Bhurkunda OCP (1.75MTY)

1.0 INTRODUCTION

1.1 PRESENT PROPOSAL

The Bhurkunda Colliery is situated in Ramgarh district, in the state of Jharkhand and falls in South Karanpura Coalfield. This colliery belongs to the Barka-Sayal area of Central Coalfields Limited (CCL), a subsidiary of Coal India Limited. Bhurkunda OCP block consists of an area of 7.5 sq km with two blocks - Bhurkunda with an area of 4.5 sq km and Bhurkunda North Extension with an area of 3.0 sq km. The Bhurkunda block comprises a number of existing and discontinued UG and OC workings. The entire Bhurkunda North Extension is at present virgin but it has huge built up of residential and civil structure belonging to CCL. It also comprises tenancy and forest land in the north which needs to be acquired.

Project report of Bhurkunda OCP (1.75 MTY) has been prepared based on the Geological Report on Bhurkunda Block, South Karanpura Coalfield, MECL, July, 1986 and Geological Report on Coal Exploration Bhurkunda North Extension South Karanpura Coalfield, MECL, March 1988. This report envisages mining of seams up to Argada-D in Bhurkunda Block and Argada-K in Bhurkunda North Extension by Opencast method.

The normative production of the project is 1.75MTY having non-coking coal grade of 'G7' (GCV based classification of coal). The present report envisages two Variants. The capital is given in Appendix-A of respective Variants.

The broad details of the various variants proposed in the PR are as follows:

Variant-I: Coal production and OB removal has been envisaged to be done departmentally in this variant. CHP has been provided for sizing of coal to -100mm.

Variant-II: In this variant, coal production and OB removal has been envisaged to be outsourced. However, CHP and pumping will run in departmental mode.

The Report also recommends for EMP clearance at about 1.75MTY capacity.

1.2 DIFFICULTIES AND CONSTRAINTS IN MINING WITH ASSOCIATED RISK

1. Bhurkunda OCP consists of a number of discontinued and existing Opencast and Underground mines. The UG workings are waterlogged and discontinued. The OC workings are either waterlogged or dumped with overburden. Proper safety precaution needs to be adopted while approaching these workings to prevent outbreak of fire and sudden flooding.

2 Additionally, few galleries of abandoned and waterlogged UG workings of adjoining Saunda Colliery (in Sirka, Argada-A seams) have crossed the Nakari nala into the proposed PR boundary in the west. Proper safety precaution needs to be adopted while approaching these workings to prevent outbreak of fire and transfer of danger to adjoining mines. The PR proposes a safety barrier of 60m from such workings and the quarry boundary has been suitably adjusted to prevent such danger.

3 The area is structurally complicated having a total of 29 faults (19 in Bhurkunda Block and 10 in Bhurkunda North extension Block with throw varying from 5-125m).

4 The dip of the seam is very steep with gradient varying from 15-35 deg making concurrent internal dumping difficult. Floor dinting/blasting should be done prior to starting internal dump to negotiate effects of adverse floor gradient.

5 The mining will generate huge quantity of overburden. Initially certain quantity of OB needs to be dumped externally which will require additional land. To accommodate the external OB dump, area to the north of the quarry has been proposed. Major part of the land is already in possession of Bhurkunda Colliery, however this will require dismantling and shifting of the existing civil structures and infrastructure in the area. The land in the north upto Damodar River needs to be acquired.

6 A water pipeline supplying water from Patratu to Army Cantonment at Ramgarh passes through the leasehold of Bhurkunda Colliery. Also a 33kV OH power line of JSEB passes through the leasehold. These needs to be shifted prior to the start of mining operation

1.3 LOCATION

The proposed Bhurkunda OCP is located in the South Karanpura Coalfield and falls in the Ramgarh district of Jharkhand. The block is bounded by latitudes 23º39'00" to 23º41'00" North and longitudes 85º21'00" to 85º23'30" East. The block is covered in Survey of India toposheet no. 73E/6 (in 1:50,000 scale). The Blocks covering an area of 7.5 sq km is bounded by Lapanga/ Jeewandhara project in the east, Gidi-A colliery in the north, CCL Saunda Colliery in the north-west, Saunda-D Colliery in the west and Bhurkunda UG mines in the south.

1.4 ACCESSIBILITY AND COMMUNICATION

The area is well connected by Rail and road. The nearest Railway station Bhurkunda of Eastern Railway on Gomoh–Barkakana–Dehri-on-Sone loop line is about 3km from the Project. The State Highway No 2 (SH-2) is about 2km from the southern part of the block which connects Ramgarh (about 16km) in the east and Patratu (about 10km) in the west. The existing road communication connects the block with other adjoining projects and also the office of the

GM, Barka-Sayal. The block is about 48km from Ranchi via SH-2. The nearest commercial airport is situated at Ranchi.

1.5 LAND REQUIREMENT

The total land requirement for the OCP is about 789.26 Ha comprising tenancy land only.. The break-up of land under different heads is shown in the following table:

(Fig in Ha)

Sl. No.	Land Requirement	Area (ha)
1	Quarry	469.87
2	External OB Dump	115.68
3	Road	21.31
4	Infrastructure (W/s, CHP, S/S, Rly siding, etc)	65.53
5	Colony & Rehabilitation site*	40.00
6	Safety Zone/Green Belt	76.86
7	Total Land in Leasehold Boundary	**789.26**

2.0 GEOLOGY

2.1 INTRODUCTION

The proposed Bhurkunda OCP block consists of Bhurkunda Geological block and Bhurkunda North Extension Geological block. It is located in the South Karanpura Coalfield falls in Ramgarh District, Jharkhand.

The Geological Report available is: –

1. Geological Report on Bhurkunda Block, South Karanpura Coalfield, MECL, July, 1986.
2. Geological Report on Coal Exploration Bhurkunda North Extension South Karanpura Coalfield, MECL, March 1988.

2.2 BLOCK BOUNDARIES

The block boundaries of Bhurkunda OCP are as follow:

North : Gidi 'A'

South : South Bhurkunda

East : Lapanga

West : Saunda 'D'

The limitation of the block boundaries are given as below:

Block	Longitude	Latitude
Bhurkunda	85º21'00" to 85º23'00"	23º39'00" to 23º41'00"
Bhurkunda N Extn.	85º21'38" to 85º23'30"	23º39'03" to 23º40'14"

2.3 EXPLORATION STATUS

A brief summary of the agency-wise and year-wise drilling in the above blocks along with number of boreholes, meterage and borehole density is given below:

S.N.	Block	Agency	Total	Meterage	Year of Drilling
1	Bhurkunda	MECL	47	7520.50	Feb, 1985 to Feb, 1986
2	Bhurkunda N. Extn.	MECL	28	4047.30	Mar, 1986 to Feb, 1988

The borehole density of the geological block is 10.

2.4 RESERVE

The seamwise Geological reserves estimated is tabulated below:

Seam	Bhurkunda NE	Bhurkunda	Total
Bansgara		7.35	**7.35**
Bansgara 'A'		4.39	**4.39**
Bansgara 'B'		2.91	**2.91**
Bansgara 'C'		3.55	**3.55**
Bansgara 'D'		3.67	**3.67**
Upper Sirka		15.47	**15.47**
Middle Sirka		3.64	**3.64**
Lower Sirka		8.29	**8.29**
Sirka 'A'		0.83	**0.83**
Argada		79.91	**79.91**
Argada 'A'		56.78	**56.78**
Argada 'B		27.86	**27.86**
Argada 'C' Top		5.92	**5.92**
Argada 'C' Bot		10.02	**10.02**
Argada 'D'	0.24		**0.24**
Argada 'D' Top		7.83	**7.83**
Argada 'D' Mid		11.58	**11.58**
Argada 'D' Bot		7.79	**7.79**
Argada 'E' Top	0.24	-	**0.24**
Argada 'E' Mid	0.16	-	**0.16**
Argada 'E' Bot	0.00	-	**0.00**
Argada 'E'	0.10	-	**0.10**
Argada 'F' Top	0.66	-	**0.66**
Argada 'F' Bot	0.78	-	**0.78**
Argada 'G'	1.24	-	**1.24**
Argada 'H' Top	0.84	-	**0.84**
Argada 'H' Bot	0.26	-	**0.26**
Argada 'H'	0.37	-	**0.37**
Argada 'I'	1.87	-	**1.87**
Argada 'J'	0.75	-	**0.75**
Argada 'K'	1.34	-	**1.34**
Argada 'L'	3.61	-	**3.61**
Argada 'M' Top	0.10	-	**0.10**
Argada 'M' Bot	0.37	-	**0.37**
Argada 'M'	0.72	-	**0.72**
Argada 'N' Top	0.00	-	**0.00**
Argada 'N' Bot	0.00	-	**0.00**
Argada 'N'	0.28	-	**0.28**

Seam	Bhurkunda NE	Bhurkunda	Total
Argada 'O' Top	0.01	-	**0.01**
Argada 'O' Bot	0.43	-	**0.43**
Argada 'O'	2.40	-	**2.40**
Argada 'P'	0.27	-	**0.27**
Argada 'Q'	0.03	-	**0.03**
Argada 'R' Top	0.00	-	**0.00**
Argada 'R' Mid	0.00	-	**0.00**
Argada 'R' Bot	0.77	-	**0.77**
Argada 'R'	1.81	-	**1.81**
Argada 'S'	0.38	-	**0.38**
Argada 'T'	0.47	-	**0.47**
Total	20.50	257.79	**278.29**

3.0 MINING

3.1 BOUNDARIES OF THE MINING BLOCK

The mine boundary of the OCP has been fixed as follows:

East: The extent of eastern surface of the quarry has been fixed by the eastern geological block boundary of Bhurkunda Block and south-eastern block boundary of Bhurkunda North extension block.

