project in Rajasthan and the balance for the remaining projects in Tamilnadu, Gujarat and Rajasthan.

All the projects put together there will be a requirement of about Rs.900 Crores per annum from NLC's internal resources which NLC could meet without any difficulty. As regards raising loans from the domestic or the international markets, NLC does not foresee any difficulty given the present and past trend of performance.

(B) Gujarat

Investment required for undertaking the programmed additional lignite production and power production during XI Plan is given below:

Rs Crores

Mine Projects	Agency	Capacity (MTPA)	Investment Proposed
Khadsaliya-I	GPCL-Nirma	1.00	45.00
Khadsaliya-II	GPCL-Nirma	1.00	45.00
Akrimota	GMDC	2.00	90.00
Umarsar	GMDC	2.00	90.00
Surkha – North	GMDC	3.00	135.00
Tadkeshwar	GMDC	2.00	90.00
Surkha – I	GPCL-GMDC	2.00	90.00
Valia – Mangrol	GIPCL	2.00	90.00
Amod	GMDC	1.00	45.00
Moran	GMDC	1.25	56.00
Valia	NLC-GOG	8.00	257.00
Total for Mine sector in Gujarat		25.25	1033.00

Power Projects	Agency	Capacity (MW)	Investment Proposed
Kutch TPS Expn.	GEB	75	385.00
Surat TPS Expn.	GIPCL	250	1250.00
Padva TPS	GPCL-Nirma	250	1250.00
Bhavnagar TPS	GPCL-GMDC	250	1250.00
Valia TPS	NLC-GOG	1000	900.00
Total for Power Sector in Gujarat		1825	5035.00

The total investment required for Gujarat is Rs.6068 Crores including the investment by NLC (Mine sector – Rs. 1033.00 Crores and Power sector – Rs. 5035.00 Crores.).

(C)

Rajasthan:

Estimated investment requirement during XI Plan for developing mining and power projects is given below.

Rs Crores

Mine Projects	Agency	Capacity (MTPA)	Investment Proposed
Sonari	RSMML	1.00	45.00
Gurah	RSMML	1.00	45.00
Mokhla	RSMML	0.30	14.00
Shivkar	RSMML	1.00	45.00
Bithnok	NLC	2.10	352.00
Riri	NLC	4.50	182.00
Total for Mine sector		9.90	683.00

Power Projects	Agency	Capacity (MTPA)	Investment Proposed
Sonari	RVUNL	125	625.00
Gurah	RVUNL	100	500.00
Shivkar	RVUNL	125	625.00
Bithnok	NLC	250	1000.00
Riri	NLC	500	900.00
Total Power Sector		1150	3650.00

Total investment required for Rajasthan is Rs.4333 Crores (Mine sector – Rs. 683 Crores and Power sector – Rs. 3650.00 Crores.)

Summary of Investment Requirement in Lignite Sector

Fig. in Crores				
Investment Proposed During XI Plan				
State		Mine Sector	Power Sector	Total
Tamilnadu				
	N-GOING PROJECTS	1506	2040	3546
	EW PROJECTS *	275	1805	2080
	Total	1,781	3845	5626
Gujarat				
	NLC	257	900	1157
	Others	776	4135	4911
	Total	1033	5035	6068
Rajasthan				
	NLC	763	3203	3966
	Others	149	1750	1899
	Total	912	4953	5865

In Orissa,MP,Tuticorian & Jarkhand	25	4094	4119
Grand Total	3751	17927	21678

* An amount of Rs. 5 crores each in Mine sector & Power Sector is included for Mine – III/TPS-III expenditure.

Agency wise Investment	(Rs.in crores)
NLC Ltd.	14,868 (+176 crores for completed projects & others)
Gujarat (other than NLC)	4,911
Rajasthan	1,899

A total amount of about Rs.21678 crores is assessed during the XI Five Year Plan. For on-going projects Rs.3546 crores and Rs.18132 crores for New/expansion projects. The share of NLC, PSUs of Gujarat and Rajasthan in the total investment is Rs.14868 crores, Rs.4911 crores and Rs.1899 crores respectively. The share of mining sector and power sector are Rs.3751 crores and Rs.17927 crores respectively. Additionally NLC has assessed an amount of Rs.176 crores requirement towards Mine IA, TPS – I Expansion, Science & Technology, Geological Investigation and others spill over payment (land) etc. during the XI Plan. Including this, the investment required by lignite sector during the XI Plan is Rs. 21854 crores.

