

Annex 3.1.2 NOTIFICATION OF GOVERNMENT OF INDIA, MINISTRY OF ENERGY (DEPARTMENT OF COAL) (20/22)

PRICE STRUCTURE OF COAL WITH EFFECT FROM JANUARY 01, 1989

(1) AS PREVALENT AT SOUTH EASTERN COALFIELDS LIMITED, BILASPUR.
(FOR COLLIERIES IN ORISSA)

Serial No.	BASIC PRICE		ROYALTY		CESS ON ROYALTY @300%		STOWING EXCISE DUTY		TOTAL PRICE				
	STEAM	SLACK ROM	STEAM	SLACK ROM	STEAM	SLACK ROM	STEAM	SLACK ROM	STEAM	SLACK ROM			
	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te			
A SEMI-COKING COAL :													
Gr. I	480.000	473.000	470.000	6.500	19.500	19.500	19.500	4.250	4.250	4.250	510.250	503.250	500.250
UPTO 19%													
Gr. II	400.000	393.000	390.000	6.500	19.500	19.500	19.500	4.250	4.250	4.250	430.250	423.250	420.250
UPTO 19.24%													
B NON-COKING COAL (OTHER THAN LONGFLAME) :													
GRADE A	409.000	402.000	399.000	6.500	19.500	19.500	19.500	3.500	3.500	3.500	438.500	431.500	428.500
GRADE B	374.000	367.000	364.000	6.500	19.500	19.500	19.500	3.500	3.500	3.500	403.500	396.500	393.500
GRADE C	328.000	321.000	318.000	5.500	16.500	16.500	16.500	3.500	3.500	3.500	353.500	346.500	343.500
GRADE D	262.000	255.000	252.000	4.300	12.900	12.900	12.900	3.500	3.500	3.500	282.700	275.700	272.700
GRADE E	210.000	203.000	200.000	4.300	12.900	12.900	12.900	3.500	3.500	3.500	230.700	223.700	220.700
GRADE F	170.000	163.000	160.000	2.500	7.500	7.500	7.500	3.500	3.500	3.500	183.500	176.500	173.500
GRADE G	124.000	117.000	114.000	2.500	7.500	7.500	7.500	3.500	3.500	3.500	137.500	130.500	127.500
C LONG FLAME (NON COKING) :													
GRADE A	434.000	427.000	424.000	6.500	19.500	19.500	19.500	3.500	3.500	3.500	463.500	456.500	453.500
GRADE B	399.000	392.000	389.000	6.500	19.500	19.500	19.500	3.500	3.500	3.500	428.500	421.500	418.500
GRADE C	353.000	346.000	343.000	5.500	16.500	16.500	16.500	3.500	3.500	3.500	378.500	371.500	368.500
GRADE D	287.000	280.000	277.000	4.300	12.900	12.900	12.900	3.500	3.500	3.500	307.700	300.700	297.700

NOTE :

- The following tax elements are in addition to the above duties :
C.S.T. REGD. MANUFACTURER - 4% OF SALE VALUE

REFERENCE : SPRICES
DATED : 24-10-1990

Annex 3.1.2 NOTIFICATION OF GOVERNMENT OF INDIA, MINISTRY OF ENERGY (DEPARTMENT OF COAL) (21/22)

PRICE STRUCTURE OF COAL WITH EFFECT FROM JANUARY 01, 1989

(1) AS PREVALENT AT NORTHERN COALFIELDS LIMITED, SINGRAULI.
(for Sales within M.P.)

Serial No.	BASIC PRICE			ROYALTY			MAD CESS			STOWING EXCISE DUTY			MP CESS Rs.5/-PER TONNE PLUS LOCAL CESS Rs.0.10 PER TONNE			TOTAL PRICE PLUS Rs.5/-PER TONNE		
	STEAM	SLACK	ROM	STEAM	SLACK	ROM	STEAM	SLACK	ROM	STEAM	SLACK	ROM	STEAM	SLACK	ROM	STEAM	SLACK	ROM
	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te
1 NON-COKING COAL :																		
GRADE A	409.00	402.00	399.00	6.50	8.13	8.13	3.50	3.50	3.50	5.10	5.10	5.10	437.23	430.23	427.23			
GRADE B	374.00	367.00	364.00	6.50	8.13	8.13	3.50	3.50	3.50	5.10	5.10	5.10	402.23	395.23	392.23			
GRADE C	328.00	321.00	318.00	5.50	6.88	6.88	3.50	3.50	3.50	5.10	5.10	5.10	353.98	346.98	343.98			
GRADE D	262.00	255.00	252.00	4.30	5.38	5.38	3.50	3.50	3.50	5.10	5.10	5.10	285.28	278.28	275.28			
GRADE E	210.00	203.00	200.00	4.30	5.38	5.38	3.50	3.50	3.50	5.10	5.10	5.10	233.28	226.28	223.28			
GRADE F	170.00	163.00	160.00	2.50	3.13	3.13	3.50	3.50	3.50	5.10	5.10	5.10	189.23	182.23	179.23			
GRADE G	124.00	117.00	114.00	2.50	3.13	3.13	3.50	3.50	3.50	5.10	5.10	5.10	143.23	136.23	133.23			
2 NON COKING (LONG FLAME) :																		
GRADE C	353.00	346.00	343.00	5.50	6.88	6.88	3.50	3.50	3.50	5.10	5.10	5.10	378.98	371.98	368.98			
GRADE D	287.00	280.00	277.00	4.30	5.38	5.38	3.50	3.50	3.50	5.10	5.10	5.10	310.28	303.28	300.28			

NOTE :

- The following tax elements are in addition to the above duties :
SA REGD.MANUFACTURER - 8% OF SALE VALUE
C.S.T. REGD.MANUFACTURER - 4% OF SALE VALUE

REFERENCE : SPRICES
DATED : 22-10-1990

Annex 3.1.2 NOTIFICATION OF GOVERNMENT OF INDIA, MINISTRY OF ENERGY (DEPARTMENT OF COAL) (22/22)

PRICE STRUCTURE OF COAL WITH EFFECT FROM JANUARY 01, 1989

(1) AS PREVALENT AT NORTHERN COALFIELDS LIMITED, SINGRAULI.
(for Sales within U.P.)

Serial No.	GRADE	BASIC PRICE		ROYALTY	STOWING EXCISE DUTY			TOTAL PRICE PLUS Rs.5/-PER TONNE			
		STEAM	SLACK ROM		STEAM	SLACK	ROM	STEAM	SLACK	ROM	
		Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	Rs/te	
1 NON-COKING COAL :											
	GRADE D	262.00	255.00	252.00	4.30	3.50	3.50	3.50	274.80	267.80	264.80
	GRADE E	210.00	203.00	200.00	4.30	3.50	3.50	3.50	222.80	215.80	212.80
2 NON COKING (LONG FLAME) :											
	GRADE C	353.00	346.00	343.00	5.50	3.50	3.50	3.50	367.00	360.00	357.00
	GRADE D	287.00	280.00	277.00	4.30	3.50	3.50	3.50	299.80	292.80	289.80

NOTE :

- The following tax elements are in addition to the above duties :
SA REGD. MANUFACTURER - 8% OF SALE VALUE
C.S.T. REGD. MANUFACTURER - 4% OF SALE VALUE

REFERENCE : SPRICES
DATED : 22-10-1990

Annex 3.2.1 (1/2)

(9) Selection of feed coal for SRC process

It is necessary to select the most suitable coal as feed materials for SRC plant from the technical and economical view-points and the followings are the items to be taken into consideration for the above selection.

1) Coalification

Regarding the SRC process, coal easily soluble in solvent is suitable as feed material.

Generally, medium & low volatile bituminous coal, semi-anthracite and anthracite are difficult to dissolve in solvent, but the coals ranked from high volatile bituminous coal to lignite are easy to dissolve in solvent. In case of using carbon per cent (dry ash free basis) as an index, coals having high carbon per cent are difficult to dissolve. On the one hand, coals with low carbon per cent have a low yield of SRC product.

Therefore, coals having carbon per cent of about 80% are desirable.

On the other hand, high volatile coals are easily soluble.

In case of using a fuel ratio* as an index, desirable coals are those having a fuel ratio of less than 1.3.

2) Insoluble Materials

As ash and inert components (Fusinite, Micrinite, etc.) are insoluble materials, coals containing such materials as little as possible should be selected.

In the SRC process, in order to increase an yield of SRC products as much as possible, reaction conditions which reduce an yield of an oil fraction should be selected.

Under this condition, high contents of insoluble materials (ash + inert component) have to be taken out from the process and simultaneously, much equivalent volume of heavy oil (solvent) will also be discharged accompanying the insoluble materials, thereby causing a shortage of recycle solvent. Accordingly, the process can not be realized without filling up additional solvent.

Therefore, it is very important to select coals with less ash and inert contents and in addition, lowering ash through effective coal preparation is required.

In general, the target of ash contents or ash and inert contents are of less than 10% or less than 20% respectively after preparation in case of coals which are described in Item 1.

* Fuel ratio = Fixed carbon % / Volatile matter %

Annex 3.2.1 (2/2)

3) CHLORINE CONTENT

Chlorine is undesirable for SRC process, because it has corrosive action against plant materials. Coals with chlorine content of more than 500ppm should be avoided as feed coal of SRC plant.

4) CONSTANT SUPPLY OF FEED COAL

As SRC plant is a sophisticated chemical plant, it is desirable to select coals which can be constantly supplied both quantitatively and qualitatively during plant life, preferably from the same coal seam.

**Annex 3.2.2 DETAILS OF COAL MINES WHERE COAL SAMPLES
WERE COLLECTED**

The following details of the individual coal mines are mainly based on data which was obtained at the time of observations of the collection of coal samples in India in September to October, 1990. Some parts were revised by the information collected during the 2nd on site survey in September, 1991.

1. Argada-Sirka

(1) Name of Colliery

Central Coalfields Ltd.
Argada Area, Sirka Colliery

(2) Location

Bihar State, Hazaribagh District
Latitude: 23 degrees 39 minutes North
Longitude: 85 degrees 25 minutes East

(3) State of Coalfield and Coal Seams

This area forms part of the South Karanpura coalfield and at present working is in progress on an open cast mining basis at three coal seams beginning with the Sirka seam (seam thickness 7.65-20.70 metres) at the uppermost reach followed by the Argada seam (seam thickness 15.25-26.90 metres) and the Argada A seam (seam thickness 15.70-18.70 metres). The grade of the coal variety mined (run of mine from combined seam) is evaluated at Grade B/C Non-coking coal. The analytical data for the various seams is shown below:

* Proximate Analysis (Bore Hole Data/Equilibrated Basis)

		Sirka Seam	Argada Seam	Argada 'A' Seam
Moisture Content (%)	In Band	3.5- 5.1	2.6- 3.6	2.3- 3.2
	Ex Band	3.5- 5.2	2.8- 3.7	2.4- 3.7
Ash Content (%)	In Band	15.7-24.0	17.9-20.2	24.2-31.7
	Ex Band	14.1-22.7	16.9-20.0	19.8-23.1
Volatile Matter (%)	In Band	27.8-31.6	31.2-32.9	27.3-29.6
	Ex Band	27.7-31.8	31.6-32.7	29.4-31.9
Fixed Carbon (%)	In Band	44.1-49.3	45.2-47.3	38.3-43.7
	Ex Band	45.5-50.7	45.4-47.6	43.7-46.9

* Ultimate Analysis

		Sirka Seam	Argada Seam	Argada 'A' Seam
C (%)	In Band	83.0	82.9	85.1
	Ex Band	65.8	65.6	60.2
H (%)	In Band	5.2	5.3	5.4
	Ex Band	4.1	4.2	3.8
N (%)	In Band	1.8	1.7	1.6
	Ex Band	1.4	1.3	1.1
S (%)	In Band	0.6	0.8	0.6
	Ex Band	0.5	0.7	0.6
O (%)	In Band	9.4	9.3	7.3
	Ex Band	-	-	-
Carbonate CO ₂ (%)	In Band	-	-	-
	Ex Band	0.45	0.39	1.33
P (%)	In Band	-	-	-
	Ex Band	0.193	0.119	0.045

Note: The ultimate analysis data for the Sirka and Argada seams are based on the 1955 analysis of Seam Samples shown in Indian Coals Vol. 4 (CFRI). Values given for Argada A seam are based on a 1963 analysis.

* Gross Calorific Value (kcal/kg)

	Sirka Seam	Argada Seam	Argada 'A' Seam
In Band	5,535-6,395	6,185	5,070
Ex Band	5,705-6,535	6,285	5,855

* Caking Property 5 (BSS Caking Index)

The coal reserves as estimated by the MEC in 1976 is shown below. Minalbe reserves can be estimated from these figures on the basis of a 1:3 coal/overburden ratio.

Sirka seam	10.63 million tons
Argada seam	14.56 million tons
Argada 'A' seam	14.77 million tons
Combined Argada and Argada 'A' Seams	7.36 million tons
TOTAL	47.32 million tons

The grand total output as of 1976 reached six million tons so that at present about 41 million tons remain.

(4) Details of Production

Coal production is primarily done on an open cast mining basis and a damper shovel combination method is employed. The main equipment used at the Sirka colliery is as follows:

Shovel-EKG 4.6 : three
 Hydraulic shovel : one
 Mining capacity : 3.5 MMm³/y
 Tonner Dumper : 37
 Hauling capacity : 3.5 MMm³/y

The mining output record, projection and nominal capacity for the Sirka colliery is as follows:

	Overburdens(OBR)	Coal
Nominal Capacity (Mechanized O/C)	2.23 MMm ³ /y	0.60 MMt/y
1986/1987	1.71 MMm ³ /y	0.39 MMt/y
1987/1988	1.89 MMm ³ /y	0.48 MMt/y
1988/1989	1.68 MMm ³ /y	0.545 MMt/y
1989/1990	1.59 MMm ³ /y	0.56 MMt/y
1994/1995 planned	-	0.60 MMt/y
1999/2000 planned	-	0.60 MMt/y

There are 520 personnel engaged at the Sirka colliery in open cast mining with a total personnel of 2816 employees if underground mining is also taken into account. Annual production cost averaged 292.57 Rs/t in 1989-90 and reached 387.27 Rs/t for performance between April and July, 1990 (the effect of the monsoon season causes large fluctuations in production cost).

There are no washery facilities installed.

(5) Dispatch

At present, mined coal is dispatched to consumers as it is mined. A coal handling plant equipped with the following facilities is now under construction and is expected to begin operations in the near future.

Main Equipment of the Coal Handling Plant

Feeder Breaker with Grab	2
Metal Detector and Picker	1
Reciprocating Feeder 100-300 t/h	14
Reciprocating Feeder 100-400 t/h	1
Belt Weighing Scale	3
Vibrating Screen 200 t/h	3
Rack and Pinion Chute Gate	16
Motorized Loading Chute	1
Sump Pump	3
Dust Suppression	1
Dust Extractor	2
Weigh Bridge 100 tons capacity	1
Wagon Hauler	1
Motorized Hoist 5 tons capacity	3

The quality specifications of dispatched coal is set at Grade B/C, and the fluctuations in actual quality registered between April and June of 1990 are as follows:

Grade B:	B	77%
	C	20%
	D	3%
Grade C:	C	86%
	D	14%

The records and future projections for annual coal dispatch are shown below:

1985-1986	307,000 tons
1986-1987	390,000 tons
1987-1988	382,000 tons
1988-1989	545,000 tons
1989-1990	562,000 tons
1994-1995 planned	600,000 tons
1999-2000 planned	600,000 tons

The coal price is determined by the Government, the following indicates the pit head basic price.

	(Unit: Rs/t)		
	Steam	Slack	ROM
Grade B	374	367	364
Grade C	328	321	318

(6) Details of Central Coalfields Ltd. (CCL)

The mining activities of CCL are centered in Bihar state and cover twelve areas and has workings in 54 collieries in the coalfields of Bokaro, Ramgarh, Giridih, North and South Karanpura in this state. Of these there are five collieries in the Argada area namely the Gidi 'A', Gidi 'C', Religara, Sirka and Argada collieries. The coal reserves belonging to the CCL are as follows.