West: The western surface boundary has been fixed by keeping a minimum of 100m barrier from Damodar / Nakari River.

North: The northern floor boundary has been fixed along the incrop of the seam Argada-K (the lowermost economically mineable seam) in the west and Argada-D Bottom in the east (the lowermost proved seam in the area).

South: The southern floor boundary has been kept upto the floor RL of +100m in the floor of Argada-D seam so that the quarry surface could be restricted to a limit upto which floor contour has been generated in the Geological report as well as in the MINEX model. Restricting the surface boundary will also allow working of the existing UG to continue unaffected for the next 10-15 years.

3.2 TARGET OUTPUT & LIFE OF THE MINE

The mine life for target production of 1.75 MTY is 9 years. It includes 2 years of construction period. The break-up of life of mine are as under:

Particulars	Years
Mine Life (Production period)	7 (Production period)
Construction period	2
Production build-up period	5
Production period	2
Total period (inc. Construction Period)	9

3.3 MINING RESERVES – VOLUME OF OBR – STRIPPING RATIO

The cumulative mineable reserve is estimated to be as 9.30 MT with corresponding volume of O.B estimated as 38.43 Mm^3 with an average stripping ratio of 4.13 cum/t.

19% of Geological loss and Mining loss has been considered to arrive at the net mineable reserve of the project. The seams having less than 1m thickness has been excluded for the calculation of the mineable reserve.

Seamwise details of Geological vis-à-vis Mineable Reserves

S N	Seam Name	Seam Thickness (m)	Geological Reserve (MT)	Balance Mineable Reserve (MT)
1	Bansgara	4.06-10.35	7.35	0.00
2	Bansgara A	3.11-4.60	4.39	0.02
3	Bansgara D	0.45-1.85	3.67	0.05
4	Upper Sirka	0.62-8.34	15.47	0.20
5	Middle Sirka	0.41-2.70	3.64	0.07
6	Lower Sirka	0.76-4.92	8.29	0.24
7	Argada	5.50-28.63	79.91	3.60
8	Argada A	2.59-12.67	56.78	2.06
9	Argada B	0.39-8.17	27.86	1.40
10	Argada C Top	0.26-2.27	5.92	0.17
11	Argada C Bot	0.48-4.25	10.02	0.56
12	Argada D Top	0.35-3.37	7.83	0.64
13	Argada D Mid	0.17-3.71	11.58	0.19
14	Argada D Bot	0.07-3.20	7.79	0.11
15	Argada F Top	0.20-2.40	0.66	0.00
16	Argada F Bot	0.88-2.96	0.78	0.00
17	Argada G	0.20-3.88	1.24	0.00
18	Argada H	0.59-2.13	0.84	0.00
19	Argada I	0.16-4.89	1.87	0.00
20	Argada J	0.14-3.02	0.75	0.00
21	Argada K	0.30-3.95	1.34	0.00
			257.98	**9.30**

Note: Seams Argada-F and below has been reported in the Geological Report of Bhurkunda NE on I_{30} basis

3.4 MINING PARAMETERS

The mining parameters of the proposed Bhurkunda OCP (1.75 mty) are given below:

Final Stage Mine Parameters

Parameters	Unit	Minimum	Maximum
Dimensions of the quarry along strike (on floor)	m	600	2000
Depth of quarry	m	10	250
Dip rise length (on floor)	m	1300	1900
Seam Gradient	deg	15	35
Average Gradient	deg	20	
Final Quarry Floor area	km^2	3.19	
Final Quarry Surface area	km^2	4.75	
Mineable reserves	(Mte)	9.30	
Total OB	(Mcum)	38.43	
Average Stripping Ratio	(cum/t)	4.13	

3.5 CHOICE OF TECHNOLOGY:

Considering the geo-mining condition of the Bhurkunda OC, shovel-dumper combination has been proposed for mining the quarry. The targeted capacity of 1.75 MTY is proposed to be achieved by 8^{th} year (this includes 2 years of construction period).

The time to achieve target production has been fixed on the basis of:

a) Estimated schedule of delivery and erection of main HEMM - capacity build up.

b) Time required for opening the entire strike length and the availability of the most potential seams (Argada, Argada-A seams).

c) Construction period required for coal handling plant, evacuation system and other infrastructure development.

d) Land acquisition.

3.6 EQUIPMENT SELECTION:

The selection process is the most critical part of the project planning. The following selection criteria have been considered for selecting the size and type of the equipment:

1. The strike length of the mine,
2. Annual rate of advance/ deepening,
3. Total volume of overburden and coal to be handled annually,
4. The individual thickness of coal seam and partings,
5. The geo-mining condition of the mine,
6. The type of mining system,
7. The economics of the mine.

Based on the above selection criteria, in Variant-I (departmental variant), 10-12 cum electric hydraulic shovel with 100T RD and 5.5-6.5 cum diesel hydraulic shovel with 60T RD are proposed for removal of top OB and partings. Coal production will be carried out by deploying 5.5-6.5 cum diesel hydraulic shovel/backhoe with 60T RD. In case coal and OB occur in any particular bench, excavators deployed in that bench will take both. This will also help in reducing unnecessary movement of shovel demarcated for coal production. Dozer with ripper attachments is provided to handle dirt bands and very thin coal seams.

3.7 MINING STRATEGY / MINING SEQUENCE

First two years mine operation will be dedicated to allow the following:

i) identification, construction and shifting of residential and civil structures belonging to CCL occupied by employee or non-employee;

ii) dismantling of the entire civil structures falling within the active mining area.

Mine operation will start from 3rd year. The start of the quarry has been proposed in the north-eastern part of Bhurkunda Geological Block between boreholes MKBN-12 and MKBN-15. It is proposed to touch the incrop of Argada-D Bottom at a floor RL of 350m. Total twenty one numbers of seams are considered for exploitation with gradient varying from 15^0 to 35^0 (average gradient is 20^0). The quarry will advance from north to south in the dip direction from the proposed entry from the north-eastern side with seam Argada-D as the base seam.

The haul road layout of the mine has been shown in different stage plans prepared for the purpose. The width of the working and non-working benches has been kept at 50m and 30m throughout the life of the mine except first few years.

Dumping of OB is being proposed to be done externally in the area to the north of the quarry.

3.8 MINING SYSTEM

As the seams are steeply dipping, the mine will follow horizontal slicing method. The following mining parameters have been considered in the project.

Sl. No.	Particular	Unit	Value
1	OB Bench Height for 10-12 cum shovels	m	12-15
2	OB Bench Height for 5.5-6.5 cum shovels	m	8-10
3	Coal Bench Height for 10-12 cum shovels	m	12-15
4	Coal Bench Height for 5.5-6.5 cum shovels	m	8-10
5	Working bench width	m	50

Sl. No.	Particular	Unit	Value
6	Non - Working bench width	m	30
7	Bench Slope for OB and coal	Deg	60
8	Blast Hole Dia for OB and coal	mm	250/160
9	Powder Factor in OB and coal	Kg/cum	0.3-0.4 & 0.2

3.9 CALENDAR PROGRAMME OF EXCAVATION

The mining schedule has been formulated based upon the adopted sequence of mine development. Initial two years have been considered as construction period for the project to allow the following activities:

i) identification, construction and shifting of residential and civil structures belonging to CCL occupied by employee or non-employee;

ii) dismantling of the old civil structures falling within the active mining area;

iii) construction of other infrastructure (bridge, roads, buildings, etc.).

Based on the normative annual capacity of the mine as 1.75 MT, the proposed mining schedule is generated for 9 years of mine life (including the construction period of 2 years). The targeted coal production from the mine is envisaged in 8th year. Peak overburden load for the project has been estimated as 6.7 Mcum during 8th year of the mine life and peak-stripping ratio of 6.27 cum/te in the 3rd year. The average stripping ratio of the OCP is 4.13 cum/te.

The summarized mining schedule for coal extraction and corresponding overburden load for the Project is given below:

SUMMARISED MINING SCHEDULE

Period	Year	Coal Production (MT)	OB Removal (Mcum)	Stripping Ratio (cum/te)
Construction	1	-	-	-
	2	-	-	-
Capacity build-up	3	0.50	3.14	6.27
	4	0.80	4.71	5.89
	5	1.50	5.74	3.83
	6	1.50	5.75	3.83
	7	1.50	5.75	3.83
Production period	8	1.75	6.70	3.83
	9	1.75	6.64	3.79
Total		**9.30**	**38.43**	**4.13**

3.10 EQUIPMENT CONFIGURATION

The requirement of mining equipment e.g., shovels, dumpers, drills and dozers etc. have been estimated as per annual productivity based on adopted design criteria and workload determined by the calendar plan considering the physical location of equipment within the operating mine. For calculating the number of dumpers, year wise leads have been taken into account for OB and Coal transportation separately.