Programme and Progress of Exploration Work during X Plan

Exploration Stage	Agency		Area Coverage (Sq km)		Projected Drilling in X Plan (Lakh m)		Resources Established in X Plan (Bt)	
			Programmed	Achieved	Programmed	Achieved	Programmed	Achieved Regional/ Promotional
Preliminary	GSI		No resource established as per nature of work					
Regional	GSI	Coal	1354	588*	1.83	1.49	4.9	11.77
		Lignite	1600	1291	0.21	0.20		1.36
Promotional	GSI	Coal	2076	201	3.30 (3.80)	0.59	6.68	6.12
	MEC			870		2.53		10.08
	CMPDI			140		0.63		3.58
	GSI	Lignite	3555	50	2.70 (3.10)	0.13		0.53
	MEC			3909		3.00		17.0
Total Regional + Promotional		Coal	3430	1799	5.13	5.24	11.58	31.55
		Lignite	5155	5250	2.91	3.33		18.89
Detailed (Coal)	CMPDI	CIL Areas	553	221	5.90	4.96	12.13	7.28
	MEC	CIL Areas			0.05	0.05		
	State Govts, & Pvt Pty	CIL Areas	36.2	41.2	0.23	0.13	0.32	0.74
	SCCL	SCCL Areas	116	59.0	2.70	2.35	1.02	0.91
	NTPC, State Govts & Pvt Pty	Own areas		85.2		1.09		0.48
	CMPDI	Non-CIL	164	148	2.13	2.50	3.65	4.80
	MEC	Non-CIL		116		0.33		2.26
Total Detailed Coal			869.2	670.4	11.01	11.41	17.12	16.47
Detailed (Lignite)	NLC				0.74	0.63		0.61
	DMGR				0.13	0.16		
	RSMML				0.07	.06		
Total Detailed Lignite					0.94	0.85		
Developmental	CIL Areas					1.45		
	SCCL Areas				1.10	1.42		
	NLC Areas					0.38		

Note: * In addition part of the coverage included in IX Plan as major work for some of the blocks was executed in IX Plan,

** Includes Promotional Exploration for all agencies.

Updated Details of Coal Resource as on 1.1.2006

Sl. No.	Coalfield	Resource (million tonne)			
		Proved	Indcated	Inferred	Total
1	Raniganj (W. Bengal Part)	11268.89	7807.18	3926.57	23002.64
2	Raniganj (Jharkhand Part)	1538.19	466.56	31.55	2036.30
	Total Raniganj	12807.08	8273.74	3958.12	25038.94
3	Barjora	114.27	0.00	0.00	114.27
4	Birbhum	0.00	4071.23	611.79	4683.02
5	Darjeeling	0.00	0.00	15.00	15.00
6	Jharia	15077.57	4352.49	0.00	19430.06
7	East Bokaro	2896.98	3307.17	863.32	7067.47
8	West Bokaro	3353.98	1430.15	34.42	4818.55
9	Ramgarh	367.76	545.15	58.05	970.96
10	North Karanpura	7645.86	6120.68	1864.96	15631.50
11	South Karanpura	2542.18	1985.73	1508.88	6036.79
12	Auranga	46.91	2446.79	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)	2077.97	10596.25	1441.25	14115.47
17	Rajmahal (Bihar part)	0.00	0.00	160.00	160.00
	Total Rajmahal	2077.97	10596.25	1601.25	14275.47
18	Johilla	185.08	104.09	32.83	322.00
19	Umaria	177.70	3.59	0.00	181.29
20	Pench-Kanhan	1375.98	733.27	316.78	2426.03
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 (MP part)	1567.91	2732.64	197.70	4498.25
25	Sohagpur (Chhattisgarh part)	94.30	10.08	0.00	104.38
	Total Sohagpur	1662.21	2742.72	197.70	4602.63
26	Singrauli (Part of MP)	3960.20	5549.27	2319.18	11828.65
27	Singrauli (Part of UP)	765.98	295.82	0.00	1061.80
	Total Singrauli	4726.18	5845.09	2319.18	12890.45
28	Sonhat	199.49	2463.86	1.89	2665.24
29	Jhilimili	228.20	38.90	0.00	267.10
30	Cbhirimiri	320.33	10.83	31.00	362.16
31	Bisrampur	635.57	863.42	0.00	1498.99
32	Lakhanpur	365.56	85.84	0.00	451.40
33	Panchbahini	0.00	11.00	0.00	11.00
34	Sendurgarh	152.89	126.32	0.00	279.21
35	Hasdo-Arand	1183.36	2941.75	839.47	4964.58
36	Korba	4980.58	4304.45	830.18	10115.21
37	Mand-Raigarh	1409.87	15161.84	2534.33	19106.04
38	Tatapani-Ramkola	0.00	1414.60	202.19	1616.79
39	Wardha Valley	2783.51	1246.90	1466.73	5497.14
40	Kamptee	1233.74	1067.08	505.44	2806.26