Proved: Coking Coal	2,400 million tons
Non-Coking Coal	3,630 million tons
Sub-Total	6,030 million tons
Indicated:	14,120 million tons
Inferred:	5,202 million tons
Total:	25,352 million tons

The breakdown of reserves by coalfield can be estimated as follows:

	(Unit: million tons)			
	E.Bokaro	W.Bokaro	S.Karanpura	N.Karanpura
Proved: Medium C. C.	1,822	2,310	-	-
Non-Coking Coal	10	177	1,807	2,069
Sub-Total	1,832	2,487	1,807	2,069
Indicated/Inferred:	2,642	1,759	3,901	11,039
Total:	4,474	4,246	5,708	13,108

	(Unit: million tons)			
	Auranga	Hutar	Daltonganj	Ramgarh
Proved: Medium C. C.	-	-	-	164.11
Blendable	-	-	-	270.43
Non-Coking Coal	138.77	87.15	83.86	-
Sub-Total	138.77	87.15	83.86	434.54
Indicated/Inferred:	1,643.83	162.67	60.10	624.66
Total:	1,782.60	249.82	143.96	1,059.20

The output records and future projections for annual production of CCL are shown below:

	(Unit: million tons)				
	1985	1986	1987	1988	1989
	-86	-87	-88	-89	-90
Annual Output	24.13	25.11	27.27	28.04	28.50
* By Mining Method					
Underground	4.71	4.23	4.16	4.61	4.70
Open Cast	19.42	20.88	23.11	23.43	23.80
* By Type of Coal					
Medium C.C.	11.41	11.99	10.81	8.99	NA
Non-metallurgical C.C.	1.23	1.05	2.89	5.39	NA
Non-coking C.	11.49	12.07	13.57	13.66	NA
* Argada Area	2.00	2.077	2.252	2.222	NA
* Sirka Colliery	0.543	0.587	0.666	0.732	NA

The Eighth Five Year Plan shows production programme of CCL up to 1994-95 as under:

	1990	1991	(Unit: million tons)		
	-91	-92	1992 -93	1993 -94	1994 -95
Opencast mining	24.32	26.25	28.79	32.59	38.00
Underground mining	4.85	5.00	5.21	5.41	5.50
Grand Total	29.17	31.25	34.00	38.00	43.50

CCL possesses the following coal washeries with a combined total processing capacity for about 15 million tons of raw coal per year.

Kargali	2.70 MMt/y
Kathara	3.00 MMt/y
Swang	0.75 MMt/y
Gidi	2.84 MMt/y
Rajrappa	3.00 MMt/y
Kadra (Under Construction)	2.60 MMt/y

The achievement record for clean coal output of the washeries is shown below. Figures in brackets indicate the clean coal yield in percent.

	1985/86	1986/87	(Unit: million tons)	
			1987/88	1988/89
Kargali	1.650 (65)	1.346 (57)	1.269 (58)	1.235 (58)
Kathara	1.245 (52)	0.987 (51)	0.806 (44)	0.585 (44)
Swang	0.596 (61)	0.572 (65)	0.640 (68)	0.652 (61)
Gidi	0.972 (58)	0.846 (55)	0.900 (52)	0.788 (51)
Rajrappa	-	-	0.191 (68)	0.642 (60)
Total	4.463 (59)	3.751 (56)	3.806 (55)	3.902 (55)

The target output for clean coal projected for 1994-95 is 5.55 million tons.

Further in order to maintain the parameters for product output and quality demanded by users the CCL is proceeding with the installation of a Coal Handling Plant (CHP) and the introduction of an electronic weigh bridge

in addition to reinforcement of the access rail siding capacity and improvement of the existing weigh bridge.

The annual CHP capacity in 1988-89 was 7.54 million tons and it is planned to increase this to 39.0 million tons by 1994-95.

According to the records of achievements for 1986-87 the coal production was 25 million tons for raw coal, 5.2 million tons for washed coal, 0.5 million tons for soft coke and 0.025 million tons for hard coke. The production cost was 195.65 Rs/t of raw coal (wage cost 95.10 Rs/t, other costs 100.55 Rs/t), while the sales price (avg.) was 194.03 Rs/t. At the beginning of the year personnel of executive class numbered 2,499 persons and 102,705 of non-executive class so that the per capita output (OMS) was 0.96.

The main users of coal are power plants, steel plants, railways, fertilizer plants, cement factories, paper mills, etc. The records and projection plans for the dispatch of coal of the CCL in total together with these for the Argada area are indicated below:

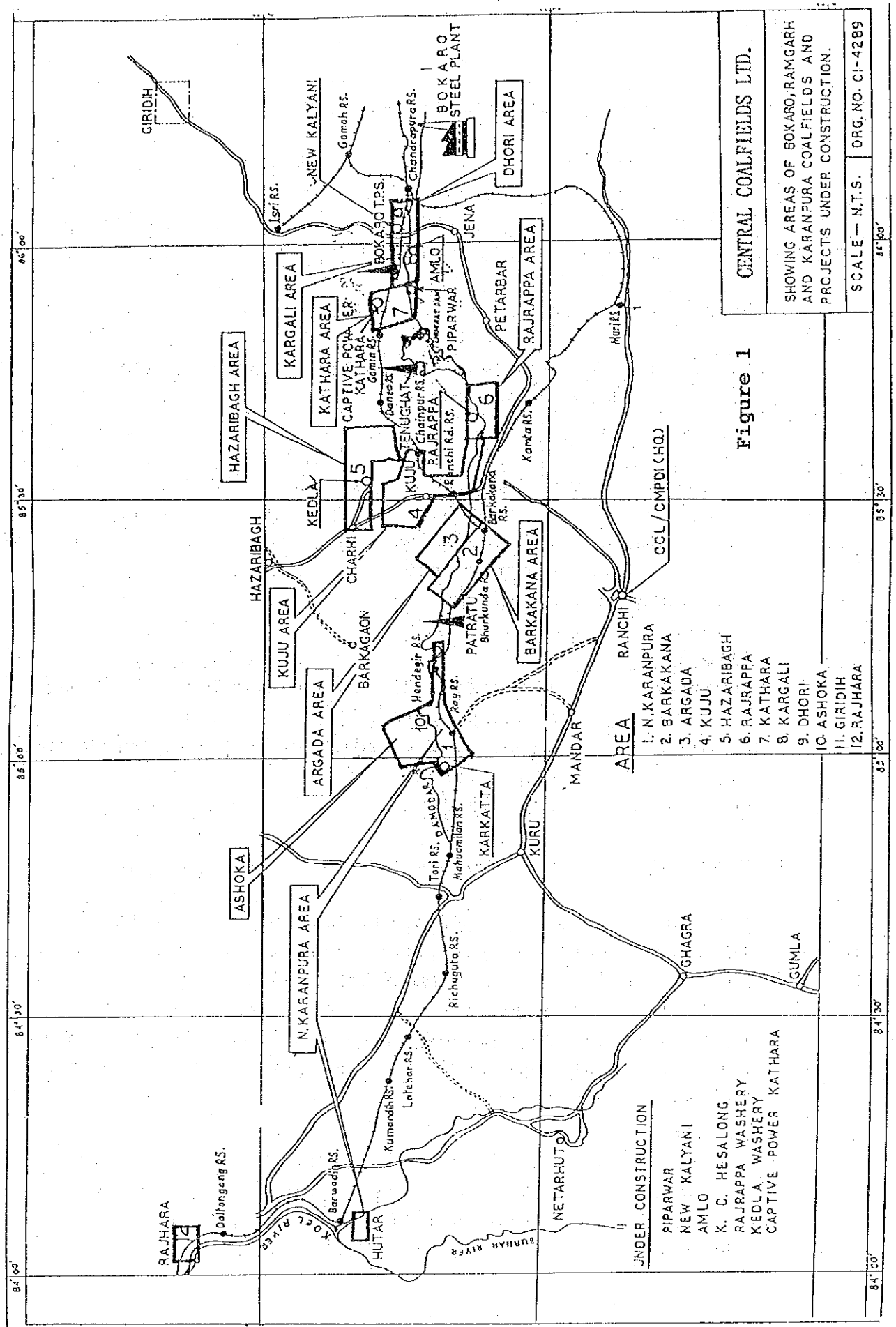
	1985 -86	1986 -87	1987 -88	(Unit: million tons)		
				1988 -89	1989 -90	1994 -95 (plan)
Overall Dispatch	25.35	23.76	24.86	25.99	29.00	42.00
In Argada Area	2.499	2.100	2.050	2.214	NA	NA

Further, the records of dispatch sector-wise are as follows:

	(Unit: million tons)			
	1985-86	1986-87	1987-88	1988-89
Steel: Washed Coal	4.402	3.745	3.790	3.697
Boiler	0.689	0.485	0.524	0.664
Power: Raw Coal	9.645	10.753	12.320	13.058
Middlings	0.940	0.938	0.810	1.021
Loco : Raw Coal	0.900	0.437	0.311	0.197
Middlings	-	-	-	-
Cement:	0.702	0.657	0.727	0.826
Paper:	0.163	0.198	0.155	0.270
Textile:	0.119	0.136	0.146	0.123
Fertilizer:	0.874	0.992	0.938	1.016
Chemicals:	-	-	-	-
Coke Oven:	0.000	0.000	0.002	0.000
Export:	-	-	-	-
BRK:	0.351	0.272	0.224	0.411
CIL Stk Yrd:	0.073	0.015	0.005	0.000
Others:	4.819	3.616	3.500	3.042
Total CCL:	23.677	22.244	23.452	24.325

Attached:

Figure 1 CCL AREA MAP



CENTRAL COALFIELDS LTD.

SHOWING AREAS OF BOKARO, RAMGARH AND KARANPURA COALFIELDS AND PROJECTS UNDER CONSTRUCTION.

SCALE — N.T.S. DRG. NO. CI-4289

Figure 1

- AREA**
1. N. KARANPURA
 2. BARKAKANA
 3. ARGADA
 4. KUJU
 5. HAZARIBAGH
 6. RAJRAPPA
 7. KATHARA
 8. KARGALI
 9. DHORI
 10. ASHOKA
 11. GIRIDIH
 12. RAJHARA

- UNDER CONSTRUCTION**
- PIPARWAR
 - NEW KALYANI
 - AMLO
 - K. D. HESALONG
 - RAJRAPPA WASHERY
 - KEDLA WASHERY
 - CAPTIVE POWER KATHARA

2. Neyveli Lignite

(1) Name of Colliery

Neyveli Lignite Corporation
Mine I (Sample collection), Mine II

(2) Location

Tamil Nadu State, South Arcot District
(200 km southwest of Madras)

Mine I

Latitude : 11 degrees 33 minutes North to 11
degrees 35 minutes North
Longitude : 79 degrees 27 minutes East to 79 degrees 32
minutes East
Surface Area : 16.69 km²

Mine II

Latitude : 11 degrees 29 minutes North to 11 degrees 33
minutes North
Longitude : 79 degrees 26 minutes East to 79 degrees 33
minutes East
Surface Area : 27.00 km²

(3) State of Coalfield and Coal Seams

This area forms part of the Neyveli Lignite Field (Miocene epoch) and the Mines I and II in present working have a single lignite seam which is 45 to 150 metres in thickness. In a quarter of the total area there is a 2 to 5 meter single seam of intercalation. The coal is of a woody lignite variety. The analytical data is given below:

* Proximate Analysis (As mined basis)

Moisture (%)	53
Ash content (%)	3
Volatile matter (%)	24
Fixed carbon (%)	20

* Gross Calorific Value 2,450 kcal/kg

* Ultimate Analysis

Moisture (%)	10.40	(after 24 hours at room
Ash Content (%)	4.60	temperature)
C (%)	53.05	
H (%)	4.15	
N (%)	0.75	
S (%)	0.80	
O (%)	26.25	

* Chemical Analysis of Ash

SiO ₂ (%)	16.20
Al ₂ O ₃ (%)	20.60
Fe ₂ O ₃ (%)	4.15
CaO (%)	26.70
MgO (%)	6.75
SO ₃ (%)	25.60

* Grindability Index(HGI) 108-127

* Fusion Characteristics of Lignite Ash

Initial Deformation Point	1,080-1,150°C
Boiling Point	1,250-1,300°C
Flow Point	1,320-1,350°C

The total reserves of the Neyveli Lignite Field are estimated at 3,300 million tons of proved reserves and 2,000 million tons of minable reserves. Of these the minable reserves of Mine I are 287 million tons but since

122.96 million tons had been mined up to August of 1990 there remain 164.04 million tons of minable reserves (accepting that there is no expansion). If expansion is approved then the remaining minable reserves would amount to 252.04 million tons. On the other hand, Mine II is estimated to have 398 million tons of minable reserves of which 14.30 million tons had been mined up to August of 1990 so that the remaining minable reserves left are estimated at 383.70 million tons.

(4) Details of Production

All mining of lignite is on an open cast basis and is said to involve continuous mining technology using specialized mining equipment. The main equipments of Mine I are as follows:

Bucket Wheel Excavators	1,400 l	3
Bucket Wheel Excavators	700 l	4
Mobile Transfer Conveyors	11,000 t/h	3
Mobile Transfer Conveyors	4,700 t/h	3
Spreaders	11,000 t/h	3
Spreader	8,000 t/h	1
Spreaders	4,700 t/h	2
Belt Conveyors:	2,000 mm Steel cord	16.8 km
	1,800 mm Steel cord	5.0 km
	1,500 mm Fabric	6.9 km
	1,200 mm Fabric	1.9 km
	1,000 mm Fabric	1.8 km

The lignite output records and projected targets for Mine I are shown below:

* Production Output

1984-85	7.108 million tons
1985-86	7.134 million tons
1986-87	7.136 million tons
1987-88	7.142 million tons

1988-89	7.162 million tons
1989-90	7.406 million tons

* Projected Production Schedules

Current Plan	6.5 MMt/y
Increased Output Plan given Expansion	10.5 MMt/y

(Further, Mine II has similar targets with 4.7 million tons as the current target and an expanded target of 10.5 million tons with the expansion plan realized.)

Personnel at Mine I on March 31, 1990 numbered 4,260 employees.

At the present time production cost at Mine I is 151 Rs/t.

(5) Dispatch

Almost all of the lignite of Mine I is sent by conveyor belts directly to the thermal power station and workshops under the control of the NLC. The records of amounts supplied to individual users are shown below:

	Thermal Power Station	Briquetting & Carbonization Plant	(Unit: thousand tons) Process Steam Plant	Total	External Sales
1984-85	5,791	791	348	6,930	159
1985-86	5,644	841	360	6,845	175
1986-87	5,648	809	415	6,872	119
1987-88	5,503	985	390	6,878	225
1988-89	5,616	999	410	7,025	369
1989-90	5,623	1,055	442	7,120	399

Only a small amount is directed to external sales and this is conveyed by dump cars to the nearby users.

The sales price of the lignite above is 227 Rs/t in the case of supplies to thermal power station and 275 Rs/t in the case of external sales.

(6) Details of the Neyveli Lignite Corporation (NLC)

NLC is a government enterprise and in addition to working Mines I and II on an open cast basis it also operates two pithead thermal power stations, a urea fertilizer plant, a process steam plant, a briquetting and carbonization plant to produce lignite coke and a clay washery for white clay washing. The present capacity of facilities and future plans for these components are shown below:

Current Operating Capacity of Facilities:

Mine I:	6.5 MMt/y (lignite)
Thermal Power Station I:	600 MW
Urea Fertilizer Plant:	129,200 t/y (urea)
Briquetting- Carbonization Plant:	262,000 t/y (coke)
Clay Washery:	6,000 t/y (clean clay)
Mine II, Stage I:	4.7 MMt/y (lignite)
Thermal Power Station II Stage I:	630 MW

Projects Under Construction:

Mine-II, Stage II: Expansion of lignite production from 4.7 MMt/y to 10.5 MMt/y.

Thermal Power Station II, Stage II: To expand capacity from 630 MW to 1,470 MW.

Projects in Planning:

Expansion of Mine I: to expand lignite production from 6.5 MMt/y to 10.5 MMt/y.

Expansion of Thermal Power Station I: to expand from 630 MW to 1,020 MW.

Mine III: 11.0 MMt/y (lignite)

Thermal Power Station III: 1,500 MW (500 MW x 3)

* The Lignite Coalfield of NLC

Location (longitude and latitude):

11 degrees 15 minutes North to
11 degrees 40 minutes North and
79 degrees 25 minutes East to
79 degrees 40 minutes East.