The envisaged requirements of main mining equipment for different Variants are given below:

EQUIPMENT SCHEDULE (VARIANT-I)

Type of HEMM	Capacity	Max	3	4	5	6	7	8	9
OB									
Electric Hyd Shovel	10-12 Cum	**4**	1	1	2	2	2	2	2
Diesel Hyd Shovel	5.5-6.5 Cum	**4**	0	1	1	1	1	1	1
Rear Dumper	100 T	**40**	5	8	14	15	15	19	19
Rear Dumper	60 T	**31**	3	10	9	10	10	10	11
Electric RBH Drill	250 mm	**4**	1	1	2	2	2	2	2
Diesel RBH Drill	160 mm	**3**	0	1	1	1	1	1	1
Dozer	410 HP	**7**	2	2	3	3	3	3	3
Coal									
Diesel Hyd Shovel	5.5-6.5 Cum	**2**	1	1	1	1	1	1	1
Diesel Hyd Backhoe	4-5 Cum	**1**	1	1	1	1	1	1	1
Rear Dumper	60 T	**14**	2	3	5	5	5	6	6
Diesel RBH Drill	160 mm	**2**	1	1	1	1	1	1	1
Dozer	410 HP	**2**	1	1	1	1	1	1	1
Common									

Type of HEMM	Capacity	Max	3	4	5	6	7	8	9
Diesel Hyd Backhoe	2-3 Cum	**1**	1	1	1	1	1	1	1
FE Loader	5-6 Cum	**2**	1	1	1	1	1	1	2
Dump Truck	20 T	**8**	6	6	6	6	6	6	8
Drill	110-120 mm	**2**	1	1	1	1	1	1	2
Grader	250-280 HP	**2**	1	1	1	1	1	1	2
Wheel Dozer	460 HP	**2**	1	1	1	1	1	1	2
R T Crane	40T	**1**	1	1	1	1	1	1	1
R T Crane	20T	**1**	1	1	1	1	1	1	1
Mobile Crane	8T	**1**	1	1	1	1	1	1	1
Tyre Handler		**2**	1	1	1	1	1	1	1
Dozer with Ripper Attachment	850 HP	**1**	1	1	1	1	1	1	1
Water Sprinkler	28KL	**2**	1	1	1	1	1	1	2
Reclamation									
Water Sprinkler	28 kL	**1**	1	1	1	1	1	1	1
Dozer	410 HP	**1**	1	1	1	1	1	1	1

EQUIPMENT SCHEDULE (VARIANT-II)

Type of HEMM	Capacity	Max	3	4	5	6	7	8	9
OB	Outsourced								
Coal	Outsourced								
Common									
FE Loader	5-6 Cum	**1**	1	1	1	1	1	1	1
Dump Truck	20 T	**2**	2	2	2	2	2	2	2
Dozer	410 HP	**1**	1	1	1	1	1	1	1
Water Sprinkler	28KL	**1**	1	1	1	1	1	1	1
Reclamation	Outsourced								

NOTE: The maintenance of the HEMM provided in Variant-II has been proposed to be outsourced.

3.11 SPOIL DUMP

Total overburden quantities estimated for Bhurkunda OCP is 38.43 Mcum of OB which needs to be accommodated in the External OB Dump in the area available at the north of quarry. The proposed external dump height is maximum 90m from immediate surface level with an overall slope of $<28^0$. The height of the individual bench is 30m with facing berm width of 30m and side berm width is kept 30m on all sides.

3.12 PRODUCT MIX QUALITY

The quarry proposes to exploit 21 non-coking coal seams. The weighted average grade of the coal has been estimated as 'G7' (GCV range of 5200-5500 kcal/kg).

4.0 MAIN FACILITIES

4.1 PUMPING AND DRAINAGE

Financial provision for pumps, pipes and fittings has been made for both the Variants. The provisions for pumping has been laid down in the following paragraphs.

4.1.1 Selection of Pump and delivery ranges:

On the basis of the calculation and providing additional pumping capacity to handle accumulated water in old opencast & UG workings & provision for stand-by pumps, the main pumps provided for the quarry are as follows:

a) PUMPS: Existing pumps of Bhurkunda Colliery will be used during initial period and subsequently transferred to other projects as these are at 3.3kV whereas fresh provision has been made at 6.6kV.

Main Pumps

Six nos. of 120 LPS x 310 m head and five nos. of 120 LPS x 230m head pumps have been provided for the quarry. Out of these pumps, one pump each has been kept as standby.

Low Head Pumps

Five nos. of 120 LPS x 150 m head and three nos. of 38 LPS x 60 m head pumps have been provided during initial mining operation. Out of these pumps, one pump each has been kept as standby. 120 LPS x 150 m head pumps will be utilized to dewater the accumulated water in old quarries.

Face Pumps and Slurry Pumps

Four nos of Face Pumps of 15 LPS x 60 m head and four nos of Slurry Pumps of 22 LPS x 45 m head capacities have been provided to pump out the water & slurry respectively accumulated near the working faces of the quarry. Out of these pumps, one pump each has been kept as standby.

Diesel Pump

One number of 80 LPS x 310 m head diesel pump has been provided for emergency requirement for quarry.

b) SELECTION OF DELIVERY RANGES

The delivery ranges have been selected on the basis of the pumping capacity during probable maximum rainfall and velocity of flow within the reasonable limit. The delivery ranges for

different capacity of pumps have been selected for nominal diameters as 250mm, 200mm, 150mm and 100mm for the pumps as per manufacturer's standard.

4.2 POWER SUPPLY

4.2.1 Source of Power & Supply Voltage

The proposed Bhurkunda OCP is located in Barka-Sayal Area of CCL. Presently, Bhurkunda Substation is receiving power at 11 kV from the existing 33/11 kV substation at Giddi Washery located at about 9 km from the existing substation. Giddi washery substation is under the administrative control of Argada Area. This sub-station receives power at 33 kV from Naisarai Station of DVC 10.6 MVA, 11/3.3kV. Bhurkunda sub-station consists of 1X3MVA, 2X2 MVA, 2X1 MVA, 1X1.6MVA transformers.

4.2.2 Proposed Scheme of Power supply & Distribution

Considering the population of electrical HEMMs, CHP, Pumping and other common loads proposed in this report, a 2X10 MVA 33/6.6kV project substation has been envisaged for the project. Existing 11/3.3 kV substation will not be able to meet the increased power demand of the project. The existing substation is also located inside the mining area of the proposed project. Therefore the existing substation will cater only existing loads and subsequently will be dismantled.

Proposed 2X10MV A33/6.6kV project sub-station will receive power at 33 kV from double circuit 33 kV overhead line feeder from 33/11 kV Urimari substation of CCL. Urimari substation receives power at 33 kV from BASAL/JSPL Sub-station of DVC. Approximate distance of proposed project Sub-station from Urimari substation is 10 km.

4.3 COAL HANDLING PLANT

One CHP, located near the quarry mouth, has been proposed to handle the entire coal production of 1.75 MTY from the Project.

The coal handling plant will have facilities for receiving ROM coal from rear discharge dumpers at the quarry mouth of mine, crushing of coal from 1200 mm to (-)100 mm size, conveying, storing in ground bunker. Crushed coal will be conveyed through belt conveyors to nearby existing Saunda Railway Siding. Coal from bunker will be reclaimed through plough feeders and it will be loaded into wagons through RLS and Hoppers. Coal handling plants have also been provided with suitable repair, communication and other auxiliary facilities to meet the day to day requirement in the plant operation.

4.3.1 Design Parameters

The following parameters have been considered while designing & planning of different units of coal handling plants:

(a)	Coal production of mine in MTY	1.75
(b)	Number of working days/year	330
(c)	Number of working shift/day	3 (8 Hrs. each)
(d)	Number of effective working hours/day	15
(e)	Type of unloading dumper at receiving pit of CHPs	Rear Discharge Dumper 60Te.
(f)	Feed size of ROM. coal (in mm)	1200 mm
(g)	Product size (in mm)	(-) 100 mm
(h)	Type of conveying and loading	Conveyor transport of coal to rail wagon through RLS
(i)	HGI/Grade	40-60

4.4 RAILWAY SIDING

It has been proposed that coal from Bhurkunda OCP will be dispatched by rail from the existing Saunda (B) railway siding. For this purpose additional rail track has been proposed in parallel with the existing rail line at this siding. It is proposed that the additional railway line at siding will be taken off from signalling junction of the existing Saunda (B) siding. The length of the yard of proposed railway line will be about 1.6 km to accommodate a full rake of 58 'N' wagons before and after the loading hopper (Pre and post loading). Rapid load out system fitted below loading hopper has been envisaged for loading of coal into rail wagons. The loading hopper will be constructed above the loading line.

Empty rake would be brought by railway loco at the loading point of railway siding and wagons will be placed for loading through RLS fitted blow the hopper. The loaded rake will be dispatched to the desired customer.

4.5 WORKSHOP & STORE

For Variant-I (Departmental Variant), a new unit workshop has been proposed. This unit workshop is envisaged to cater the need of daily maintenance, schedule maintenance, lubrication, routine inspection, minor repair and replacement of parts/sub-assemblies of HEMM such as- Dumpers, Dozers, Shovels, and Drills etc. Minor repair of assemblies and sub-assemblies of pumps, CHP equipment, electricals etc. deployed in the project will also be performed in this workshop.