41	Umrer-Makardhokra	308.41	0.00	0.00	308.41
42	Bander	242.80	118.20	0.00	361.00
43	Nand	73.93	0.00	0.00	73.93
44	Bokhara	10.00	0.00	20.00	30.00
45	Ib-River	5153.45	10027.33	7183.33	22364.11
46	Talchir	11757.18	20765.74	7112.23	39635.15
47	Godavary Valley	8403.18	6158.17	2584.25	17145.60
48	Singrimari	0.00	2.79	0.00	2.79
49	Makum	304.87	9.85	1.19	315.91
50	Dili-Jeypore	9.03	14.19	30.80	54.02
51	Mikir Hills	0.69	0.00	2.02	2.71
52	Namchik	31.23	40.11	18.89	90.23
53	West Daranggiri	93.31	33.69	0.00	127.00
54	Balphakram-Pendenguru	0.00	0.00	107.03	107.03
55	Siju	0.00	0.00	125.00	125.00
56	Langrin	11.34	7.20	31.46	50.00
57	Mawlong-Shella	2.17	0.00	3.83	6.00
58	Khasi Hills	0.00	0.00	7.09	7.09
59	Bapung	11.01	0.00	22.65	33.66
60	Jayanti Hills	0.00	0.00	3.65	3.65
61	Borjan	3.43	1.35	5.22	10.00
62	Jhanzi-Disai Valley	0.00	0.00	2.08	2.08
63	Tien Sang	0.00	0.00	1.26	1.26
64	Tiru Valley	0.00	0.00	6.60	6.60
	GRAND TOTAL	95866.36	119769.32	37665.98	253301.66

State-wise Lignite Resources as on 1.4.2006

(million tonnes)

State	Proved	Indicated	Inferred	Total
Tamilnadu				
Neyveli Lignite sector	2831.00	3728.84	1468.99	8028.83
Mannargudi Lignite sector	0.00	13606.39	9651.20	23257.59
Ramanathapuram Sector	0.00	23.92	28.79	52.71
Sub-Total	2831.00	17359.15	11148.98	31339.13
Rajasthan				
Barmer District	170.40	2177.84	911.09	3259.33
Bikaner District	277.51	382.69	68.60	728.80
Nagaur District	113.00	60.07	60.35	233.42
Jaisalmer District	0.00	0.00	13.80	13.80
Sub-Total	560.91	2620.60	1053.84	4235.35
Gujarat				
Kutch District	300.61	32.10	33.09	365.80
Bhavnagar District	0.00	0.00	299.17	299.17
Bharuch District	266.38	118.59	949.61	1334.58
Surat District	218.28	108.71	336.21	663.20
Sub-Total	785.27	259.40	1618.08	2662.75
J&K	0.00	20.25	7.30	27.55
Sub-Total	0.00	20.25	7.30	27.55
Kerala	0.00	0.00	9.65	9.65
Sub-Total	0.00	0.00	9.65	9.65
Grand Total	4177.18	20259.40	13837.85	38274.43

Depth-wise Lignite Resources as on 1.4.2006

(million tonnes)

Depth range (m)	Proved	Indicated	Inferred	Total
0-150 m	4476	3662	1556	9694
150-300 m	0	8336	3400	11736
> 300 m	0	8261	8583	16844
Grand Total	4476	20259	13539	38274

Annexure- 11.1

STATEMENT SHOWING ACTUAL CAPITAL EXPENDITURE OF COAL INDIA LTD. WITH ITS SUBSIDIARY COMPANIES FOR CONSECUTIVE FIVE YEARS FROM 2000-01 TO 2004-05 AND PROJECTED EXPENDITURE OF XI PLAN AS BEING STARTED FROM 2007-08 TO 2011-2012.

(Amount in Rs. Crore)

Items of expenditure	2000-01	2001-02	2002-03	2003-04	2004-05	Projection of XI Plan				
						2007-08	2008-09	2009-10	2010-11	2011-12
Housing	63.91	53.80	40.65	46.44	67.96	99.45	145.54	212.98	311.67	456.10
% increase (+) / Decrease (-)		(-)15.82%	(-)24.44%	(+)14.24%	(+)46.34 %	(+)46.34%	(+)46.34%	(+)46.34%	(+)46.34%	(+)46.34%
Hospitals	1.35	Nil	0.23	0.50	1.08	2.33	5.03	10.86	23.46	50.67
% Increase (+) / Decrease (-)	-	-	(+)17.04%	(+)117.39%	(+)116%	(+)116%	(+)116%	(+)116%	(+)116%	(+)116%
Water Supply	13.34	14.06	8.82	6.75	5.59	5.87	6.16	6.47	6.79	7.13
% Increase (+) / Decrease (-)	-	(+)5.40%	(-)37.27%	(-)23.47%	(-) 17.19%	(+)5%	(+)5%	(+)5%	(+)5%	(+)5%
Total	78.60	67.86	49.70	53.69	74.63	107.65	156.73	230.31	341.92	513.90

- Note:
- 1) Expenditure of 2005-06 is under Audit
 - 2) Expenditure of 2006-07 is running till end of the year
 - 3) For projection of XI Plan, last 5 year expenditure w.e.f. 2000-01 to 2004-05 are being shown above for consideration
 - 4) Basis of growth for XI Plan is being taken of 2004-05 for Housing and Hospitals since growth may not be negative that's why growth of water supply is being taken as 5% PA