Surface Area: 480 km²

Reserves: Proved reserves of 3,300 million tons
Minable reserves of 2,000 million tons

Ratio of Overburdens to Lignite:

45-150 m / 2-22 m
1:5 - 1:10

Lignite Quality:

moisture (%) 45-55
ash content (%) 3-12
volatile matter (%) 20-23
fixed carbon (%) 17-21
calorific value 2,200-2,800 kcal/kg
bulk density 1.12-1.18 g/ml

Records of Lignite production

1984-85	7,109 million tons
1985-86	7,217 million tons
1986-87	8,522 million tons
1987-88	10,150 million tons
1988-89	11,405 million tons
1989-90	11,233 million tons

* Thermal Power Station

Existing Capacity of Thermal Power Station

Thermal power station I:

600 MW	50 MW x 6
	100 MW x 3

Thermal power station II:

630 MW	210 MW x 3
--------	------------

Expansion Plans

Expansion of Thermal power station II:

840 MW	210 MW x 4
--------	------------

Records of Electric Generation and Plant Load Factor

	Thermal Power Station I (TPS-I)		Thermal Power Station II (TPS-II)	
	gross gen. (MU)	PLF (%)	gross gen. (MU)	PLF (%)
1980-81	3,175	60.4		
1981-82	3,391	64.5		
1982-83	3,883	72.9		
1983-84	3,909	74.2		
1984-85	4,056	77.2		
1985-86	3,938	74.9		
1986-87	3,942	75.0	1,169	73.5
1987-88	3,834	72.75	2,631	65.7
1988-89	3,909	74.3	3,667	66.4
1989-90	3,928	74.7	3,458	62.7

* Urea Fertilizer Plant

The annual productive capacity of urea is 152,000 tons. This plant was constructed by M/S Pintsch Bamag, M/S Linde of West Germany, and M/S Ansaldo of Italy and began operations in 1966. Initially the output was produced by synthesis after lignite had been gasified. Problems of a technical and operational order were encountered in the use of lignite and since 1979 the raw material was changed to fuel oil. After switching to fuel oil the capacity utilization of the plant was improved. The production output for 1983-84 was estimated at 129,200 tons of urea and this output level was almost attained. A record output of 143,121 tons was reached for 1989-90. The record of output is as follows:

	Annual Output (tons)	Plant Utilization (%)
1984-85	127,804	98.9
1985-86	128,266	99.3
1986-87	128,003	99.1
1987-88	126,204	97.7
1988-89	141,079	109.2
1989-90	143,121	110.8

* Briquetting and Carbonization Plant

This plant began operations in 1966 as a part of the Neyveli Integrated Complex and has an annual coke production capacity of 430,000 tons. The annual production capacity achieved in 1983-84 was estimated at 262,000 tons and a record of 253,724 tons was reached in 1989-90. The records of production are shown below:

	Annual Output (tons)	Plant Utilization (%)
1984-85	191,190	72.9
1985-86	200,811	76.4
1986-87	189,074	72.1
1987-88	233,704	89.2
1988-89	240,044	91.6
1989-90	253,724	96.8

This coke is of excellent quality and has properties of low ash content, low sulfur content and low phosphorous content so that it is well suited for use as a domestic fuel. Further, it is widely used as a reductant in metallurgical ferro-alloys and electro-chemical industries. This coke can be used for drying in place of fire wood in the tea industry and also used as a substitute for coal in the cement and paper industries.

* Eighth Five Year Plan

The year wise production targets are furnished as under. The lignite production is expected to increase 17.50 million tons by the terminal year of the Eighth Five Year Plan from 11.24 million tons at the end of 7th plan. Power generation is also targeted to increase to 11,881 MU from 7040 MU.

	1989 -90 (Actual)	1990 -91	1991 -92	1992 -93	1993 -94	1994 -95
Lignite (in million tons)	11.24	11.00	12.32	13.30	15.30	17.50
Power-Gross (in MU)	7,386	7,040	7,968	9,685	11,133	11,881
Urea (in tons)	143,121	129,200	129,200	129,200	129,200	129,200
Coke (in tons)	253,724	262,000	262,000	262,200	262,200	262,200

Attached :

Figure 2 Neyveli Lignite Field

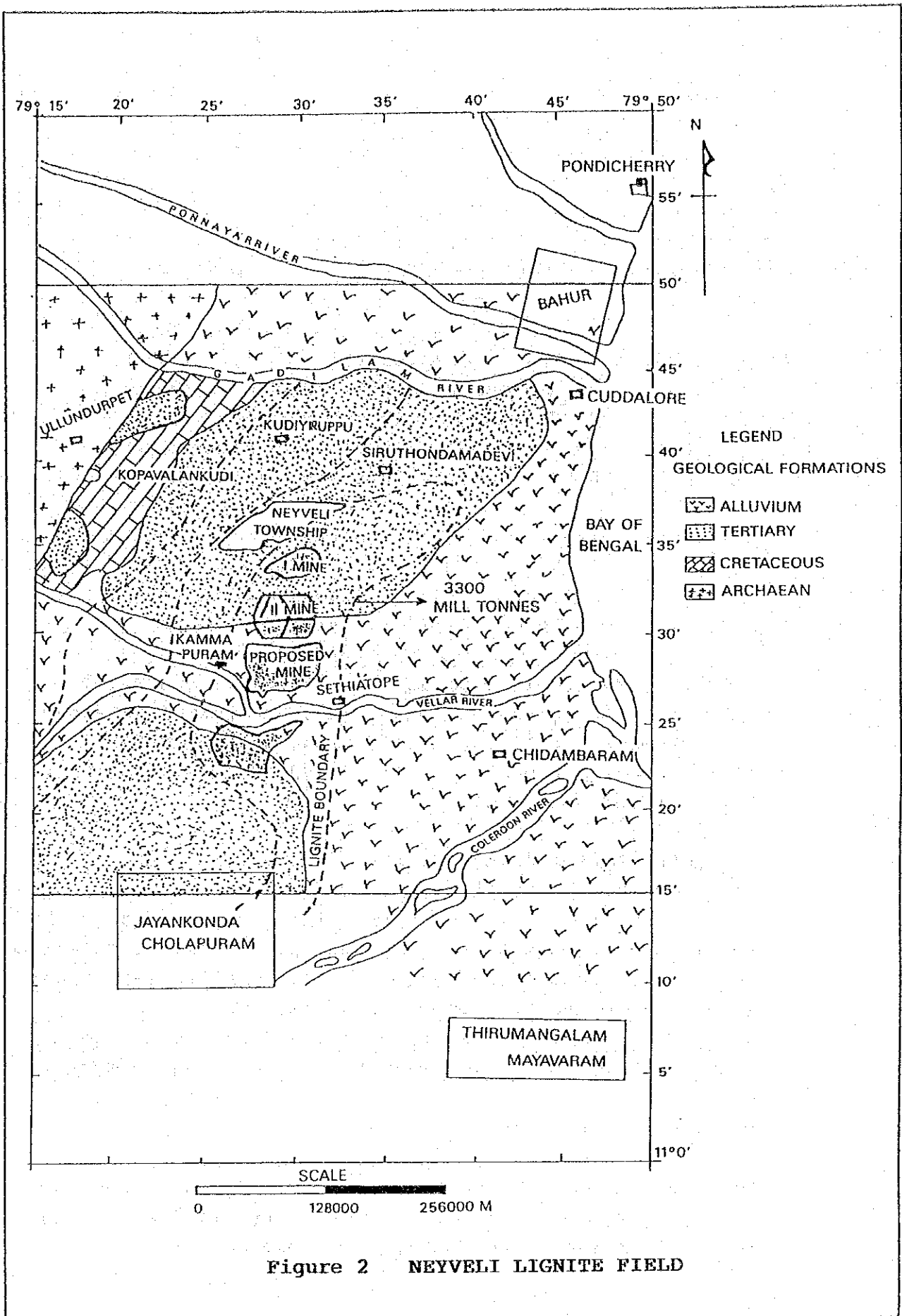


Figure 2 NEYVELI LIGNITE FIELD

3. Samla Coal

(1) Name of Colliery

Eastern Coalfields Ltd. (ECL)
Pandaveswar area, Pandaveswar Colliery

(2) Location

West Bengal State, Burdwan District
Latitude: 23 degrees 42 minutes North to
23 degrees 45 minutes North
Longitude: 87 degrees 11 minutes East to
87 degrees 18 minutes East

(3) State of Coalfield and Coal Seams

This area forms part of the Raniganj coalfield and there are seven seams named R-II to R-VIII.

Of these, the Samla seam accounts for R-II and R-III. The reserves of the Samla seam in the Pandaveswar area are estimated at 147.81 million tons (of which 97.71 million tons are proved reserves and 50.10 million tons are unproved reserves).

According to the report of the Samla colliery the thickness of the Samla seam is between 4.8 and 5.1 m with a gradient of 1 in 10 and a proximate analysis shows that the moisture content is 9.6%, ash content 14.1%, volatile matter 32.8% and fixed carbon 43.5%. Coal is ranked as long flame Grade B/C non-coking coal. There are nine collieries at present working in the Pandaveswar area. Table 1 shows the colliery-wise and seam-wise reserves.

(4) Details of Production

For underground mining in the Pandaveswar area a method involving use of coal cutting machinery, solid blasting, depillaring with sand stowing is employed.

The annual output records of individual collieries of the Pandaveswar Area is given below:

(Unit: thousand tons)

Collieries	1985-86	1986-87	1987-88	1988-89
Dalurband	247	235	230	231
Kenda	185	158	139	148
Khottadih	271	289	316	294
Manderboni	184	183	170	137
Nutandanga	173	158	120	101
Pandaveswar	208	208	190	173
Samla	173	163	144	129
Durula/South Samla	0	28	25	42
Purushottampur	354	190	140	44
Total	1,794	1,612	1,474	1,299

The Eighth Five Year Plan shows the production programme of Pandaveswar Area as under:

	(Unit: million tons)				
	1990-91	1991-92	1992-93	1993-94	1994-95
Manderboni	0.13	0.13	0.13	0.13	0.13
Nutandanga	0.10	0.10	0.10	0.10	0.10
South Samla	0.02				
Pandaveswar	0.165	0.165	0.17	0.17	0.17
Kenda	0.145	0.14	0.13	0.10	0.06
Samla	0.08	0.08	0.08	0.08	
Dalurband	0.21	0.24	0.25	0.25	0.25
Total	0.85	0.855	0.86	0.83	0.71

13,080 personnel were employed in this area (in Aug. 1990).

The production cost (in July 1990) of the Pandaveswar colliery was 790.22 Rs/t, which exceeds considerably the sales price which was 432.37 Rs/t.

(5) Dispatch Details

The annual dispatch records for the Pandaveswar area are as follows:

1985-86	2.105 million tons
1986-87	1.945 million tons
1987-88	1.622 million tons
1988-89	1.617 million tons

The following shows the records of the ratio of dispatch to the different users over the period between April and August of 1990.

Railways	36%
Power plants	35%
Steel plants	6%
Cement plants	7%
Tea manufacturers	2%
Exports	1%
Fertilizers	1%
Others	12%
Total	100%

(6) Details of Eastern Coalfields Ltd. (ECL)

The coal production of ECL covers an area in West Bengal State embracing the Raniganj, Mugma and Rajmahal coalfields. There are twenty one areas in this territory (eight eastern areas and thirteen western areas), and 136 collieries. The total personnel numbered 184,044 persons in August, 1990.

The breakdown of the reserves by individual coalfield in the ECL territory is given below:

(Unit: million tons)

	Proved	Indicated	Inferred	Total
Raniganj	7,241	11,899	8,097	27,237
Rajmahar	1,113.88	6,433.68	1,991.14	9,538.70

The records of ECL output are as follows:

(Unit: million tons)

	1985-86	1986-87	1987-88	1988-89	1989-90
Annual output	24.03	25.62	27.99	30.13	24.49
Mining method :					
Underground	16.21	16.15	15.76	16.31	NA
Opencast	7.70	9.22	12.15	13.73	NA
Long wall	0.12	0.25	0.08	0.09	NA
Coal variety :					
Semi C.C.	0.41	0.33	0.27	0.23	NA
Non-metallurgical					
C.C.	1.01	1.22	1.23	1.19	NA
Non-coking C.	22.61	24.07	26.49	28.71	NA

The Eighth Five Year Plan shows total production programme of ECL as under:

(Unit: million tons)

	1990-91	1991-92	1992-93	1993-94	1994-95
ECL Total	26.20	27.00	29.47	33.05	38.00

At present ECL does not possess a coal washery. The dispatch records by coal variety are as follows:

(Unit: million tons)

	1985-86	1986-87	1987-88	1988-89
Total Despatch	22.785	23.965	24.738	26.383
Blendable	0.400	0.307	0.237	0.204
Other Coking	0.904	1.229	1.184	1.091
Non-Coking	21.481	22.429	23.317	25.088

Further, the records of dispatch to the individual end users are as follows:

(Unit: million tons)

	1985-86	1986-87	1987-88	1988-89
Steel: Coking Coal	0.387	0.276	0.218	0.170
Boiler	1.265	1.355	1.407	1.494
Power: Raw Coal	8.339	9.371	10.506	11.964
Loco: Raw Coal	4.225	3.739	3.643	3.324
Cement:	0.609	0.956	0.766	0.886
Paper :	0.295	0.258	0.303	0.305
Textile:	0.255	0.275	0.248	0.265
Fertilizer:	0.445	0.446	0.336	0.318
Chemicals:	0.355	0.389	0.405	0.425
Coke Oven:	0.017	0.026	0.016	0.015
Export:	0.153	0.136	0.226	0.180
BRK:	0.059	0.122	0.059	0.070
CIL Stk Yrd:	0.392	0.585	0.742	0.608
Others:	5.702	5.806	5.643	6.160
Total ECL:	22.498	23.740	24.518	26.184

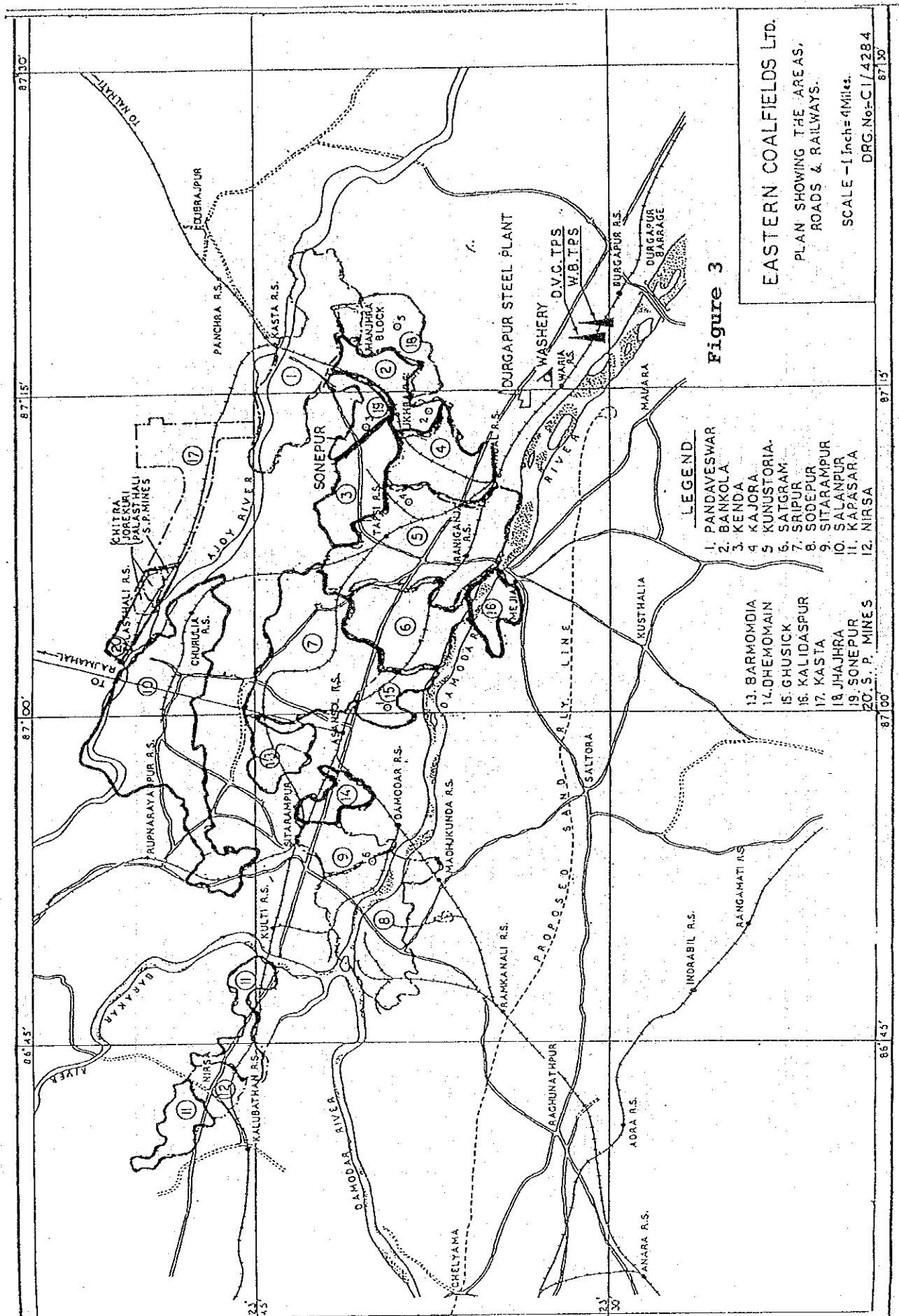
Attached :