Any major repair of equipment and manufacturing of spares on large scale are beyond the scope of this workshop.

This unit workshop will have two parts – Excavation and E&M workshops. Apart from this, Project store and other common facilities have been provided.

In Variant-II, coal production & OB removal has been proposed to be outsourced. However, Coal Handling Plant is proposed to be run departmentally. For this variant, only a small E&M workshop has been provided for day to day work. Few HEMM under common category have been provided in this variant. However the maintenance of the above HEMM will be outsourced and no separate Workshop has been provided for the same

4.6 MANPOWER & PRODUCTIVITY

Manpower requirements are assessed on the basis of 7 days week and 330 days of annual working. The peak manpower of the project has been estimated as 942 for Variant-I and 212 for Variant-II. The category wise breakup of manpower for Variant-I & II is given below:

Variant-I

Sl No	Manpower Particulars	Category	Max. Man Power	
			No.	%age
1	Unskilled	I	39	7.83
2	Semi-skilled	II, E	48	9.64
3	Skilled	C, D, III, IV, V, VI	207	41.57
4	Highly skilled	A, B	204	40.96
5	**Total Workers**		**498**	**100/68.78**
6	Monthly Paid		184	25.41
7	Officers		42	5.80
8	**Total manpower**		**724**	**100**
9	OMS (Te)		9.16	

Variant-II

Sl No	Manpower Particulars	Category	Target Year (14th Yr)	
			No.	%age
1	Unskilled	I	6	6.90
2	Semi-skilled	II, E	5	5.75
3	Skilled	C, D, III, IV, V, VI	70	80.46
4	Highly skilled	A, B	6	6.90
5	**Total Workers**		**87**	**100**/41.04
6	Monthly Paid		95	44.81
7	Officers		30	14.15
	Total manpower		**212**	**100**

4.7 HOUSING

For a housing satisfaction of 55%, a provision of 398 quarters has been made for Variant-I and 117 for Variant-II. All existing quarters will be demolished due to quarry operation, hence 442 no. of replacement quarters for Saunda Colliery has been provided in addition to 518 quarters in Variant-I. Similarly, 692 replacement quarters (i.e., 442 for Saunda Colliery & 250 for Bhurkunda Colliery) has been provided for in Variant-II. The township is proposed to be constructed either on the vacant land, if available, in the nearby existing township of Barkakana or by the side of Ranchi-Ramgarh via Patratu road (State Highway No 2) nearest to Bhurkunda. Provision of 40.0Ha land for construction of township and rehabilitation site at the new location(s) has been made.

4.8 SERVICE BUILDINGS

It is proposed to provide facilities for medical, educational, recreational & shopping for Bhurkunda OCP. Provision has been made in this report for construction of Project office, workshops, Store, substation, first aid center, canteen, rest shelter, Community buildings etc..

5.0 ECONOMICS

5.1 For Project Report of Bhurkunda OCP, at the peak rated target production of 1.75 Mty of coal, the estimated economics has been worked out in two variants considering departmental workings for both Coal winning & OB removal as Variant-I and outsourcing of Coal & OB both as Variant-II.

5.2 TOTAL CAPITAL INVESTMENT

Initial capital investment has been provided in the proposal till the 8th year i.e. the year of achieving rated coal production. The capital investment, both Initial Investment as well as Investment beyond target year, has been proposed from the internal resources of the Company. The additional capital requirements for the two Variants are given below:

Figures in Rs. Lakhs

SL NO	PARTICULARS	TOTAL PROVN
		VARIANT I
1	Land	2094.50
2	Buildings:	
	Service	8149.94
	Residential	6436.75
3	Plant & Machinery	
	a) H. E. M. M.	23227.18
	b) Others than HEMM	18357.31
4	Furniture & Fittings	85.82
5	Railway Siding	3067.02
6	Vehicles	300.88
7	Prospecting & Boring	75.75
8	Development	
8.1	Capital Outlay in Mines	2989.91
8.2	Roads & Culverts	5057.22
8.3	Water Supply & Sewerage	2023.13
8.4	Scientific Research	
8.5	P.R Preparation Cost	516.81
9	Revenue Exp. capitalised during development Period	1670.48
10	Land Reclamation	451.01
	INITIAL CAPITAL	**74503.72**

Bhurkunda UG (0.30 MTY)),

CHAPTER I

INTRODUCTION

1.1 Background of the Report

Bhurkunda Colliery is situated in Ramgarh district, in the state of Jharkhand and falls in South Karanpura Coalfield. This colliery is under the administrative control of Barka-Sayal area of Central Coalfields Limited (CCL), a subsidiary of Coal India Limited. The HQ of CCL is at Darbhanga House, Ranchi, Jharkhand at a distance of about 48km from Bhurkunda Colliery.

Mining of coal in Bhurkunda Colliery started in the year 1924 under the ownership of State Railways and subsequently transferred to National Coal Development Corporation (NCDC) in 1956. Later in the year 1973, it came under the control of Central Coalfileds limited (CCL) and now it is under the administrative control of Barka-Sayal Area of CCL.

The work on "Detailed study of Techno-Economic parameters and Time bound Action Programme for phasing out worst of uneconomic mines with deployment of labour force elsewhere gainfully" has been given to CMPDI by the General Manager (P&P) of Central Coalfields Limited (CCL), vide letter no. GM (P&P)/ Work order/CCL/2016/2276-81, dated: 28/29.11.2016. With this above background, Under Ground Mining Division, CMPDI (HQ) took up the job of preparing a scheme for improvement on Bhurkunda UG Mine, CCL.

A team of officers from Underground Mining Division of CMPDI (HQ) visited the Bhurkunda UG mine to study the present mine workings and collected relevant data.

1.2 Present Mining *Activities*

The mining in Bhurkunda Colliery started in the year 1924 under the ownership of State Railways and subsequently transferred to National Coal Development Corporation (NCDC) in 1956. Later in the year 1973, it came under the control of Central Coalfileds limited (CCL).
At present Hathidari and Bansgarha seams are being worked by bord and pillar system of mining using SDLs. Development of both the seams are complete and currently depillaring with caving is practised to exploit the rest of the reserve.

1.3 Present Production

The production from Bhurkunda underground mine achieved during last few years are as given under:

	2012-13	2013-14	2014-15	2015-16
Production (Lakh Te)	1.43	1.49	0.85	1.02

CHAPTER - II

Mine information

2.1 Location

The Bhurkunda UG mine is situated in Ramgarh district, in the state of Jharkhand and falls in South Karanpura Coalfield. This colliery belongs to the Barka-Sayal Area of Central Coalfields Limited (CCL), a subsidiary of Coal India Limited. The HQ of CCL is at Darbhanga House, Ranchi, Jharkhand at a distance of about 48km from Bhurkunda Colliery. The Colliery is bounded by latitudes 23º39'00" to 23º41'00" North and longitudes 85º21'00" to 85º23'00" East. (See Plate No.1)

2.2 Mine Boundary

(a) Northern Boundary

Ramgarh–Patratu Road and Nakari River pass through the northern side of the mine. Sangam OCP is located on the north-eastern side of the mine. The incrop line of Bansgarha seam approximately forms the north eastern boundary of the Bhurkunda UG mine.

(b) Southern Boundary

The southern boundary of the mine is fixed at the fault F1-F1. Balkudra quarry is located on the south-west of the mine.

(c) Eastern Boundary

The leasehold boundary of Bhurkunda colliery serves as the eastern boundary of the mine. Jawahar Nagar colony is also located on the eastern side of the mine.

(d) Western Boundary

The Western boundary of the mine is restricted by the Kurse Nalla and the Nakari River.

2.3 Accessibility and Communication

The area is well connected by rail and road. The nearest Railway station Bhurkunda of Eastern Railway on Gomoh-Barkakhana-Dehri-On-Sone loop line is about 3km from the Project. The State Highway No 2 (SH-2) is about 2km from the southern part of the block which connects Ramgarh (about 16km) in the east and Patratu (about 10km) in the west. The existing road connects the block with other adjoining projects and also the office of the GM, Barkasayal. The block is about 48km from Ranchi via SH-2. The nearest commercial airport is situated at Ranchi.

2.4 Climate and rainfall data

The area witnesses a tropical climate. The daily mean temperature zone as per annual Temperature Map of India (National Atlas) is 22.50 C to 250 C. Heavy rainfall occurs in the month of July to October. The average annual rainfall varies from 1200-1400mm of rain fall (Source: IMD, Hazaribagh).

2.5 Topography with drainage pattern of area

The area has a gentle undulating topography. The drainage is by Nakari River which also forms the north-western boundary. Nakari River flows towards north and joins west to east flowing Damodar River. Part of the land where there is no mining activity consists of residential and civil structures.

2.6 Reports Prepared for Bhurkunda Mine

A Project Report for Bhurkunda colliery was prepared in 1959 for a production of 1.04 Mty including both underground and opencast. The PR was sanctioned for a capital investment of Rs. 357.66 Lakhs. The reserve of the coal as estimated by the IBM at that time was about 99 million tonne.
A Revised Project Report was prepared for Reorganisation of Bhurkunda UG mine for a capacity of 0.36 Mty for an investment of Rs. 11.3 crores in 1996. Extraction of four coal seams viz. Upper Nakari, Lower Nakari, Upper Semana and Lower Semana were envisaged in this report. These seams had an estimated extractable coal reserve of 2.92 million tonne.