Table 1 ECL/Pandaveswar Area, Movable Reserves of Coal

Figure 3 ECL Territory Map

Table 1 ECL/PANDAVESWAR AREA, MINABLE RESERVE OF COAL

Colliery	(Unit: million tons)								TOTAL
	R-II&III	R-IV	R-V	R-VI	R-VIIB	R-VIIA	R-VIII		
MADEAIPUR	Proved	23.00	-	-	-	-	-	-	23.00
	Unproved	-	0.80	-	-	-	-	-	0.80
	Total	23.00	0.80	-	-	-	-	-	23.80
NUTANDANGA	Proved	4.80	-	-	-	-	-	-	4.80
	Unproved	1.50	-	-	-	-	-	-	1.50
	Total	6.30	-	-	-	-	-	-	6.30
MANDERBONI	Proved	3.90	2.23	2.82	-	-	-	-	8.95
	Unproved	5.50	4.00	1.20	-	-	-	-	10.70
	Total	9.40	6.23	4.02	-	-	-	-	19.65
PURUSHOTTAMPUR	Proved	14.50	13.03	2.80	2.00	-	-	-	32.33
	Unproved	-	-	-	-	-	-	-	-
	Total	14.50	13.03	2.80	2.00	-	-	-	32.33
PANDAVESWAR	Proved	5.40	-	1.20	1.10	-	-	-	7.70
	Unproved	8.10	4.00	1.90	1.90	-	-	-	15.90
	Total	13.50	4.00	3.10	3.00	-	-	-	23.50
DALURBAND	Proved	-	-	-	0.50	18.21	5.60	0.90	25.21
	Unproved	35.00	30.00	30.00	30.00	24.50	19.50	-	169.00
	Total	35.00	30.00	30.00	30.50	42.71	25.10	0.90	194.21
KHOTADIII	Proved	33.40	10.00	18.30	30.20	-	-	-	91.90
	Unproved	-	-	-	-	-	-	-	-
	Total	33.40	10.00	18.30	30.20	-	-	-	91.90
SAMLA-KENDRA	Proved	12.71	1.40	-	-	-	-	-	14.11
	Unproved	-	2.00	-	-	-	-	-	2.00
	Total	12.71	3.40	-	-	-	-	-	16.11
KANKARTALA	Proved	-	-	-	-	-	-	-	-
	Unproved	-	-	-	-	-	-	-	-
	Total	-	-	-	-	-	-	-	-
AREA TOTAL	Proved	97.71	26.66	25.12	33.80	18.21	5.60	4.05	211.15
	Unproved	50.10	40.80	33.10	31.90	24.50	19.50	7.50	207.40
	Total	147.81	67.46	58.22	65.70	42.71	25.10	11.55	418.55



EASTERN COALFIELDS LTD.
 PLAN SHOWING THE AREAS,
 ROADS & RAILWAYS.

SCALE - 1 Inch = 4 Miles.

DRG. No. - CI/4284

Figure 3

LEGEND

- 1. PANDAVESWAR
- 2. BANKOLA
- 3. KENDA
- 4. KAJORA
- 5. KUNUSTORIA
- 6. SATGRAM
- 7. SRIPUR
- 8. SODEPUR
- 9. SITARAMPUR
- 10. SALANPUR
- 11. KAPASARA
- 12. NIRSA
- 13. BARMONDIA
- 14. CHEMOMAIN
- 15. GHUSICK
- 16. KALIDASPUR
- 17. KASTA
- 18. JHAJHRA
- 19. SONEPUR
- 20. S. P. MINES

4. Assam Coal

(1) Name of Colliery

Coal India Ltd., North Eastern Coalfields Division.
Makum Coalfield, Ledo Colliery

(2) Location

Assam State, Dibrugarh District, Margherita

Latitude: 27 degrees 13 minutes North to

27 degrees 23 minutes North

Longitude: 95 degrees 35 minutes East to

96 degrees 00 minutes East

Situated 1,350 km northeast of Calcutta.

(3) State of Coalfield and Coal Seams

There are five coal seams in Makum coalfield. Starting from the topmost the seams are an 8 ft seam (of 2.4 m thickness), a 5 ft seam (1.2-1.8 m), a 20 ft seam (5-7 m), a new seam (1.5-2.6 m), and a 60 ft seam (15-18 m). The caking index (C.I.) of the coal variety mined is between 15 and 20. The analytical data of 20ft seam and 60ft seam by colliery are as shown in Table 2.

Salient points of Assam coal are said to be the following:

- A low ash content (3-9%)
- A low moisture content (2-5%)
- A high volatile matter (40-45%)
- A comparatively high hydrogen content and low oxygen content
- A high sulphur content (2.5-6%) most of which is organic sulphur.
- Extremely easily pulverised
- Caking property (with a caking index of 25 to 30)
- Calorific value, in the range of 6,500 to 8,000 kcal/kg

- Although the ash content is inherently low this increases during mining. As a result coal can be washed easily. Figure 4 shows cleaning characteristics of Assam coal for reference.

The various figures for sector-wise, depth-wise and seam-wise reserves of the Makum coalfield are shown in Table 3.

Besides the Makum coalfield there are several other coalfields in the vicinity of Assam. Of these there is a coalfield being worked at Dilli-Jeypore and production is scheduled for the Namchik coalfield. Details of these two coalfields are given below.

* Dilli-Jeypore Coalfield

This coalfield is situated in the Sibsagar and Dibrugarh districts of Assam state. There are seven seams named Seam I to VII being worked at the Jeypore colliery. The leased surface area of the Jeypore colliery is about 9 km² and the reserves and quality are as follows:

Reserves (from the outcrop to a depth of 200 metres):

(Unit: million tons)

	Proved	Indicated	Inferred	Total
Seams IV,V,VI	0.88	0.77	4.80	6.45

Quality:

	Moisture (%)	Ash Content (%)	Volatile Matter (%)	Total Sulphur (%)	Calorific Value (kcal/kg)	C.I.
Jeypore I	5.2	10.0	42.6	3.5	6,315	3
III	6.2	6.67	42.3	6.5	6,685	5
IV	5.4	13.7	39.0	4.8	5,870	3
V	4.8	20.1	40.2	5.8	6,155	3

* The Namchik Coalfield

This coalfield is an extension of the eastern side of the Makum coalfield and is located about 10 km to the east of this. It is composed of eight seams entitled Seams I through VIII. At present the colliery is not worked but production is scheduled to commence in the Eighth Five Year Plan. Reserves and coal quality are as follows:

Reserves (from the outcrop to a depth of 300 metres):

(Unit: million tons)

	Proved	Indicated	Inferred	Total
Seam I-V	17.10	8.307	(85)	25.407

Quality:

	Moisture (%)	Ash Content (%)	Volatile Matter (%)	Total Sulphur (%)	Calorific Value (kcal/kg)	C.I.
Namchik I	4.5	15.0	40.8	3.5	8,405	16
II	3.7	19.4	47.4	6.3	8,470	26
III	3.8	12.4	45.4	3.5	8,315	22
IV	4.0	17.3	46.5	6.28	8,340	20
V	2.7	17.1	46.3	5.6	8,290	17
VI	3.3	18.3	46.0	4.0	-	15

(4) Details of Production

Colliery management in these coalfields is under the direct control of Coal India Ltd. At present underground mining on a steeply inclined seam using the Room and Pillar Method (the Tipong Method, Bhaska Method) together with the Flexible Roofing, Shield Method introduced with technology from the Soviet Union is used for production of the coal. Open cast mining has been mechanized and is done using bulldozer, scraper, hydraulic shovel and dumper for stripping overburden. A hydraulic shovel and coal tipper are used in conjunction for mining the coal.

The production records of Makum coalfield are as follows:

(Unit: thousand tons)

	Underground	Open Cast	Total
1974-75	384	142	526
1979-80	392	172	563
1984-85	443	369	812
1985-86	387	453	840
1986-87	393	512	905
1987-88	360	640	1,000
1988-89	400	500	900
1989-90	348	488	836
1990-91 (upto Sep.)	144	60	204

The construction of a 360,000 t/y (clean coal) washery at Ledo has received the approval of the executive committee of Coal India Ltd. and construction work is currently being prepared for.

The coal handling plant (CHP) capacities are as follows:

(Unit: t/m)

* Tipong Colliery	Dhalai CHP	20,000
	NEC Mine CHP	10,000
* Baragolai Colliery	Baragolai CHP	10,000
	Tikak K. Drift CHP	10,000

* Tikak Colliery	CHP	15,000
* Ledo Colliery	CHP	15,000

Personnel figures are as follows (at date of Oct. 1, 1990):

Tipong	1,574
Baragolai	1,511
Ledo	761
Tikak	386
Jeypore	330

The following production schedules are planned for the present Eighth Five Year Plan. Poor coal offtake and need to preserve environment necessitated downward revision of production programmes of the North Eastern coalfields. Current indications place the coal production at 0.61 million tons during 1990-91. The production programmes for 1991-92 and 1994-95 are 0.70 million tons and 0.90 million tons respectively.

(Unit: million tons)

Name of Mine	1990-91 BE	1990-91 RE	1991-92 BE	1992-93 Proj.	1993-94 Proj.	1994-95 Proj.
<u>Existing Mines</u>						
Jeypore	0.04	0.03	0.03	0.04	0.05	0.05
Ledo	0.05	0.08	0.03	0.03	0.04	0.04
Baragolai	0.11	0.11	0.11	0.08	0.08	0.08
Tipong	0.17	0.15	0.16	0.20	0.20	0.20
Tikak OC	0.12	0.04	0.00	0.00	0.00	0.00
Patch Deposits	0.31	0.20	0.37	0.33	0.20	0.19
Total Existing Mines	0.80	0.61	0.70	0.68	0.57	0.56
<u>Sanctioned Projects</u>						
Simsang	0.00	0.00	0.00	0.00	0.00	0.01
Ledo Expn.	0.00	0.00	0.00	0.07	0.10	0.12
Total Sanctioned Projects	0.00	0.00	0.00	0.07	0.10	0.13

Projects Yet to Be Appvd.

Tipong Expn-I&II	0.00	0.00	0.00	0.00	0.00	0.01
Lekhapani UG	0.00	0.00	0.00	0.00	0.00	0.02
Namchik UG	0.00	0.00	0.00	0.00	0.00	0.01
Namchik OC	0.00	0.00	0.00	0.00	0.13	0.15
Baragolai Expn.	0.00	0.00	0.00	0.00	0.00	0.02
Total Projects	0.00	0.00	0.00	0.00	0.13	0.21
Yet to Be Appvd						
<u>Grand Total NEC</u>	0.80	0.61	0.70	0.75	0.80	0.90

(5) Coal Dispatch

Records for the sector wise dispatch of supplies are as follows:

(Unit: thousand tons)

	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91 upto Sep.
Steel	151.06	233.13	264.80	222.45	208.92	39.36
Locomotive	266.92	199.59	161.87	149.64	141.37	68.38
Defence	2.51	3.33	2.87	3.46	2.56	0.36
Paper	19.40	29.10	56.96	68.72	77.41	47.94
Brick	43.72	37.68	66.01	64.26	76.44	10.00
Tea	136.61	101.88	99.52	93.23	84.71	48.32
Cement	32.54	51.97	69.26	71.26	41.31	40.53
Fertilizer	-	-	-	5.86	11.87	1.97
Others	102.90	144.46	118.67	166.99	161.62	100.10
Total	755.66	801.14	839.96	845.87	806.21	356.96

The breakdown of dispatches by the method of transportation is as follows:

(Unit: thousand tons)

	1984-85	1985-86	1986-87	1987-88 (target)
By rail	490	500	590	680
By road	242	270	233	180
Total	732	770	823	860

Supply by rail is conducted to steel plants in Durgapur, Bokaro, etc. and railway facilities and cement, paper and pulp plants in Assam state as well as cement plants outside of Assam state. Supply by road is used in the case of tea manufacturing, brick and coke plants and domestic use supplies.

Attached:

- Table 2 Quality of Coal in Makum Coalfield, Assam
- Table 3 Geological Reserves of Makum Coal Coalfield, Assam
- Figure 4 Cleaning Characteristics of Assam Coal
- Figure 5 Geological Map of the Makum Coalfield
- Figure 6 North Eastern Coalfield

Table 2 QUALITY OF COAL IN MAKUM COALFIELD, ASSAM

A. Proximate analysis: Run-of-Mine from 20 ft Seam (Seam-III)

Colliery/ Block	*60% RH, 40°C Moisture%	Air dried basis			
		Moisture%	Ash%	Volatile Matter%	Fixed Carbon%
Namdang	1.8	2.3	8.0-19.3	35.4-42.2 (43.8-46.3)	43.0-47.5 (53.7-56.2)
Baragolai	1.7-2.3	2.0-2.5	8.8-13.1	39.5-42.8 (45.5-46.9)	44.9-47.7 (53.1-54.5)
Ledo	1.9-2.3	2.1-2.8	5.5-20.8	37.6-40.6 (43.5-45.6)	39.6-51.8 (54.4-56.4)
Tipong	1.8-2.4	2.3-2.8	8.8-23.4	34.3-43.1 (44.0-46.3)	39.6-50.8 (53.7-56.0)

Figures within brackets are on pure coal basis.

* RH means Relative Humidity

B. Proximate analysis: Run-of-Mine from 60 ft Seam (Seam-I)

Colliery/ Block	*60% RH, 40°C Moisture%	Air dried basis			
		Moisture%	Ash%	Volatile Matter%	Fixed Carbon%
Namdang	1.8-2.3	2.0-2.7	4.9-11.9	37.4-42.0 (42.7-45.2)	48.0-50.8 (54.8-57.3)
Baragolai	1.6-2.1	2.0-2.5	4.0-13.9	37.3-42.7 (42.8-46.1)	44.0-51.2 (53.9-57.2)
Ledo	1.8-2.1	1.8-2.0	3.8-11.5	38.7-40.0 (41.6-43.6)	47.8-54.2 (56.4-58.4)
Tipong	1.5-2.3	1.8-2.6	6.3-19.8	36.7-43.2 (44.5-48.1)	39.9-49.9 (51.9-55.5)
All Collieries	1.5-2.3	1.8-2.7	3.8-19.8	36.7-43.2 (41.6-48.1)	39.9-54.2 (51.9-58.4)

Figures within brackets are on pure coal basis.

* RH means Relative Humidity

Note) This data was given by CMPDIL during 2nd on site survey in September, 1991.

Table 3 GEOLOGICAL RESERVES OF MAKUM COALFIELD, ASSAM (1/3)

A. Sector-wise and category-wise reserves:

Block	Proved					Indicated		(Unit: Million tons)	
	Goaf	Barrier	Pillar	Fire (blocked)	Virgin under development	Total	Inferred	Total	
Baragolai including Namdang and Tikak	33.69	5.45	8.91	0.40	23.84	72.29	5.00	32.19	109.48
Ledo including Tirap	9.65	1.85	2.67	0.15	6.27	20.59	15.20	16.02	51.81
Tipong	6.09	2.24	1.17	1.03	10.66	21.19	28.44	13.60	63.23
Unleased dip side of Tirap					9.59	9.59	1.55		11.14
Total	49.43	9.54	12.75	1.58	40.77	123.66	50.19	61.81	235.66

Note 1) Out of 123.66 million tons of "Proved" reserves, 73.30 million tons is locked up in Goaf, Pillars, Barriers and under Fire.

2) This data was given by CMPDIL during 2nd on site survey in September, 1991.

Table 3 GEOLOGICAL RESERVES OF MAKUM COALFIELD, ASSAM (2/3)

B. Sector-wise, category-wise and depth-wise reserves:

Block	(Unit: million tons)					Total
	Proved		Indicated MSL to 150m below MSL	Inferred 150m below MSL to 300m below MSL	Total	
	surface to 150m above MSL	150m above MSL to MSL below MSL				
Baragolai including Namdang and Tikak	9.23	28.64	34.42	5.00	32.19	109.48
Ledo including Tirap	1.76	12.56	6.27	15.20	16.02	51.81
Tipong	10.53	10.66	-	28.44	13.60	63.23
Unleased dip side of Tirap		7.17	2.42	1.55	-	11.14
Total	21.52	59.03	43.11	50.19	61.81	235.66

Note 1) Out of 123.66 million tons of "Proved" reserves, 73.30 million tons is locked up in Goaf, Pillars, Barriers and under Fire.

2) This data was given by CMPDIL during 2nd on site survey in September, 1991.

Table 3 GEOLOGICAL RESERVES OF MAKUM COALFIELD, ASSAM (3/3)

C. Seam-wise and category-wise reserves:

Seam	Proved							Indicated		Inferred	Total
	Goaf	Barrier	Pillar	Fire (blocked)	Virgin under development	Unleased	Total				
8 ft (Seam V)	0.22	-	0.13	-	-	-	0.35	-	-	0.35	
5 ft (Seam IV)	0.42	0.003	0.04	-	-	0.23	0.69	2.03	-	2.72	
Thin Seam	0.01	-	-	-	-	-	0.01	-	-	0.01	
20 ft (Seam III)	8.30	0.64	1.84	0.85	3.46	2.79	17.88	29.90	19.27	67.05	
7 ft (Seam II/New)	0.27	0.005	0.04	-	-	0.27	0.59	4.17	-	4.76	
60 ft (Seam I)	40.21	8.89	10.70	0.73	37.31	6.30	104.14	14.09	42.54	160.77	
Total	49.43	9.54	12.75	1.58	40.77	9.59	123.66	50.19	61.81	235.66	

Note: 1) Out of 123.66 million tons of "Proved" reserves, 73.30 million tons is locked up in Goaf, Pillars, Barriers and under Fire.

2) This data was given by CMPDIL during 2nd on site survey in September, 1991.

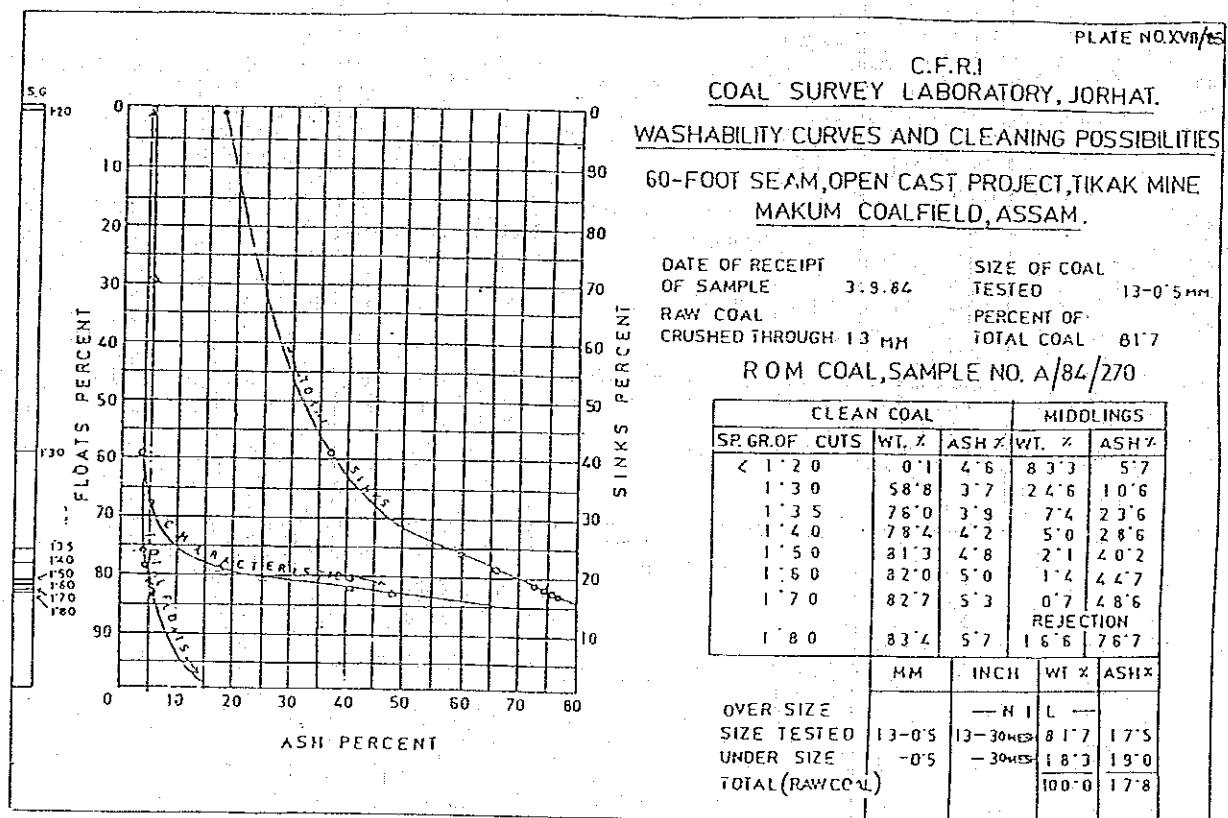
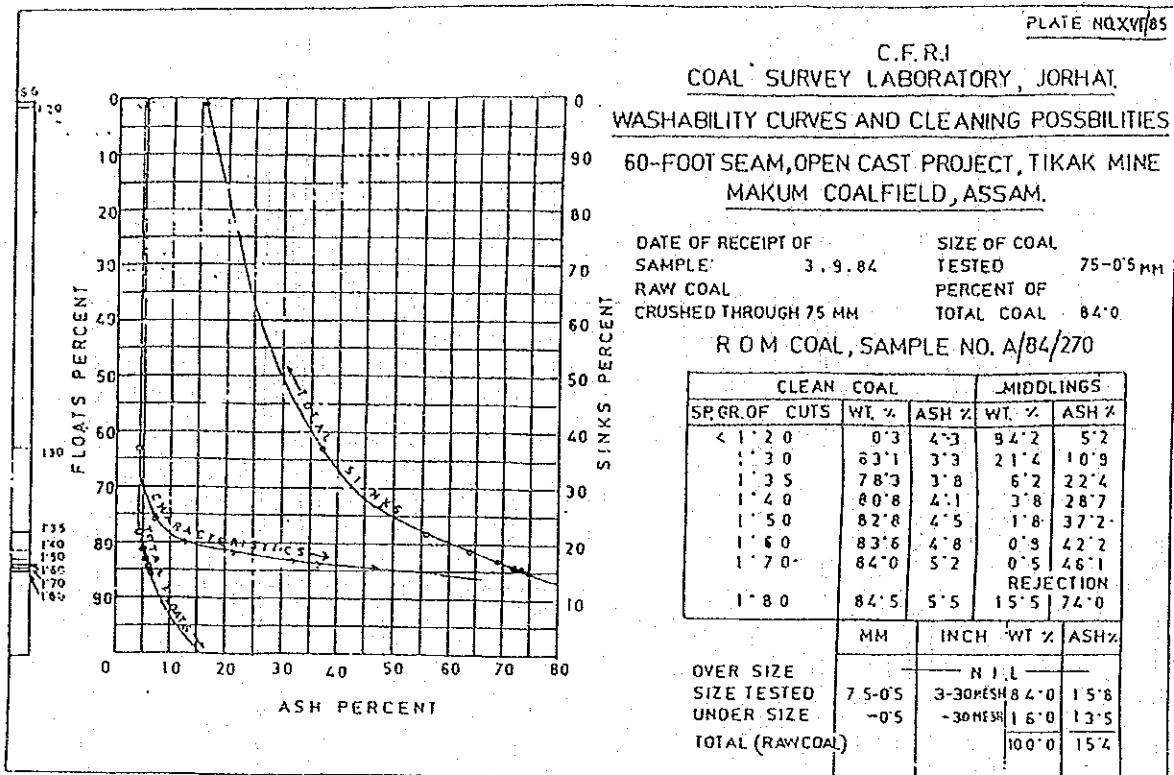


Figure 4 CLEANING CHARACTERISTICS OF ASSAM COAL (1/2)

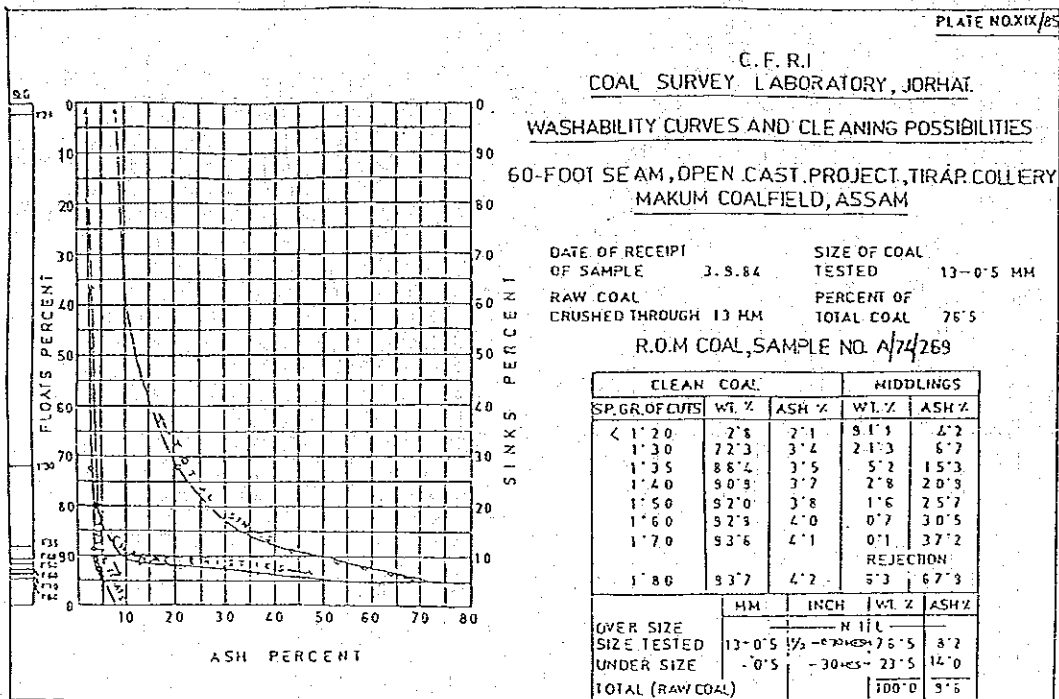
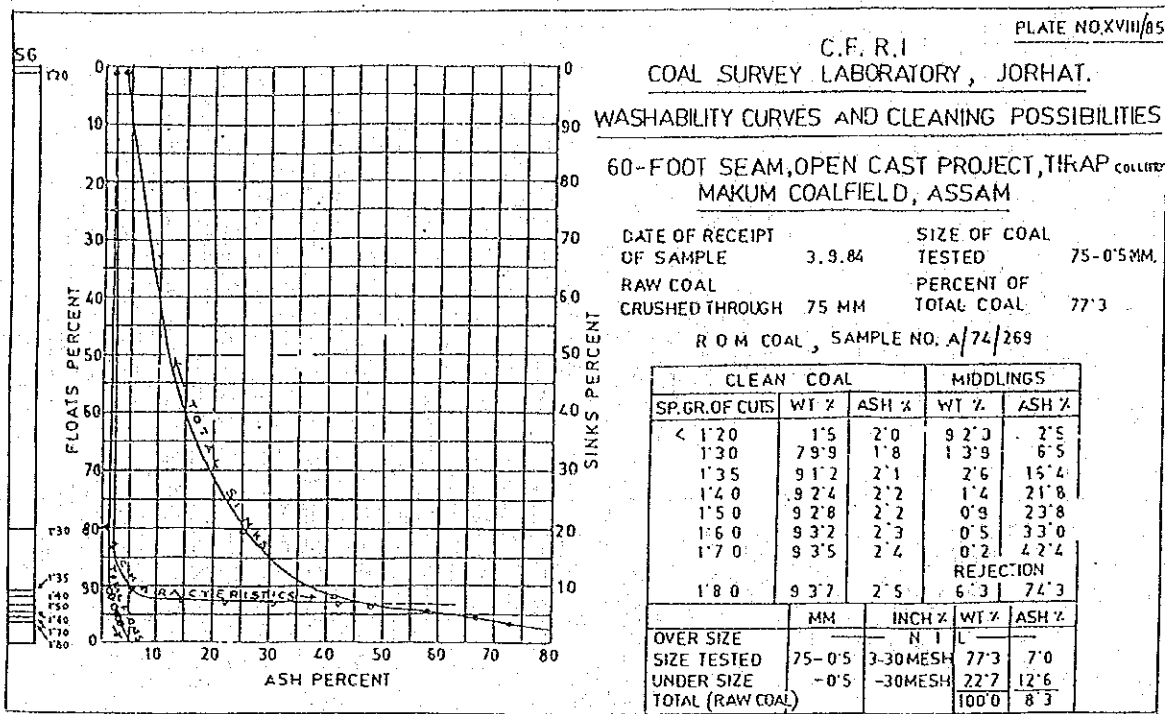
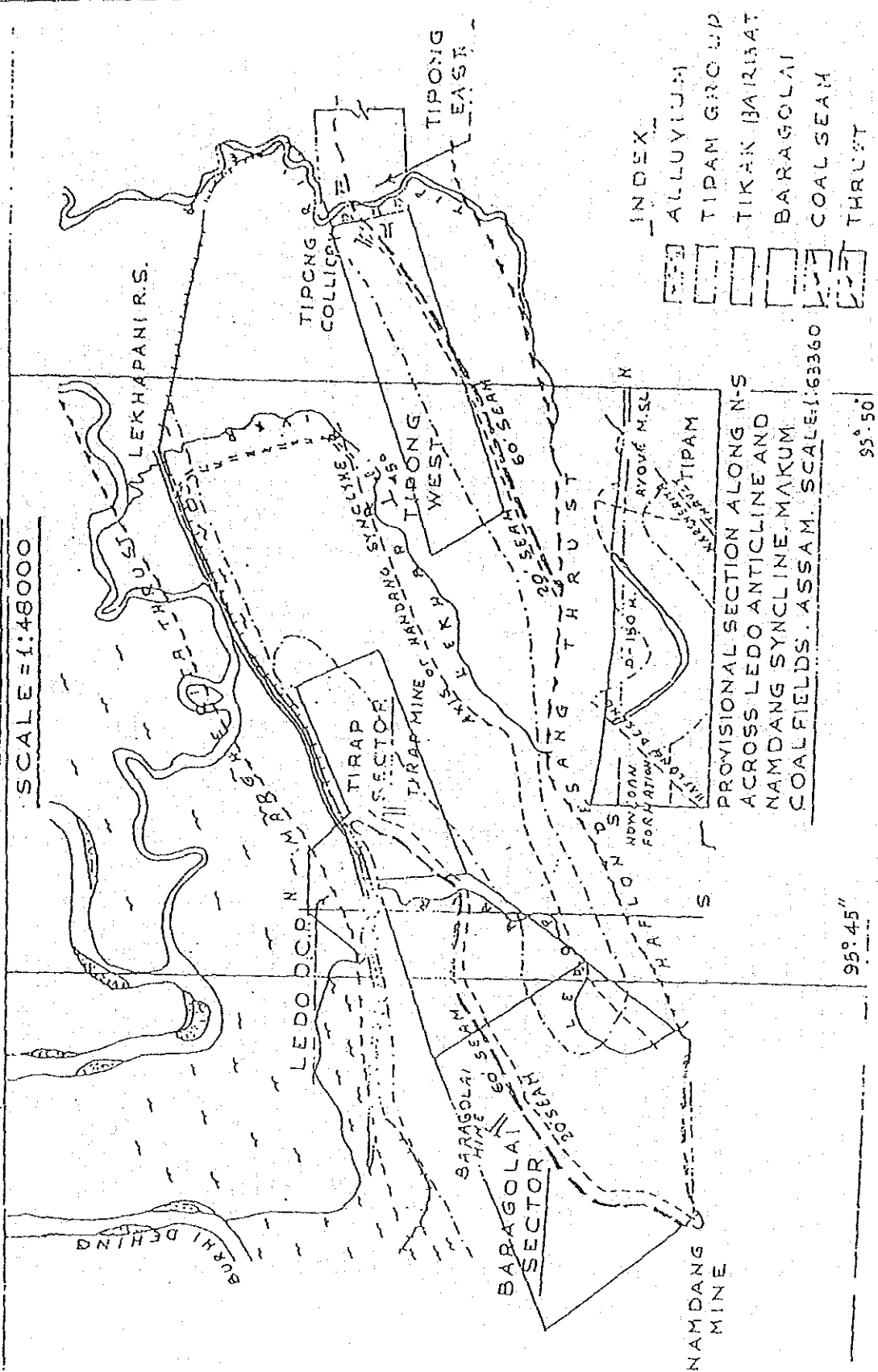