CHAPTER - III

GEOLOGY & DEPOSIT APPRAISAL

3.1 INTRODUCTION

Bhurkunda UG mine is an existing mine of CCL and is located in the south eastern part of the South Karanpura Coalfield. Actual mining operation are being done at Bhurkunda Colliery since 1924. Geological Report was prepared for Bhurkunda Block, South Karanpura Coalfield by MECL in January, 1987. The geological information in this scheme are based on the data available from (i) Geological Report on Coal Exploration, Bhurkunda Block, South Karanpur Coalfield (1987), (ii) RPR for Re-organisation of Bhurkunda UG mine in 1996 and (iii) Data supplied by officials of Bhurkunda Colliery ,CCL.

3.2 AREA

The block is covered in Survey of India toposheet no. 73E/6. The Block covers an area of 4.5 sq km.The Bhurkunda UG mine covers an area of only about 1.2 Sq.km on the south western part of the Bhurkunda Geological Block. The rest of the area on the north eastern part is covered by quarries of Bhurkunda / Sangam OC mine. The area of UG working is 132.33 ha with an overlap of 32.30 Ha with OC Workings.

3.3 DRILLING

A total of 47 nos. of boreholes have been drilled in Bhurkunda geological block. Out of these 47 boreholes only one borehole has intersected Hathidari seam and two boreholes have intersected Bansgarha and Bansgarha A seams. The incrop line of Bansgarha seam approximately forms the north eastern boundary of the Bhurkunda UG mine.

3.4 GEOLOGICAL STRUCTURE OF THE BLOCK

The general strike of the formation in the block is North West to south east, gently swinging towards north-south.The general dip of the strata varies from 1 in 5 to 1 in 6.

3.5 FAULTS

No geological fault has been encountered within the Bhurkunda underground mininig area. However the Fault F1-F1 exists on the south-western side of the mine and this fault forms the dip side (south-western) boundary of Bhurkunda UG mine.

3.6 COAL SEAMS

Bhurkunda colliery is an old mine. Existance of following seams within the underground mining area has been proved (in order from top to bottom):

1. Kurse
2. Upper Nakari
3. Lower Nakari
4. Upper Semana
5. Lower Semana
6. Hathidari
7. Bansgarha
8. Upper Sirka
9. Lower Sirka
10. Argada
11. Argada A

A brief description of coal seams i.e Kurse, Upper Nakari, Lower Nakari, Upper Semana and Lower Semana are as under.

Kurse seam is the topmost seam in the mining area under consideration.The thickness of the seam varies from 4.51m to 6.79m.The kurse seam was entirely depillared by caving method before 1944.

The Upper Nakari seam is comparatively thinner seam than Kurse seam. The thickness of the seam varies from 2.68m to 3.96m. The parting with Kurse seam varies from 10m to 17m. The seam has been entirely developed. Pillar extraction started in the lower part of the seam with pneumatic stowing in 1966

Lower Nakari seam is also member of the Barakar Formation.The thickness of the seam varies from 1.80m to 3.45m in the block. The parting between the upper Nakari and Lower Nakari seam varies from 12.48m to 18.35m. while parting between the Lower Nakari seam and Upper Semana seam varies from 20.17m to 29.52m in the block.The general gradient of the seam is 1 in 5. The seam has been entirely developed and depillared.

Upper Semana seam is one of the most important members of the Barakar Formation.The parting with the overlying seam varies from 20.17m to 29.52m in the mining block.The parting with the underlying seam Lower Semana varies from 10.10m to 41.15m. The thickness of the seam varies from 2.89m to 5.68m in Bhurkunda Block. The average thickness of the seam is about 4.27m. The coal of Upper Semana seam is non-coking grade A. The seam has been entirely developed and depillared partly with caving and partly with stowing.

The parting between Upper Semana seam and Lower Semana seam varies from 10.10m to 41.15m while parting between Lower Semana seam and Hathidari seam varies from 20m to 42m in the block. The thickness of the seam varies from 2.55m to 4.62m in Bhurkunda Block. The seam has been entirely developed and depillared.

The Geological Plan of the entire Bhurkunda Block is given as Plate 2.

CHAPTER - IV

Mining activity

4.1 Past mining activities

Bhurkunda UG Colliery is an old mine. All the coal seams from Kurse to Argada have been extensively worked in different sectors by underground and opencast methods.The present status of mining in different coal seams has been shown in the Table given below.

Seam	Degree of Gassiness	Grade of Coal	Date of opening	Status of Mining
Kurse	II	B	1962	Fully worked.
U. Nakari	II	B	1962	Fully worked.
L. Nakari	II	C	1971	Fully worked.
U.Semana	II	A	1972	Fully worked.
L.Semana	II	D	1964	Fully worked.
Hathidari	II	C	1964	Fully developed and depillaring with caving under progress.
Bansgara	II	D	1973	Fully developed and depillaring with caving under progress
U.Sirka	III	B	1936	Fully developed. One panel depillared, rest standing on pillar, water upto 16th level, worked in sangam.
L.Sirka	III	B	1948	Fully developed. Standing on pillar, worked in Sangam OC.
N.Sirka	III	B	1965	Fully developed and Partly depillared.
Qry.Sirka	III	B		Developed by horizon mining standing of pillars.
Argada	III	B	1957	Developed, Standing on pillar, worked in Sangam OC
Argada A	III	C	1981	Partly Developed, worked in Sangam OC

A schematic diagram of a representative section showing the coal seams and their status is given in the next page.

SECTION OF COAL SEAM IN WORKINGS OF BHURKUNDA U/G

NAME OF THE SEAM	SECTOR	THICKNESS	PARTING	REMARKS
KURSE				Exhausted
UPPER NAKARI				Exhausted
LOWER NAKARI				
UPPER SEMANA				Exhausted
MIDDLE SEMANA BOT.				
LOWER SEMANA				Exhausted
SEMANA 'A'				
HATHIDARI				Fully developed and depillarlng . with caving under progress.
BANSGARAH				Fully developed and depillaring . wlth cavlng under progress.
UPPER SIRKA				Fully developed
LOWER SIRKA				Fully developed,Standlng on pillar, worked in Sangam OC
ARGADA				Fully developed,pllIar worked in Sangam OC
ARGADA 'A'				Fully developed,pillar worked In Sangam OC

The extent of workings in different seams have been shown in Plate No.3. It can be seen that entries to the seams (Sirka and Argada) below Bansgarha are beyond the boundary of underground mine, towards the rise side of incrop line of Bansgarha seam. But the dip side workings of these seams (Sirka and Argada) extend well below the present underground mining areas of Hathidari and Bansgarha seams.

4.2 Present Mining Activity

At present Bhurkunda UG Colliery has two working units, namely, Hathidari Incline and Bansgarha Incline.

4.2.1 HATHIDARI SEAM

Hathidari seam is being worked by a set of inclines (Hathidari Incline). The entire property has been developed by bord and pillar method. The southern and eastern parts of the property has either been depillared or cannot be depillared due to presence of heavily built up area on the surface. On the northern side of the main trunk roadway, 2 panels have been depillared. (See Plate No. 4)
The extractable coal from the remaining property where depillaring can be done is only around 13 lakh tonne.

4.2.2 BANSGARHA SEAM

Bansgarha Seam which lies below the Hathidari seam is being worked by a set of inclines named as Bansgarha Incline. Here also, the entire seam has been developed in bord and pillar method. Only one panel has been depillared on the southern side of the main trunk roadways. A large part of the area falling on the south-eastern part of the main trunk cannot be depillared due to presence of heavily built up area on the surface. (See Plate No. 5) The entire north-western part of the seam is standing on pillar which can be depillared after depillaring of the corresponding panels of the Hathidari Seam above it. Bansgarha seam has a remaining extractable reserve of around 29 lakh tonne.

4.3 Geo-mining Characteristics

4.3.1 GEO-MINING PARAMETERS:

The general strike of the formation in the block is North West to south east, gentely swinging towards north-south.The general dip of the strata varies from 1 in 5 to 1 in 6. However near the faults, the dip becomes steeper i.e 1 in 3.5 to 1 in 4.

Geo-mining characteristics of the seams have been given in the following table.

Particulars	Characteristics of seams	
	Hathidari	Bansgarha
Area of the coal bearing within Geological Block Boundary (sq.km)	**1.2**	
No.of Borehole intersections	**1**	**2**
Seam Thickness range(m) of the Block	**2.26-2.26**	**4.06-4.27**
Average thickness (m) in Mining Area	**3.75**	**4.27**
Av. Seam Gradient	**1 in 5 to 1 in 6**	
Average grade of coal	**G-8**	**G-8**
Gassiness	**Degree II**	**Degree II**
Immediate roof	**Sand Stone**	**Sand Stone/Shale**
Extractable reserve (mte)	**1.3(Balance)**	**2.9(Balance)**
Status of mining	**Depillaring in progress**	**Depillaring in progress**

4.3.2 BEHAVIOR OF IMMEDIATE ROOF

The roof of Hathidari and Bansgarha seams are of fair category (Class III) having RMR value of around 49.