Figure 4 CLEANING CHARACTERISTICS OF ASSAM COAL (2/2)

Figure 5 GEOLOGICAL MAP OF MAKUM COAL FIELDS ALONG WITH TYPICAL SECTION



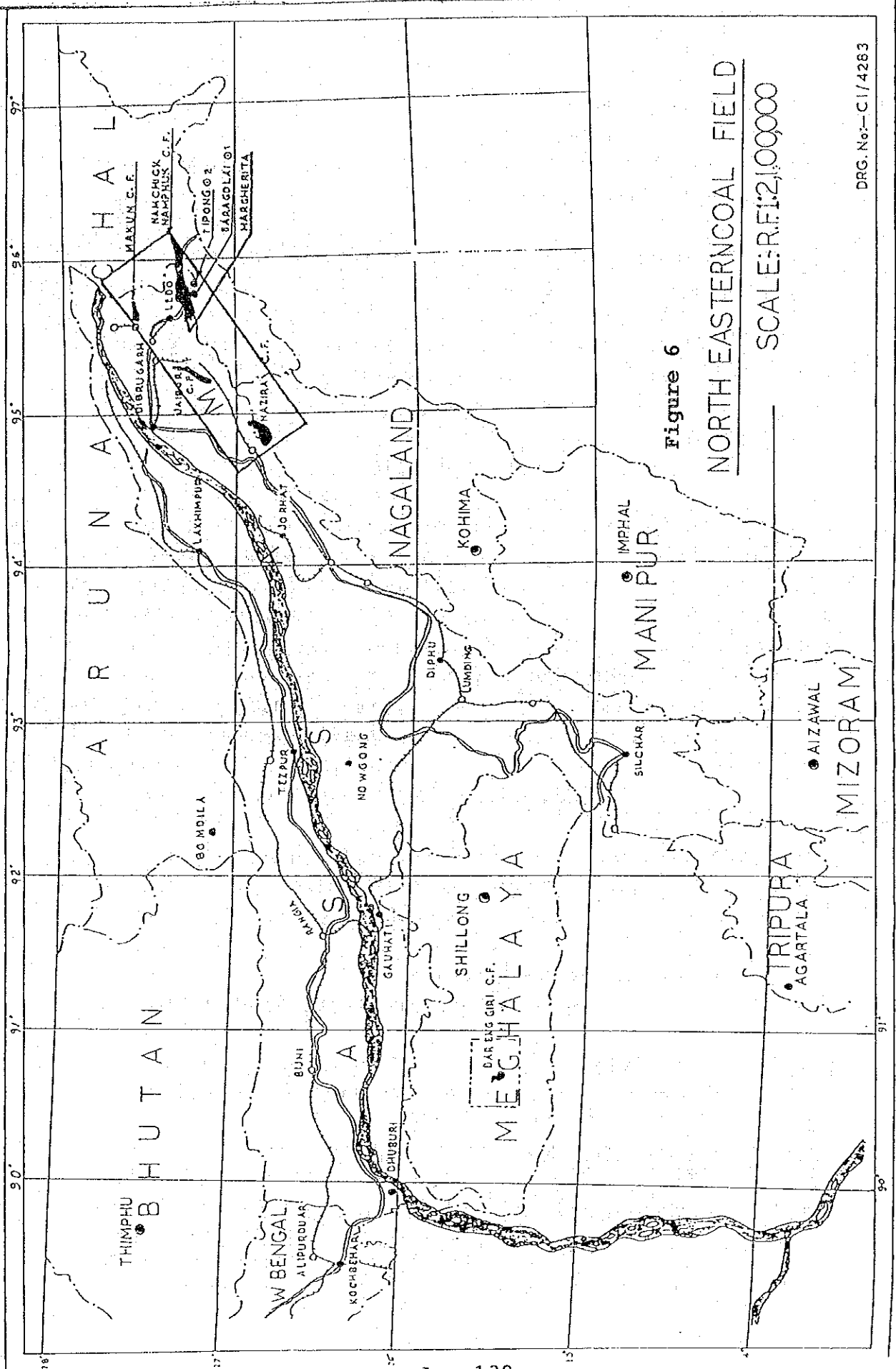


Figure 6

NORTH EASTERN COAL FIELD

SCALE: R.F. 1:2,000,000

5. Oil Agglomerated Middlings

(1) Details of Oil Agglomerated Middlings Testing Equipment Used to Produce Sample

- * Location: Central Fuel Research Institute, Dhanbad, Bihar State
- * Nominal capacity: 100 kg/h of washery middlings as feed basis
- * Flow sheet: Separate attachment
- * Source of Feed: The feed sample was collected from Lodna Washery of BCCL. It was the middlings sample produced by the three products 70 t/h Feldspar Jig Washer.
- * Size distribution of feed: Size of sample was 13mm-0. It was ground to 80% below 200 mesh (B.S.) in wet condition by continuously operated ball mill.
- * Yield of products: Agglomerates Yield 80%
Tailings Yield 20%
- * Outline of the process: Refer to flow sheet
- * Reagents: Conditioning: Diesel oil
Bridging : Furnace oil
- * Pulp density: 20%
- * Analysis of oil agglomerated product: To be conducted in Japan

* Production costs: As the equipment is for experimental testing it is not on a realistic commercial level.

Note: At the time of signing the S/W the Indian party indicated that the use of Anthracene oil for bridging would be advantageous for the SRC process. However, because of the lack of stability in such operations furnace oil was used as is normally the case.

(2) Present State of the Oil Agglomeration Plant

In addition to the CFRI testing facility there are a 2 t/h pilot plant at the Lodna Washery and a 10 t/h plant at the Patherdih washery. During the visit of the study team in September, 1990 the former was under repair while the latter was being commissioned and so operations were not such to permit the collection of samples. Data concerning the operational results of the Lodna 2 t/h pilot plant are shown in Table 4 for reference.

(3) Present State of Middlings Production

In order to reduce the ash content of coal for coke the BCCL operates nine washeries which produce a large output of middlings. Figures for this production are shown below.

The nine BCCL washeries taken together:

(Unit: million tons)

	1985-86	1986-87	1987-88	1988-89
Raw coal supplied	6.255	7.158	7.352	7.728
Clean coal output	3.391	4.106	4.198	4.506
Clean coal yield(%)	54	57	57	58
Middlings output	1.879	2.053	2.161	2.224

Lodna Washery:

(Unit: million tons)

	1985-86	1986-87	1987-88	1988-89
Raw coal supplied	0.234	0.269	0.242	0.262
Clean coal output	0.172	0.179	0.152	0.163
Clean coal yield(%)	73	64	63	62
Middlings output	0.050	0.051	0.046	0.047

Patherdih Washery:

(Unit: million tons)

	1985-86	1986-87	1987-88	1988-89
Raw coal supplied	1.127	1.040	0.997	1.146
Clean coal output	0.622	0.631	0.592	0.688
Clean coal yield(%)	56	61	59	60
Middlings output	0.483	0.408	0.394	0.400

Further, the CCL operates five washeries. The following shows data of these:

(Unit: million tons)

	1985-86	1986-87	1987-88	1988-89
Raw coal supplied	7.587	6.752	6.976	7.159
Clean coal output	4.463	3.751	3.806	3.902
Clean coal yield(%)	59	56	55	55
Middlings output	1.907	1.801	1.850	2.153

Attached :

- Figure 7 Flow Sheet for Oil Agglomeration Pilot Plant at CFRI
- Table 4 Results of Performance of Lodna Oil Agglomeration Plant

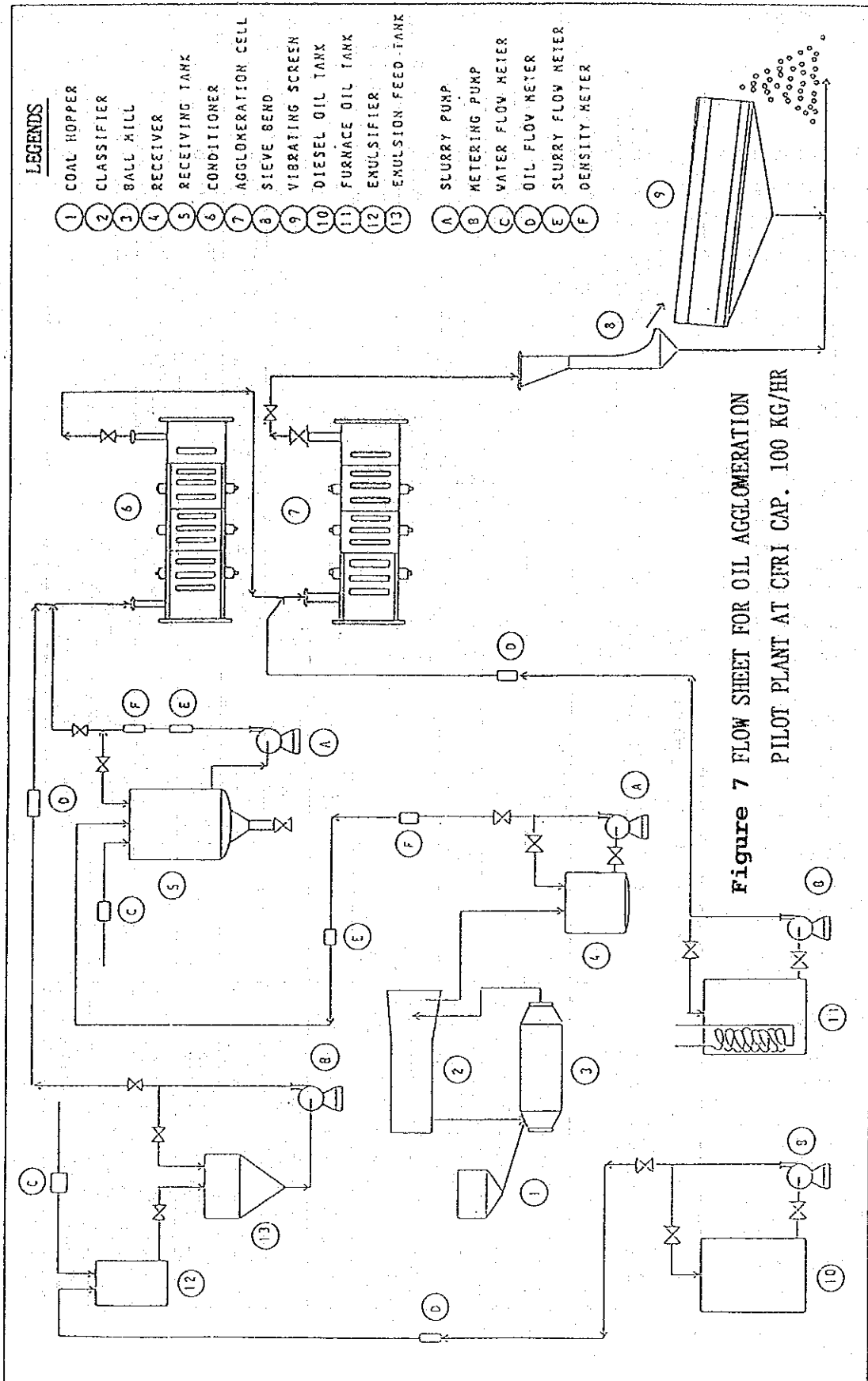


Table 4 RESULTS OF PERFORMANCE OF LODNA OIL AGGLOMERATION PLANT

Particulars of Sample	Diesel Oil for Conditioning (%)	Furnace Oil for Bridging (%)	Feed Ash (%)	Agglomerates		Tailings	
				wt%	Ash%	wt%	Ash%
Lodna Washery Middlings	1.8	7.5	38.5	58.0	17.0	42.0	68.2
Lodna Washery Middlings	1.8	7.5	38.0	59.3	16.7	40.7	69.0
Lodna Washery Middlings	1.8	7.0	37.0	64.2	19.0	35.8	69.3
Lodna Washery Middlings	1.8	7.2	39.0	58.8	18.8	41.2	67.8
Lodna Washery Middlings	1.4	6.5	39.0	60.3	19.8	39.7	68.2
Lodna Washery Middlings	2.0	8.0	37.8	61.8	18.8	38.2	68.5
Lodna Washery Slurry	-	9.0	24.0	82.7	14.0	17.3	72.0
Lodna Washery Slurry	-	9.0	24.0	79.3	12.0	20.7	71.0
Lodna Washery Slurry	1.4	-	24.0	80.2	12.5	19.8	70.5
Lodna Washery Slurry	1.4	-	24.0	79.9	12.1	20.1	71.3
Lodna Washery Slurry	1.4	6.5	24.0	80.5	12.4	19.5	72.0
Lodna Washery Slurry	1.4	6.0	19.3	82.5	8.3	17.5	71.3

Annex 3.2.3 DETAILS OF COKING COALS USED FOR COKE PRODUCTION TEST

The following is the details of individual coking coals used for coke production test. The major part of this is the information mainly collected from CMPDIL, CCSO and Commercial Directorate of SAIL, and MECON at the time of 2nd on site survey in September, 1991. The assumed figures are used for the items which are not available but required for financial and economic analysis. These assumptions are stated in the Note.

1. Prime Coking Coal:

<u>Name of Coal</u>	<u>Bhojudih Washed coal</u>	<u>Sudamdih Washed Coal</u>	<u>Chasnala Washed Coal</u>
Operating company	BCCL	BCCL	SAIL/IISCO
Location (State)	Bihar	Bihar	W. Bengal
Source of raw Coal	Plural Coal mines	Plural Coal mines	Plural Coal mines
Estimate of reserves*1	N.A	N.A	N.A
Capacity of washery (Raw coal feed) (MMt/y)	2.0	2.0	2.0
Contractual specification*2			
Total Moisture % (Assumed)	6.0	6.0	6.0
Ash% (Assumed)	20.0	19.0	19.0
Distance to RSP (km)	272	281	297
Contract price*3 (Rs/t) at loading point (Expected)	852.00	852.00	852.00
Sales tax 4% (Rs/t)	34.08	34.08	34.08

Railway freight*4 (Rs/t)	110.7 x 1.1	113.5 x 1.1	116.4 x 1.1
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Total purchase price (Rs/t)	1007.85	1010.93	1014.12
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- Note: *1 Individual reserves can not be estimated because raw coals come from plural coal mines.
- *2 Figures of contractual specification are just of assumption in this study since actual figures have not been available. It is presumed that coal price will be adjusted in accordance with variation of total moisture content like medium coking coal.
- *3 Renewal of purchase contract has not been agreed upon yet between SAIL and CIL. Increase rate of basic price is expected to be 26.00 Rs/t while the present basic price being 826.00 Rs/t.
- *4 Transportation tariff was revised in August, 1991 and the rate was increased by 10% of 1990's rate.

2. Medium Coking Coal:

Name of Coal	Kargali Washed coal	Swang Washed coal	Rajrappa Washed Coal
Operating company	CCL	CCL	CCL
Location (State)	Bihar	Bihar	Bihar
Source of raw coal	Plural Coal mines	Plural Coal mines	Rajrappa Colliery
Estimate of reserves*1	N.A	N.A	Minable 128 million tons
Capacity of washery (Raw coal feed) (MMt/y)	2.72	0.75	3.0
Contractual Specification*2			
Total Moisture %	6.5	8.5	7.0
Ash %	17.0	18.5	17.0
Distance to RSP (km)	303	317	248
Contract price*3 (Rs/t) at loading point	835.38	835.38	835.38
Sales tax 4% (Rs/t)	33.42	33.42	33.42

Railway freight (Rs/t)*4	121 x 1.1	124.0 x 1.1	118.00
Total purchase price (Rs/t)	1002.01	1005.20	986.80

- Note: *1 As to Kargali and Swang, reserves can not be estimated because raw coals come from plural coal mines. As to Rajrappa, only Rajrappa colliery supplies feed coal from its reserves to the Rajrappa washery.
- *2 Depending upon the variation of the total moisture, coal price will be adjusted as under. An adjustment of weight will be made according to the following adjustment formula.

$$\text{Adjustment of weight} = \frac{\text{R/R weight} \times (100 - X)}{100 - \text{A.M.}}$$

R/R : Railway received

X : Average gross moisture

A.M.: Agreed gross moisture

- *3 As to medium coking coal, the coal purchasing contract was made on April 9, 1991 retrospectively valid from April 1, 1990. However the coal price of this contract was reviewed and revised between SAIL and CCL/CIL on September 9, 1991, because the royalty rate went up from August 5, 1991.
- *4 Transportation tariff was revised in August, 1991 and the rate was increased by 10% of 1990's rate. Figure of 118.00 Rs/t for Rajrappa coal was given by CCSO/SAIL as the newly revised railway freight.

3. Imported Coal:

India is importing some coking coal for steel industry mainly from Australia. Commercial Directorate of SAIL is an organization in charge of importing coking coal. Current contractual specification for prime quality coking coal and purchase price are as under.

Contractual specification (Desired)

Size	0 - 50 mm
	(Fractions below 0.5 mm 25% Max.)
Total moisture (As received)	8.0% Max.
Inherent moisture (air dried)	1.5% Max.
Ash (Air dried)	8.0% Max.
Volatile matter (Air dried)	24 - 28%
Phosphorus	0.1% Max.
Sulphur	0.6% Max.
Gray King coke type	G3 Min.
Crusible swelling number (CSN)	6 Min.
Max. fluidity	700 ddpm Min.
Fluidity range	60°C Min.
Initial softening temp. at 5 ddpm	410+/-15°C Min.
Mean max. reflectance of vitrinite	1.10 - 1.30
Vitrinite percentage	55% Min.
Vitrinite distribution V9-V13	80% Min.

Note: As to the imported coal from ARCO Australia, figures of specifications are changed as follows;

Ash (Air dried)	7.0% Max.
Sulphur	0.5% Max.
CSN	7 Min.
Max. fluidity	1050 ddpm Min.

Coal price

FOB	52.00 US\$/t (Approx.)
CIF	72.00 US\$/t (Approx.)
Purchased price at RSP (Including customs duty 5% on CIF, etc.)	2,450 Rs/t

Australia produced total 149,349,000 tons of clean coal in AFY 1988/89 (July to June), 68,176,000 tons in New South Wales and 74,118,000 tons in Queensland, and exported 99,302,000 tons. In 1989, 3,969,000 tons were exported to India and out of them 3,885,000 tons were coking coal. Goonyella coal is main imported coal for Rourkela steel plant and Curragh and Cook coals are also imported. Outlines of these coals are as under.

Goonyella coal (Queensland):

Owner: Central Queensland Coal Associate

Managing company & Shipper: BHP-Utah Coal Ltd.

Standard quality : TM 10%, IM 1.0%, Ash 8.0%, VM 25.5%,

FC 65.5%, TS 0.5%, CSN 3,

CV 7,860 kcal/kg

Max. fluidity 1,750 ddpm, Size 0-50mm

Coal reserves : Proved 1,390 million tons

(O/C 290, U/G 1100)

Inferred 245 million tons

(O/C 55, U/G 190)

Total 1,635 million tons

(O/C 345, U/G 1290)

Basic production capacity : 5.5 MMT/y (clean coal)

Actual production in 1988/89:

4,280,248 tons of clean coal

Export for India in 1988/89 :

887,988 tons of clean coal

Loading port : Hay Point

Curragh coal (Queensland):

Owner: Un-inco. Joint Venture (ARCO Coal Australia Inc. and others)

Operation company:

Curragh Queensland Mining Ltd. (Subsidiary of ARCO)

Standard quality (Coking coal):

TM 9.5%, IM 1.5%, Ash 8.0%, VM 21.0%, FC 69.0%,

TS 0.6%, CSN 4

Coal reserves: O/C Movable proved 140.0 million tons

(Coking coal 55.0 million tons)

(Non-coking coal 85.0 million tons)

U/G Movable proved 27.0 million tons

(Coking coal 13.0 million tons)

(Non-coking coal 14.0 million tons)

Basic production capacity: 7 MMT/y (raw coal)

(3 million tons for coking coal, 4 million tons for non-coking coal)

Actual production in 1988/89:

5,323,775 tons of raw coal

Export for India: N.A

Loading port : Gladstone

Cook coal (Queensland):

Owner and operating company:

Coal Resources of Queensland Pty. Ltd. (Subsidiary of ARCO)

Standard quality (Coking coal):

TM 9.0%, IM 1.4%, Ash 7.0%, VM 27.5%, FC 64.1%,

TS 0.38%, CSN 7.5, Max. fluidity 2500 ddpm

Coal reserves (U/G Minable reserves):

Proved 210 million tons

Inferred 530 million tons

Total 740 million tons

Basic production capacity:

2.25 MMt/y (raw coal)

(1.1 million tons for coking coal, 0.8 million tons for non-coking coal in clean coal basis)

Actual production in 1988/89:

1,200,375 tons of raw coal

Export for India in 1988/89 : 268,170 tons of clean coal

Loading port : Gladstone

Note: Source of the above three Australian coals is "Coal Year Book 1991" issued by Tex Report Company, Japan.

Annex 3.3.1 LIST OF EXPERIMENTAL DATA OF AUTOCLAVE TESTS (1/12)

Experimental Number	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112
Test condition												
Coal name	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin
Solvent name	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Coal/Solvent Ratio(wt/wt)	380	380	410	410	430	430	380	380	410	410	430	430
Reaction Temperature(°C)	60	60	60	60	60	60	90	90	90	90	90	90
Residence time(min)	100	100	100	100	100	100	100	100	100	100	100	100
Initial pressure(kg/cm ² G)	0.0	3.0	0.0	3.0	0.0	3.0	0.0	0.0	0.0	3.0	0.0	3.0
Catalyst (wt%)	100	100	100	100	100	100	100	100	100	100	100	100
H ₂ -Partial pressure(%)												
Raw material												
Coal (g)	50.38	50.45	50.26	50.40	50.45	50.38	50.13	50.24	50.16	50.17	50.18	50.16
Moisture(wt%)	0.22	0.22	0.22	0.22	0.16	0.18	0.73	0.73	0.84	0.84	0.83	0.83
Ash(wt%)	2.26	2.26	2.56	2.56	2.27	2.27	2.24	2.24	2.24	2.24	2.23	2.23
Solvent(g)	100.39	100.67	100.20	100.39	100.22	100.42	100.68	100.66	100.48	100.26	100.60	100.55
Catalyst(g)	0	1.50	0	1.50	0	1.50	0	1.50	0	1.50	0	1.50
Hydrogen(g)	3.59	3.52	3.55	3.54	3.56	3.52	3.47	3.46	3.43	3.48	3.41	3.41
Product yield												
Solubility(daf.wt%)	--	--	98.18	98.24	97.72	97.51	--	--	98.09	98.39	97.94	98.17
Gas(total)(daf.wt%)	--	--	2.31	2.20	5.39	4.70	--	--	4.20	4.05	7.20	7.26
C ₁ (daf.wt%)	--	--	0.68	0.59	1.99	1.83	--	--	1.40	1.44	2.75	2.80
CO (daf.wt%)	--	--	0.10	0.12	0.41	0.35	--	--	0.31	0.29	0.58	0.58
CO ₂ (daf.wt%)	--	--	0.68	0.65	0.93	0.85	--	--	0.93	0.93	1.15	1.15
C ₂ (daf.wt%)	--	--	0.39	0.39	1.00	0.90	--	--	0.66	0.66	1.32	1.33
C ₃ (daf.wt%)	--	--	0.26	0.21	0.53	0.45	--	--	0.43	0.41	0.78	0.84
C ₄ (daf.wt%)	--	--	0.06	0.04	0.20	0.14	--	--	0.16	0.14	0.27	0.29
H ₂ S (daf.wt%)	--	--	0.20	0.10	0.33	0.18	--	--	0.31	0.18	0.37	0.27
Oil+Water (daf.wt%)	--	--	21.05	29.08	34.85	32.99	--	--	34.32	33.57	38.35	40.44
SRC (daf.wt%)	--	--	75.75	68.75	59.05	62.21	--	--	60.86	62.21	54.06	52.32
H ₂ -Consumption (daf.wt%)	--	--	0.93	1.80	1.56	2.38	--	--	1.29	1.44	1.67	1.85

Annex 3.3.1 LIST OF EXPERIMENTAL DATA OF AUTOCLAVE TESTS (2/12)

Experimental Number	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212
Test condition												
Coal name	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin
Solvent name	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Coal/Solvent Ratio(wt/wt)	380	410	410	410	430	430	380	380	410	410	430	430
Reaction Temperature(°C)	60	60	60	60	60	60	90	90	90	90	90	90
Residence time(min)	100	100	100	100	100	100	100	100	100	100	100	100
Initial pressure(kg/cm ² G)	0.0	0.0	0.0	3.0	0.0	3.0	0.0	3.0	0.0	3.0	0.0	3.0
Catalyst (wt%)	100	100	100	100	100	100	100	100	100	100	100	100
H ₂ -Partial pressure(%)												
Raw material												
Coal (g)	50.46	50.35	50.32	50.35	50.40	50.17	50.42	50.18	50.19	50.21	50.19	50.17
Moisture(wt%)	1.89	0.90	1.95	1.95	0.94	2.78	0.90	1.44	1.78	1.78	1.78	1.44
Ash(wt%)	13.49	13.63	13.48	13.48	13.62	13.25	13.63	13.41	13.23	13.23	13.23	13.41
Solvent(g)	100.15	100.34	100.32	100.40	100.17	100.79	100.37	100.51	100.43	100.42	100.53	100.56
Catalyst(g)	0	0	0	1.50	0	1.50	0	1.50	0	1.50	0	1.50
Hydrogen(g)	3.58	3.53	3.51	3.43	3.52	3.44	3.54	3.44	3.36	3.41	3.36	3.42
Product yield												
Solubility(daf.wt%)	58.20	60.15	81.30	83.46	86.00	87.61	66.82	74.35	84.44	86.69	87.78	88.95
Gas(total)(daf.wt%)	1.55	1.58	3.08	3.10	5.29	6.60	1.79	2.62	4.66	4.80	7.31	7.89
C ₁ (daf.wt%)	0.19	0.23	0.75	0.80	1.81	2.26	0.30	0.45	1.27	1.43	2.37	2.76
CO (daf.wt%)	0.12	0.11	0.21	0.23	0.51	0.52	0.14	0.21	0.40	0.42	0.68	0.79
CO ₂ (daf.wt%)	0.96	0.91	1.27	1.27	1.16	1.62	0.98	1.45	1.52	1.55	1.69	1.62
C ₃ (daf.wt%)	0.17	0.19	0.49	0.52	0.93	1.23	0.21	0.30	0.77	0.82	1.36	1.55
C ₄ (daf.wt%)	0.07	0.12	0.24	0.21	0.60	0.69	0.09	0.14	0.42	0.42	0.87	0.87
H ₂ S (daf.wt%)	0.02	0.02	0.07	0.07	0.21	0.26	0.02	0.07	0.21	0.16	0.30	0.30
Oil+Water (daf.wt%)	0.02	0	0.05	0.00	0.07	0.02	0.05	0	0.07	0.16	0.09	0.09
SRC	36.17	35.60	42.56	41.88	42.19	38.64	43.22	39.84	37.15	38.16	37.84	40.99
H ₂ -Consumption (daf.wt%)	22.24	24.31	36.70	39.60	39.73	43.84	22.44	33.18	44.36	45.00	43.91	42.17
	0.75	1.35	1.04	1.12	1.21	1.47	0.63	1.30	1.73	1.28	1.27	2.11

Annex 3.3.1 LIST OF EXPERIMENTAL DATA OF AUTOCLAVE TESTS (3/12)

Experimental Number	1301	1302	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312
Test condition												
Coal name	LIGNITE	LIGNITE	LIGNITE	LIGNITE	LIGNITE	LIGNITE	LIGNITE	LIGNITE	LIGNITE	LIGNITE	LIGNITE	LIGNITE
Solvent name	Tetralin	Tetralin	Tetralin	Tetralin	Tetralin	Tetralin	Tetralin	Tetralin	Tetralin	Tetralin	Tetralin	Tetralin
Coal/Solvent Ratio(wt/wt)	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Reaction Temperature(°C)	380	380	410	410	430	430	380	380	410	410	430	430
Residence time(min)	60	60	60	60	60	60	90	90	90	90	90	90
Initial pressure(Kg/cm²G)	100	100	100	100	100	100	100	100	100	100	100	100
Catalyst (wt%)	0.0	3.0	0.0	3.0	0.0	3.0	0.0	0.0	0.0	3.0	0.0	3.0
H ₂ -Partial pressure(%)	100	100	100	100	100	100	100	100	100	100	100	100
Raw material												
Coal (g)	50.27	50.38	50.34	50.39	50.23	50.24	50.13	50.11	50.16	50.12	50.17	50.17
Moisture(wt%)	2.24	2.24	2.02	2.02	1.53	1.53	2.38	2.38	2.38	2.38	2.38	2.38
Ash(wt%)	4.32	4.32	4.38	4.38	4.45	4.45	4.40	4.40	4.40	4.40	4.40	4.40
Solvent(g)	99.95	100.12	100.12	100.25	100.44	100.47	100.54	100.59	100.52	100.50	100.58	100.59
Catalyst(g)	0	1.50	0	1.50	0	1.50	0	1.50	0	1.50	0	1.50
Hydrogen(g)	3.61	3.52	3.56	3.52	3.55	3.46	3.41	3.36	3.41	3.39	3.43	3.42
Product yield												
Solubility(daf.wt%)	61.57	64.56	66.57	68.50	96.89	97.77	72.91	80.37	97.97	90.79	97.73	98.78
Gas(total)(daf.wt%)	8.45	8.50	11.82	11.56	15.06	14.19	10.96	11.26	14.17	14.53	16.78	16.69
C ₁ (daf.wt%)	0.26	0.28	0.68	0.70	1.50	1.44	0.45	0.51	1.11	1.20	2.01	2.01
CO (daf.wt%)	0.51	0.51	0.85	0.89	1.31	1.48	0.68	0.75	1.09	1.20	1.63	1.88
CO ₂ (daf.wt%)	7.17	7.25	8.98	8.74	9.93	9.15	8.99	9.18	10.19	10.29	10.30	10.11
C ₂ (daf.wt%)	0.15	0.17	0.49	0.49	1.02	0.95	0.26	0.30	0.71	0.75	1.20	1.18
C ₃ (daf.wt%)	0.13	0.13	0.40	0.40	0.68	0.68	0.21	0.24	0.51	0.55	0.88	0.84
C ₄ (daf.wt%)	0.08	0.08	0.19	0.19	0.32	0.30	0.13	0.13	0.26	0.28	0.38	0.36
H ₂ S (daf.wt%)	0.15	0.08	0.23	0.15	0.32	0.19	0.24	0.15	0.30	0.26	0.38	0.30
Oil+Water (daf.wt%)	23.04	23.88	39.51	39.94	26.31	50.25	31.00	37.78	49.24	43.68	50.52	52.11
SRC (daf.wt%)	30.68	32.90	36.00	39.15	56.73	34.97	31.44	32.13	35.43	33.67	31.82	31.69
H ₂ -Consumption (daf.wt%)	0.60	0.72	0.77	1.15	1.23	1.63	0.49	0.81	0.88	1.29	1.39	1.90