4.4 Underground Constrains

The seam gradient is about 1 in 5 at the incrop side near the inclines of Hathidari and Bansgarha seam. Hathidari and Bansgarha seam have already been developed by Bord & Pillar method. In some places the gallery width is more than 5m to 6m and aligment of the galleries are not maintained. The formation of panel system along the strike direction are also not maintained properly.

Additionally, there is OB from Balkudra opencast patch is being dumped on the surface above the Hathidari and Bansgarha seam workings. Therefore the stability of the underground coal pillars may be assessed by a scientific body.

4.5 Mining Method

The developed pillars in both Hathidari and Bansgarha seam are being depillarded with caving. Preparation of coal at the faces are done by blasting off the solid. Blasted coal is loaded in to tubs and hauled by tugger haulage installed in the district. The machineries deployed in each district include three SDLs, one UDM, one roof bolter, one tugger haulage etc.

4.6 Transport

Loaded coal tubs hauled by tugger haulage are being taken to the main trunk road. The direct haulage installed on the surface in tern hauls the loaded coal tubs and tubs are unloaded in to surface bunker, wherefrom coal is despatched by trucks.

4.7 Ventilation

Each unit of the underground mine has a separate ventilation circuit. One ventilation fan for each unit (PV 200 fan) is istalled which caters to ventilation requirement of Hathidari and Bansgarha units.

4.8 Manpower

The present manpower of Bhurkunda underground mine (January 2017) is 642.

4.9 Production

Bhurkunda underground mine produced 1.025 lakh tonne of coal in 2016-17 (till 31.01.2017)

4.10 Cost of Production

The cost of production in Bhurkunda underground mine are Rs. 8618/Te and Rs. 7343/Te during 2015-16 and 2016-17 (till January 2017) respectively.

4.11 Balance Extractable Reserve

The extractable coal from the remaining property of Hathidari seam where depillaring can be done is only around 13 lakh tonne. Bansgarha seam has a remaining extractable reserve of around 29 lakh tonne.

Seam/Sections	Balance Extractable Reserve (MT)

Hathidari	1.3
Bansgarha	2.9
Total	**4.2**

CHAPTER - V

Scheme for improvement

5.1 Future Mining options:

The following options were considered / studied for improvement in procuction and productivity from Bhurkunda underground mine.

5.1.1 Introduction of Continuous Miner:

Prima facie it appears that deployment of a continuous miner may not be feasible in this mine due to the following reasons:

- The inclination of the seam varies from 1 in 5 to 1 in 6. Movement of shuttle cars will be difficult at this gradient.
- The remaining extractable reserve is only about 42 lakh tonne.So sufficient quantity of coal may not be available for one continuous miner.
- Coal evacuation system from both the units (Hathidari and Bansgarha) is by rope haulage. The system of coal evacuation will have to be changed to conveyor belt system to deploy a continuous miner. The seams are already developed in the bord and pillar system and no gallery in strike direction is straight enough to lay a gate belt conveyor. A series of pony belts are required as substitute to a gate belt.
- The inclines are not of adequate size in cross-sectional area and will have to be widened for lowering CMs which involves both time and cost.

5.1.2 Improvement in productivity of the existing system

Continue as per existing system i.e one district in each seam with 3SDLs in a district. Production from each district which can be achieved is around 250 TPD. Total production from two seams nearly 500 TPD i.e 0.15 MTY.

The main hindrance of existing system is the inability of tugger haulages installed in the panels to haul more than four loaded tubs at a time. Providing higher capacity tugger haulages in the panels may increase production and productivity.

5.1.3 Working with Two SDL districts in each Hathidari Seam & Bansgarha seam

If one depillaring district can be increased in each of Bansgarha seam and Hathidari seam, the production can be increased up to 1000 TPD i.e 0.3 MTY up to 9th year after that exhaustion of reserves in Hathidari Seam in 10 th year only 0.15 MTY production can be achieved from two depillaring districts of Bansgarha Seam, because the extractable reserves of Hathidari Seam is only 1.3MT and Bansgarha seam is 2.9 MT.

As the capacity of coal evacuation system by direct haulage is limited in both the Seam, it will not be able to handle the coal produced from two districts (about 500 TPD) in each Hathidari Seam and Bansgarha seam. A system of coal transportation by conveyor belts is to be installed.

5.2 Suggested Option

Out of the above options, the third option has been envisaged to be undertaken to enhance the production from Bhurkunda underground mine. The details of this option are elaborated in the following chapters.

5.3 Details of proposed scheme for improvement

5.3.1 MINING STRATEGY AND PRODUCTION TARGET

Presently depillaring with caving of developed pillars is being carried out in both Hathidari and Bansgarha seams. The same method will continue to liquidate both the seams. Panels in Bansgarha seam will be depillared after extraction of pillars in the overlying corresponding panel in Hathidari seam.

5.3.1.1 HATHIDARI SEAM

It is proposed that depillaring with caving will be done in Hathidari seam by deploying of two SDLs districts. Coal winning will be done by blasting off the solid. It is proposed that coal will be loaded onto pony belt by three SDLs in each district.The existing tugger haulage is not capable of pulling more than four loaded coal tubs at a time. Hence the existing haulage system is proposed to be used exclusively for material transport and the new set of belt conveyor system is installed for coal transportation so that it can enhance the production. This will improve the productivity of the system. A production of 500TPD is envisaged from Hathidari seam.

For coal evacuation from underground, belt conveyor system of transport has been proposed. Provision for construction of underground staple pit on trunk roadway in Hathidari seam is to be made for proper evacuation of coal from Hathidari seam to Bansgarha Seam. This will minimize the trunk belt and incline belt conveyors in Hathidari seam, thereby saving energy cost.

5.3.1.2 BANSAGARHA SEAM

Developed pillars of Bansgarha seam are also being depillared with SDLs. Currently one depillaring panel is in operation in this seam also. Coal winning is being done by blasting off the solid while coal loading onto tubs is being done by three SDLs. Coal evacuation from the district are being done by a tuggger haulage.

It is proposed to change the coal evacuation system by introducing pony belts in the district and belt conveyors in the trunk roadway and incline. The details of coal conveying system have been elaborated in following chapters. Two such depillaring districts are proposed to be operated simultaneously in Bansgarha seam.

The introduction of conveyor system will improve the over all system efficiency and a production of 250 TPD is expected from one depillaring district. So a production 500 (250X2) TPD is envisaged from the two depillaring districts of Bansgarha seam.

The major equipment required in each district is shown in the Table below

S.No.	EQUIPMENT	NUMBER
1	SDL	3
2	UDM	1
3	Pony belt at face	3
4	Pony belt as Gate Belt	3

S.No.	EQUIPMENT	NUMBER
5	Tugger Haulage	1
6	Roof Bolter	1

5.4 Coal and Material Transport

5.4.1 MINE TRANSPORT SYSTEM OF HATHIDARI SEAM

The Existing haulage system for Material transport is proposed to be continued to operate in Hathidari seam. It is proposed to install the new set of belt conveyor system by using Pony belt/ Gate belt/ link belt for transportation of coal from face to Bansgarha seam through a proposed staple pit.

5.4.1.1 TRANSPORT THROUGH INCLINE

Existing system of haulage is proposed to be used only for material supply through incline from surface to face in Hathidari Seam.

5.4.1.2 UNDERGROUND COAL TRANSPORT

Centralized coal evacuation system is proposed.One Staple pit is proposed in Hathidari seam.The staple pit will be created at 11th level in the trunk roadway of the Hathidari Seam and will be connected with the Bansgarha Seam at 13th level.

It is proposed that a link belt conveyor (PB3) of 1000mm width and approximate 100m length will be installed in Trunk heading of Hathidari Seam. In Panels, the blasted coal will be loaded by SDLs on to pony belt conveyors and pony belt conveyors will discharge coal on to gate belt conveyors for evacuation the coal from panel. Coal received from gate belt/pony belt conveyors to the link belt conveyor (LB1) of 1000mm will be transported to Bansgarha seam through Staple pit. Combination of pony belt conveyors (PB1) and (PB2) of 800 mm width and 200m length and 100m length respectvely shall be used as gate belt conveyors.

However Considering length of gate roadways and its straightness, combination of the pony belt conveyors for gate road shall be decided. Another set of pony belt conveyors of 100m length is proposed for transportation of wining coal from the face to the gate road

5.4.2 MINE TRANSPORT SYSTEM OF BANSGARHA SEAM

It is proposed to use the existing haulage system exclusively for material transportation and a new set of belt conveyor system is to be installed for coal transportation in the Incline No-2 which is presently being used as travelling roadway.

The description of the belt conveyor system in Incline No. 2 for transportation of coal is given below. A schematic diagram of the same is given as Plate No-6.

5.4.2.1 TRANSPORT THROUGH INCLINE

One incline belt conveyor (IB1) of 1000mm width and approximate 350m length is proposed to be installed for transportation of coal from underground to the surface through the incline no.2. This conveyor will transport coal at surface up to a distance of 100m approximate from the incline mouth.

5.4.2.2 UNDERGROUND COAL TRANSPORT

A link belt conveyor (LB1) of 1000mm width and approximate 100m length is to be proposed to receive coal from staple pit and link belt conveyor will discharge the coal on to Trunk belt conveyor.In the trunk road, two trunk belt conveyor (TB1) each of 1000mm width and approximate 350m length will be installed in series. From two SDIs districts, the blasted coal will be loaded by SDLs on to pony belt conveyors and pony belt conveyors will discharge coal on to gate belt conveyors for evacuation the coal from panel.

Hence, Coal received from gate belt conveyors to the incline belt conveyor (IB1) will be transported through these trunk belt conveyors. Combination of pony belt conveyors of 200m length and 100m length shall be used as gate belt conveyors. Depending upon the requirement, length of gate road and its straightness, combination of the pony belt conveyors for gate road shall be decided. To transport wining coal from the face to the gate road another sets of pony belt conveyors of 100m length shall be used.

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A schematic diagram of underground coal transport layout is shown in Plate No.6.

The brief details of the proposed belt conveyors are given in the table below:

Coal Transport System							
Sl. No.	Name	No.	Width	Lift	Length	Power	Location
			(mm)	(m)	(m)	(kW)	
1	IB1	1	1000	50	350	2x75 NFLP	Incline
2	TB1	2	1000	60	350	2x75	Trunk Road
3	PB1	8	800	0	200	37	Gate Road
4	PB2	16	800	0	100	22	Gate Road & Face
5	LB1	2	1000	0	100	22	Link Belt

5.4.2.3 SURFACE TRANSPORT SYSTEM

At a suitable place on the surface beside the existing coal unloading system, a new surface storage bunker is proposed to be constructed. The capacity of the bunker will be (2X250) Te to accommodate coal of at least one shift production of the seams. One cross country conveyor with 800mm belt width and approximate 100m length is proposed to be installed at the surface from the drive end point of the incline belt conveyor (IB1) of Bansgarha Seam to the top of the surface bunker. Coal coming from underground through the incline belt (IB1) of Bansgarha seam will be transported and loaded to the surface bunker by the surface conveyor. At the chute of surface bunker, a bottom discharge arrangement shall be provided to facilitate direct truck loading from the surface bunker as and when required.

5.5 Power supply

Source of Power

The power shall be supplied to the mine by installing an additional transformer of capacity 1250 kVA, 11/3.3 kV at Argada Substation. The additional transformer shall operate in parallel with existing 2000 kVA, 11/3.3 kV transformer and the power shall be fed through existing 3.3 kV DOG conductor

overhead transmission line supplying power to underground mine. The proposed power consuming units of the Bansgarha & Hathidari Seam will be underground mining machinery, underground conveyor belts, CHP etc.

Power Distribution Boards (at Argada Sub-station) for supplying power to Bansgarha & Hathidari Seam

A 3.3 kV, VCB, NFLP, 4 panel power distribution board complete with vacuum circuit breakers is to be installed inside the existing substation building. The panel receives power from 1250 kVA, 11/3.3 kV transformer and feed power to existing 3.3 kV overhead transmission line. The power distribution panels with all protections & metering shall be provided in the substation for controlling the power supply to the Bansgarha Seam. The details of the switch board are given in the Table-3 below:

Table 3: Details of Surface Power Distribution Panel Supplying Power to Mine

Particulars	Quantity
-Incoming feeder control 3.3 kV VCB with CT & protections	1 no.
- Capacitor bank control 3.3 kV VCB with CT & protections	1 no.
- Overhead feeder control 3.3 kV with protective relays	1 no.
- Spares feeder control 3.3 kV VCB with CT & protections	1 no.
Total :	4 panels

POWER DISTRIBUTION FOR BANSGARHA SEAM

Power Distribution at Surface

A 250 kVA, 3.3 kV/ 415 V transformer shall be installed at the pit top of Bansgarha seam for supplying power to surface distribution as CHP, spreader conveyor, Incline belt etc. The proposed transformer will receive power from outgoing of 3.3 kV underground FLP panel through 3.3 kV, PVCSWA, 3 x 70 mm2 cable. A 5 panel, 415 V, MCCB, NFLP proposed to be installed for surface power distribution. The panel will receive power from proposed 250 kVA, 3.3 kV/ 415 V transformer.

Power Distribution Boards (at surface) for UG power Supply

A power distribution board of 2 panels, 3.3 kV NFLP complete with vacuum circuit breakers shall be installed near the existing borehole for transmitting power to the Bansgarha Seam through 3.3 kV, PVCDWA, 3 x 16 mm2 cable. The cable shall be entered to the mine through this existing borehole.

Estimated Maximum Demand, Assessed Active Demand & Proposed Connected Load for Additional UG Machineries

The estimated maximum power demand & assessed active demand considering diversity and corrective power factor (0.96 lag) and the proposed connected load are shown in the Table-5 below (Refer Power Balance Chart):

Table-5: Maximum Demand, Active Demand & Connected Load

	Maximum Demand (kVA)	Assessed Active Demand (kW)	Proposed Connected Load (kW)
For Surface & UG Supply	773	742	1720

Energy Consumption

The annual energy consumption has been estimated on the basis of working hours per year equipment wise. The estimated annual energy bill at this peak level of production is around Rs.485.97 lakhs (Energy cost Rs.7.68 per kWh).

Table-7: Specific Energy Consumption, Specific Energy Cost for Additional Production

Specific Energy Consumption (kWh/Tonne)	Specific Energy Cost (Rs./Tonne)	Additional Production (MTY)
27.30	269.98	0.18

System Voltage

Incoming supply voltage: 11 kV
Outgoing supply voltage: 3.3 kV
Capacitor Bank: 3.3 kV
Surface transport: 415 V
Coal Handling Plant: 415 V
UG Supply: 3.3 kV

Power Factor Improvement

To improve and maintain a high system power factor of around 0.96 (lag) during average and maximum demand hours, one set of 3x220 kVAR, 3.3 kV capacitor bank has been proposed for the Bansgarha & Hathidari seam. Capacitor bank shall have the facility of automatic switching on and switching off to the power supply system depending upon the loading of the substation transformer.

Underground Power Supply Distribution

The power is transmitted into the mine through 1 no. of 3.3 kV, PVCDWA, 3 x 16 mm2 cables. The cable shall be entered into the mine through existing borehole to Bansgarha seam and it will further extended to the Hathidari seam through borehole near proposed staple pit. The detail of the proposed underground distribution system is shown in Proposed Electrical Layout.

HT FLP Distribution Board

At 17L (near existing UG substation) of Bansgarha seam a proposed 10 panel VCB 3.3 kV FLP type HT distribution board shall be installed to supply power to the Trunk Belts TB1 & TB2, SDL district panels, 3 panel VCB 3.3 kV FLP type HT distribution board, power supply to Hathidari seam and to the proposed 250 kVA, 3.3 kV/ 415 V transformer at surface.

An additional 3 panel VCB 3.3 kV FLP type HT distribution board shall be installed near the existing district will supply power to proposed 100 & 200 m pony conveyor belt drives.

For supplying power to Hathidari seam an 8 panel VCB 3.3 kV FLP type HT distribution board shall be installed. The panel will receive power from 10 panel VCB 3.3 kV FLP type HT distribution board situated at 17L of Bansgarha seam and supply power to SDL district panels and 5 panel VCB 3.3 kV FLP type HT distribution board supplying power to proposed 100 & 200 m pony conveyor belt drives.

LT Distribution Boards

The LT power distribution panels for the working districts receive power from 315 kVA, 3.3 kV/550 V transformers located suitably in the underground. These LT power distribution panels are located suitably in the underground at required places to supply power to various utilities like:

- Pony Belt Conveyors
- SDLs

- UDM
- Hydraulic Roof Bolter etc.

Underground Illumination

1. Underground illumination is to be provided for face and mine roadways etc.
2. Different loading points, pumps etc. would be illuminated by LED lamps with FLP/mining type fittings, weather-proof, suitable for accommodating single or twin 12 W LED lamps at 110 V supply and provided with wire guard protection.
3. Coal faces would be illuminated by LED Lamp with FLP/mining type fittings (well-glass), suitable for accommodating 1x12 W LED lamp, threaded type confirming to IS: 2148 latest and IS: 13346 latest at 110V supply. The fittings shall be provided with reflectors, hemispherical type with strong glass lamps and wire-guard protection.
4. Adequate number of FLP lighting and signaling transformer rated 5 kVA, 550V/110V has been provided for this purpose.

Safety & Conservation of Energy:

Points related to safety and conservation of electrical energy is follows-

(i) Planning & Designing of Transmission and Distribution network :

While designing power transmission and distribution network, adequate sizes of cables have been selected to minimize line losses and voltage drop. It is also suggested to lay ultimate sizes of cables so that duplicate work is avoided and line losses are bare minimum while in construction stage.

(ii) Selection of Transformers:

While selecting number and capacity of transformers in the main substation adequate care has been taken so that transformation losses are minimised.

(iii) Improvement of power factor :

Capacitor banks have provided in the main substation to improve the system power factor to 0.96 and thereby reduce the maximum demand.

(iv) Providing Energy Meters:

To monitor actual consumption of energy in different areas such as ventilator, UG installations etc. provision of energy meters has been kept on outgoing feeder control circuit breakers. Proper cleaning and enlarging return roadways attending to leakages in ventilation stoppings should be given due importance.

(v) Safety Provisions:

While installing the power supply system both for the surface as well as for the underground respective provisions of CMR, 2017 and Central Electricity Authority Reguration, 2010.

5.6 proposed Mine capacity

Production from Hathidari seam is envisaged to be 500 TPD and also that from Bansgarha seam is 500 TPD. Hence the maximum annual target output from Bhurkunda underground mine is proposed to be 0.30 Mty.

5.7 Extractable Reserve & MINe life

The estimated balance extractable reserve from different seams is given below:

Summary of Balance Extractable Reserve in (MTe) are as given below

Seam	Balance Extractable Reserve
Hathidari	1.3
Bansgarha	2.9
Total	**4.2**

At the proposed production rate of 0.3 Mty, the estimated reserve will exhaust in 20 years.

5.8 ROM Quality

The Wt. Av. Grade of coal from seam Hathidari and Bansgarha is G8. The grade-wise extractable reserve of the both seam is given in the following table.

Grade-wise Extractable Reserves

Seam	Extractable Reserve (MTe)	Grade
Hathidari	1.3	G-8
Bansgarha	2.9	G-8
Total	**4.2**	

5.9 Manpower Requirement

As on January 2017 the manpower of Bhurkunda underground mine is 642

The total manpower requirement as assessed in this report is **711 (details are given at Appendices B.)**.

5.10 requiremeny of Capital Outlay for equipment

Capital investment is required for addition and modification of machinery in both Hathidari seam and Bansgarha seam suggested in this report are tabulated below:

Sl. No.	Equipment / Machine	Capital required (in Rs. Crore)
1	SDL (6 Nos.)	2.0
2	UDM (2 No.)	0.69
3	Roof Bolter (2 No.)	0.14
4	Conveyor Belts with installation	8.46
5	Surface Coal Handling Plant	1.15
6	Electricals & Power supply	2.90
	Total	**14.34**

A detailed break-up of the above capital expenditure is given at Appendix A1, Appendix A2, Appendix A3, and Appendix A4.

CHAPTER - VI

FINANCIAL EVALUATION

6.0 INTRODUCTION

Financial evaluation for the present Scheme for Imprvement has been worked out considering following 2 options. These are:

(i) Incremental Option with target production of 0.18 Mty
(ii) Composite option with target production of 0.30 Mty (Existing + Incremental)
The details financial evaluation have been discussed in the subsequent paragraphs.

6.1 TOTAL CAPITAL INVESTMENT

Capital investment has been provided for the scheme which has a life of 18 Years. This investment has been proposed from 100% equity. The capital requirements are given below:

Table-6.1: Capital Requirement

Particulars	Composite option (Rs. Lakhs)	Incremental option (Rs. Lakhs)
Existing Capital	156.80	-
Additional Capital	1665.80	1665.80
Total Capital	1822.60	1665.80
Specific Investment (Rs./ te)	607.53	925.44

6.2 CAPITAL INVESTMENTS FOR P&M

Additional Capital investment on P&M is given in Appendix-A.1. The detailed break-up of Plant & machinery in the case of Underground Electricals, Pump & Pipes, Workshop, CHP and Other P&M etc. are given in Appendix-A.2 to A.3. Separately.

The Total capital investment on P&M worked out is given below:

Table-6.2: Investment on P&M

Sl. No.	Particulars	Composite Option (Rs. Lakhs)	Incremental Option (Rs. Lakhs
1	Investment on P&M	1691.07	1534.27
2	Specific Investment Rs./te	563.69	852.37

METHOD OF ESTIMATION OF CAPITAL COST

The method of estimation of capital investment for P&M, Civil estimates, Development of Mines Capital, Revenue expenditure capitalised etc. is as follows.

PRICES OF PLANT & MACHINERY

For the plant and machinery, as far as possible, the prices have been taken from the Standard Price List of Mining Equipment published by CMPDI and whenever information regarding price was not available, a broad estimate was made.

Note: - Written down Value of Existing capital of P&M provided by CCL is considered for financial analysis of composite option.

6.3 MINE DEVELOPMENT

Under this head, estimated investment is given for (a) capital outlay in mines (Appendix A.8.1), (b) Roads and culverts (c) Water Supply & Sewerage. The details of each item are given in the respective Appendix.

6.4 REPLACEMENT CAPITAL

Replacement capitals of assets are estimated based on the prevailing norms of CIL i.e. useful life of the asset.

Replacement capital is estimated on Plant & Machinery, Residual value of the assets are considered in the 18th year.

Note: - Replacement capital is not provided for the assets which have a life of 18 years.

6.5 RESIDUAL VALUE:

Total Capital investment including replacement capital excluding the amount of depreciation availed up to 18 years to be considered as residual value of assets at the end of the year as cash inflow.

6.6 OPENING OF REVENUE ACCOUNT

Proposed Bhurkhunda mine has been planned to come under revenue account from 1st year itself because this is an existing project.

6.7 ESTIMATES OF OPERATING COST

Appendix-C gives the details of average cost and profitability for the target production of 0.18 MTY & 0.30 MTY.

The method adopted in estimating the costs are briefly explained as follows:

(A) SALARIES & WAGES:

The requirement of manpower for the targeted production of 0.18 MTY & 0.30 MTY is estimated category wise/ scale wise. Prevalent pay scales for executives and non- executives (NCWA-IX) are adopted. Initial basic + 7.97% of the relevant pay scales of executives & non-executives have been considered in estimating the salary and wages cost.

The average wages cost per Tonne has been shown in Appendix – C.

(B) STORES:

Prevalent norms in CMPDIL have been followed in estimating stores cost.

- **Existing Stores cost per tonne as per cost sheet – Rs.581.29/-**
- **Existing Roof Bolting per tonne as per cost sheet – Rs.66.57/-**
- **Other than above cost elements are estimated based on existing norms**

- **For Incremental option 40% of existing cost is considered only (as it is variable cost).**

(C) POWER:

The average Power cost per Tonne has been considered based on annual KWH consumed and applicable power tariff.

(D) MISCELLANEOUS EXPENDITURE:

This covers the expenditure on printing & stationery, postages, telephone, repairs and maintenance of assets other than P&M, Environment related cost etc.

- **Existing Misc. cost per tonne as per cost sheet – Rs.80.38/-**
- **Other than above cost elements are estimated based on existing norms**
- **For Incremental option 60% of existing cost is treated as variable cost and balance 40% is treated as fixed cost**

(E) ADMINISTRATIVE CHARGES:

This includes area overhead, apex overhead etc. and the cost has been taken as per the actual administration cost of CCL as per cost sheet, which works out to Rs. 360.40 per tonne.

10% of actual administrative Overhead cost of the respective company is considered for IRR calculation based on the decision taken by CIL board.

However for calculating per tonne cost, 100% of actual administrative cost with due adjustment for incremental production of Existing production of Bhurkhunda UG mine to be adopted.

Note: - The existing coal production of 0.12 Mty is considered for due adjustment
The average Administrative Cost per Tonne has been shown in respective Appendix – C

(F) INTEREST ON WORKING CAPITAL:

Working capital is estimated based on 4 months cash operating cost consists of Salaries & wages, stores, Miscellaneous, power, Mine closure .The rate of Interest on working capital is taken as 11.50% per annum. The average Interest on working capital cost per tonne has been shown in respective Appendix – C

(G) INTEREST ON LOAN CAPITAL:

As the investment for the project is proposed to be met from 100% internal resources.

(H) DEPRECIATION:

Depreciation on assets is computed as per the prevalent norms. The straight-line method of charging depreciation has been adopted.

The average Depreciation Cost per Tonne has been shown in respective Appendix – C

(I) COST & PROFITABILITY:

The details of the average cost and profitability estimates, at 100% capacity and at 85% capacity are given in Appendix-C1 &C2.

These have been summarised in the table below for two Options at 100% capacity:-

Table-6.3: Cost & Profitability Estimates

100% capacity

PARTICULARS	Average cost Rs./tonne	
	Composite Option	Incremental Option
Salary & wages	1806.22	258.31
Stores	699.82	347.40
Power	274.06	269.98
Misc. expenditure	155.55	91.82
Administrative expenditure	36.04	36.04
Mine closure cost	20.75	34.30
Interest on working capital	144.63	49.78
Depreciation	109.31	182.62
Total cost of production	**3246.38**	**1270.23**

85% capacity

PARTICULARS	Average cost Rs./tonne	
	Composite Option	Incremental Option
Salary & wages	2124.96	303.89
Stores	709.30	358.33
Power	310.33	305.72
Misc. expenditure	165.19	95.05
Administrative expenditure	42.40	42.40
Mine closure cost	24.41	40.35
Interest on working capital	163.20	54.93
Depreciation	128.60	214.84
Total cost of production	**3668.39**	**1415.51**

(j) SELLING PRICE

The notified Selling Price per tonne of coal has been adopted for the GCV 4900-5100 coal i.e. Rs. 1465/- with additional charges of Rs. 87 per tonne for sizing of coal up to -100mm and Rs.50 per tonne for evacuation charges. The Average selling price per tonne comes to Rs.1508.03.

Table-6.4: Average selling price

Particulars	Sale price(Rs/Tn)
Basic price (G-8)	1465.00
98.5% of above price	1443.03
Add:* Sizing charges (-100 MM)	87.00
Evacuation charges	50.00
Average sale price per tonne	**1508.03**

Note: - 98.5% of grade based on borehole data as per norms for economics calculation.