Annex 3.3.1 LIST OF EXPERIMENTAL DATA OF AUTOCLAVE TESTS (4/12)

Experimental Number	1401	1402	1403	1404	1405	1406	1407	1408	1409	1410	1411	1412
Test condition												
Coal name	ARGADA Tetralin	ARGADA Tetralin	ARGADA Tetralin	ARGADA Tetralin	ARGADA Tetralin	ARGADA Tetralin	ARGADA Tetralin	ARGADA Tetralin	ARGADA Tetralin	ARGADA Tetralin	ARGADA Tetralin	ARGADA Tetralin
Solvent name	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Coal/Solvent Ratio(wt/wt)	380	380	410	410	430	430	360	380	410	410	430	430
Reaction temperature(°C)	60	60	60	60	60	60	90	90	90	90	90	90
Residence time(min)	100	100	100	100	100	100	100	100	100	100	100	100
Initial pressure(kg/cm²G)	0.0	3.0	0.0	3.0	0.0	3.0	0.0	3.0	0.0	3.0	0.0	3.0
Catalyst (wt%)	100	100	100	100	100	100	100	100	100	100	100	100
H ₂ -Partial pressure(%)												
Raw material												
Coal (g)	50.37	50.31	50.35	50.35	50.34	50.27	50.20	50.19	50.15	50.16	50.17	50.18
Moisture(wt%)	0.32	0.32	0.30	0.30	0.37	0.37	0.75	0.75	0.75	0.75	0.75	0.75
Ash(wt%)	18.39	18.39	18.36	18.36	18.38	18.38	18.23	18.23	18.23	18.23	18.23	18.23
Solvent(g)	100.06	100.35	100.51	100.48	109.36	100.43	100.55	100.74	100.63	100.67	100.65	100.58
Catalyst(g)	0	1.50	0	1.50	0	1.50	0	1.50	0	1.50	0	1.50
Hydrogen(g)	3.54	3.52	3.59	3.53	3.48	3.47	3.45	3.42	3.41	3.39	3.45	3.41
Product yield												
Solubility(daf.wt%)	51.21	55.25	76.17	75.83	83.59	82.88	86.17	61.70	79.65	78.56	84.77	84.23
Gas(total)(daf.wt%)	1.00	1.05	2.42	2.29	4.82	4.41	1.79	1.87	3.74	3.86	6.03	6.47
C ₁ (daf.wt%)	0.15	0.17	0.59	0.61	1.66	1.52	0.27	0.32	1.06	1.18	2.12	2.31
C ₀ (daf.wt%)	0.05	0.07	0.12	0.12	0.39	0.24	0.12	0.12	0.27	0.30	0.49	0.54
C ₂ (daf.wt%)	0.59	0.59	1.03	0.95	1.25	1.20	1.01	1.06	1.33	1.28	1.43	1.48
C ₃ (daf.wt%)	0.12	0.15	0.39	0.39	0.88	0.86	0.20	0.22	0.57	0.62	1.08	1.20
C ₄ (daf.wt%)	0.05	0.05	0.19	0.17	0.47	0.47	0.12	0.13	0.32	0.34	0.62	0.69
H ₂ S (daf.wt%)	0.02	0.02	0.05	0.05	0.17	0.12	0.02	0.02	0.12	0.12	0.22	0.25
H ₂ O (daf.wt%)	0.02	0	0.05	0	0	0	0.05	0	0.07	0.02	0.07	0
Oil+Water (daf.wt%)	26.40	27.37	22.16	21.70	28.31	28.55	35.78	30.35	24.91	30.48	35.87	33.08
SRC (daf.wt%)	24.30	28.12	52.76	52.86	51.98	51.40	29.31	30.16	52.13	46.20	44.72	46.45
H ₂ -Consumption (daf.wt%)	0.49	1.30	1.16	1.03	1.52	1.47	0.72	0.61	1.13	1.99	1.85	1.77

Annex 3.3.1 LIST OF EXPERIMENTAL DATA OF AUTOCLAVE TESTS (5/12)

Experimental Number	1501	1502	1503	1504	1505	1506	1507	1508	1509	1510	1511	1512
Test condition												
Coal name	O.A.midd Tetralin	O.A.midd Tetralin	O.A.midd Tetralin	O.A.midd Tetralin	O.A.midd Tetralin	O.A.midd Tetralin	O.A.midd Tetralin	O.A.midd Tetralin	O.A.midd Tetralin	O.A.midd Tetralin	O.A.midd Tetralin	O.A.midd Tetralin
Solvent name	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Coal/Solvent Ratio(wt/wt)	380	380	410	410	430	430	380	380	410	410	430	430
Reaction Temperature(°C)	60	60	60	60	60	60	90	90	90	90	90	90
Residence time(min)	100	100	100	100	100	100	100	100	100	100	100	100
Initial pressure(kg/cm ² G)	0.0	3.0	0.0	3.0	0.0	3.0	0.0	3.0	0.0	3.0	0.0	3.0
Catalyst (wt%)	100	100	100	100	100	100	100	100	100	100	100	100
H ₂ -Partial pressure(%)												
Raw material												
Coal (g)	50.44	50.44	50.45	50.36	50.33	50.28	50.20	50.18	50.20	50.19	50.20	50.22
Moisture(wt%)	1.13	1.13	0.83	0.83	0.79	0.79	0.35	0.35	0.35	0.35	0.35	0.35
Ash(wt%)	20.94	20.94	20.94	20.94	20.94	20.94	21.08	21.08	21.08	21.08	21.08	21.08
Solvent(g)	100.37	100.51	99.90	99.97	100.13	99.85	100.61	100.56	100.50	100.47	100.59	100.54
Catalyst(g)	0	1.50	0	1.50	0	1.50	0	1.50	0	1.50	0	1.50
Hydrogen(g)	3.60	3.53	3.59	3.50	3.64	3.63	3.49	3.45	3.45	3.44	3.43	3.39
Product yield												
Solubility(daf.wt%)	33.94	37.24	58.70	59.76	71.92	70.77	41.25	56.41	65.54	69.23	74.11	74.88
Gas(total)(daf.wt%)	0.31	0.36	0.91	0.96	2.64	2.26	0.51	0.58	1.67	1.72	3.85	4.03
C ₁ (daf.wt%)	0.05	0.08	0.38	0.41	1.22	1.17	0.18	0.18	0.76	0.81	1.75	1.90
CO (daf.wt%)	0	0	0	0.02	0.06	0.08	0	0	0.05	0.02	0.18	0.18
CO ₂ (daf.wt%)	0.18	0.15	0.28	0.25	0.35	0.25	0.23	0.25	0.36	0.33	0.36	0.35
C ₂ (daf.wt%)	0.05	0.06	0.15	0.16	0.56	0.51	0.08	0.10	0.30	0.33	0.81	0.89
C ₃ (daf.wt%)	0.03	0.05	0.08	0.08	0.28	0.20	0.02	0.02	0.15	0.15	0.49	0.51
C ₄ (daf.wt%)	0	0	0.02	0.02	0.13	0.05	0.00	0.03	0.05	0.06	0.19	0.20
H ₂ S (daf.wt%)	0	0	0	0	0.02	0	0	0	0	0	0.05	0
Oil+Water (daf.wt%)	2.57	7.94	17.29	13.68	23.51	25.75	12.60	28.40	25.66	23.02	36	32.60
SRC (daf.wt%)	31.64	30.69	41.27	46.81	47.14	45.22	28.81	27.87	39.12	45.48	39.26	39.63
H ₂ -Consumption (daf.wt%)	0.59	1.76	0.76	1.70	1.37	2.47	0.66	0.45	0.91	0.99	1.37	1.39

Annex 3.3.1 LIST OF EXPERIMENTAL DATA OF AUTOCLAVE TESTS (6/12)

Experimental Number	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112
Test condition												
Coal name	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Tetralin	ASSAM Anthra.	ASSAM Anthra.
Solvent name	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Coal/Solvent Ratio(wt/wt)	430	430	430	430	360	450	430	430	430	430	430	430
Reaction Temperature(°C)	30	120	60	60	60	60	60	60	60	60	30	120
Residence time(min)	100	100	80	120	100	100	100	100	100	100	100	100
Initial pressure(Kg/cm ² G)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Catalyst (wt%)	100	100	100	100	100	100	100	70	80	90	100	100
H ₂ -Partial pressure(%)												
Raw material												
Coal (g)	50.26	50.25	50.30	50.22	50.24	50.52	50.48	50.21	50.28	50.13	50.30	50.32
Moisture(wt%)	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.80	0.80	0.83	0.30	0.31
Ash(wt%)	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.27	2.27	2.23	2.28	2.24
Solvent(g)	100.45	100.20	100.29	100.56	100.68	100.37	100.46	100.30	100.45	100.58	100.09	99.65
Catalyst(g)	1.50	1.50	1.50	1.50	1.50	1.50	3.00	1.50	1.50	1.50	1.50	1.50
Hydrogen(g)	3.44	3.44	2.78	4.17	3.50	3.48	3.46	2.46	2.77	3.16	3.56	3.55
Product yield												
Solubility(daf, wt%)	97.66	98.13	97.32	98.01	-	98.04	98.20	97.22	97.49	97.77	98.96	98.85
Gas(total)(daf, wt%)	4.30	7.32	5.64	5.55	-	8.30	5.36	5.81	5.47	6.46	5.71	9.87
C ₁ (daf, wt%)	1.43	2.72	2.07	2.01	-	3.11	1.95	2.11	2.00	2.43	1.94	4.00
CO (daf, wt%)	0.35	0.63	0.51	0.49	-	0.75	0.45	0.53	0.51	0.45	0.45	0.67
CO ₂ (daf, wt%)	0.92	1.06	1.00	0.96	-	1.10	1.02	1.03	1.00	1.17	1.06	1.20
C ₂ (daf, wt%)	0.80	1.47	1.08	1.06	-	1.73	1.04	1.00	0.92	1.17	1.14	2.10
C ₃ (daf, wt%)	0.43	0.84	0.57	0.57	-	1.00	0.55	0.66	0.60	0.74	0.65	1.14
C ₄ (daf, wt%)	0.16	0.31	0.18	0.21	-	0.33	0.19	0.24	0.22	0.23	0.22	0.39
H ₂ S (daf, wt%)	0.21	0.29	0.23	0.25	-	0.28	0.16	0.24	0.22	0.27	0.25	0.37
Oil+Water (daf, wt%)	32.23	40.79	35.41	36.72	-	44.41	34.68	37.68	35.38	37.22	23.95	30.16
SRC (daf, wt%)	62.50	52.65	57.71	57.99	-	47.46	59.88	54.88	57.91	55.72	71.94	62.81
H ₂ -Consumption (daf, wt%)	1.37	2.63	1.44	2.24	-	2.13	1.71	1.15	1.26	1.63	2.65	3.99

Annex 3.3.1 LIST OF EXPERIMENTAL DATA OF AUTOCLAVE TESTS (7/12)

Experimental Number	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125
Test condition													
Coal name	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.
Solvent name	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Coal/Solvent Ratio(wt/wt)	430	430	360	450	430	430	430	430	360	410	430	430	430
Reaction Temperature(C)	60	60	60	60	60	60	60	60	60	60	60	60	90
Residence time(min)	80	120	100	100	100	100	100	100	100	100	100	100	100
Initial pressure(Kg/cm ² G)	3.0	3.0	3.0	3.0	6.0	3.0	3.0	3.0	3.0	3.0	0	3.0	3.0
Catalyst (wt%)	100	100	100	100	100	70	80	90	100	100	100	100	100
H ₂ -Partial pressure(%)													
Raw material													
Coal (g)	50.34	50.24	50.28	50.22	50.35	50.27	50.28	50.18	50.24	50.28	50.27	50.30	50.30
Moisture(wt%)	0.29	0.29	0.39	0.38	0.31	0.28	0.29	0.43	0.39	0.53	0.37	0.37	0.30
Ash(wt%)	2.27	2.27	2.20	2.28	2.25	2.28	2.28	2.28	2.20	2.25	2.26	2.26	2.28
Solvent(g)	100.46	100.57	100.73	100.60	100.39	100.67	100.51	100.89	100.72	100.45	100.63	100.30	100.52
Catalyst(g)	1.50	1.50	1.50	1.50	3.00	1.50	1.50	1.50	1.50	1.50	0	1.50	1.50
Hydrogen(g)	2.94	4.27	3.46	3.48	3.53	2.47	2.83	2.91	3.49	3.48	3.50	3.43	3.50
Product yield													
Solubility(daf. wt%)	98.61	99.14	-	97.67	99.01	98.26	98.73	98.58	-	99.01	98.47	98.91	98.87
Gas(total)(daf. wt%)	6.99	6.74	-	12.48	7.58	6.74	7.19	7.59	-	3.09	7.25	7.13	8.82
C ₁ (daf. wt%)	2.77	2.39	-	5.03	2.89	2.37	2.61	2.79	-	0.88	2.65	2.65	3.43
CO (daf. wt%)	0.51	0.49	-	0.80	0.55	0.43	0.47	0.51	-	0.20	0.51	0.49	0.61
CO ₂ (daf. wt%)	1.14	1.04	-	1.37	1.12	1.25	1.22	1.23	-	0.78	1.16	1.10	1.20
C ₂ (daf. wt%)	1.24	1.16	-	2.68	1.59	1.35	1.47	1.53	-	0.55	1.45	1.43	1.86
C ₃ (daf. wt%)	0.77	1.10	-	1.60	0.86	0.75	0.80	0.82	-	0.41	0.82	0.88	1.00
C ₄ (daf. wt%)	0.27	0.27	-	0.55	0.31	0.32	0.33	0.31	-	0.12	0.29	0.29	0.37
H ₂ S (daf. wt%)	0.29	0.29	-	0.45	0.26	0.27	0.29	0.31	-	0.15	0.37	0.29	0.35
Oil+Water (daf. wt%)	25.94	26.62	-	30.15	30.30	23.25	27.36	25.95	-	22.76	24.71	27.12	30.38
SRC (daf. wt%)	68.68	65.13	-	59.10	64.65	70.76	66.90	67.89	-	75.18	69.20	67.63	63.23
H ₂ -Consumption (daf. wt%)	3.00	3.35	-	3.86	3.52	2.49	2.71	2.75	-	2.02	2.70	2.96	3.56

Annex 3.3.1 LIST OF EXPERIMENTAL DATA OF AUTOCLAVE TESTS (8/12)

Experimental Number	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212
Test condition	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Tetralin	SAMLA Anthra.	SAMLA Anthra.
Solvent name	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Coal/Solvent Ratio(wt/wt)	430	430	430	430	360	450	430	430	430	430	430	430
Reaction Temperature(°C)	30	120	60	60	60	60	60	60	60	60	60	120
Residence time(min)	100	100	80	120	100	100	100	100	100	100	100	100
Initial pressure(Kg/cm ² G)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Catalyst (wt%)	100	100	100	100	100	100	100	100	100	100	100	100
H ₂ -Partial pressure(%)												
Raw material												
Coal (g)	50.31	50.28	50.33	50.17	50.33	50.42	50.33	50.29	50.37	50.36	50.42	50.34
Moisture(wt%)	0.94	0.94	1.12	1.92	1.03	1.03	1.04	1.04	1.02	1.02	1.97	2.02
Ash(wt%)	13.56	13.56	13.50	13.43	13.61	13.61	13.52	13.52	13.51	13.51	13.47	13.47
Solvent(g)	100.03	100.24	100.04	100.26	100.51	100.42	100.46	100.30	100.55	100.47	100.17	100.30
Catalyst(g)	1.50	1.50	1.50	1.50	1.50	1.50	3.00	1.50	1.50	1.50	1.50	1.50
Hydrogen(g)	3.50	3.60	2.79	4.01	3.47	3.53	3.54	2.51	2.74	3.13	3.49	3.53
Product yield												
Solubility(daf, wt%)	84.72	89.81	86.27	89.00	36.82	88.89	88.44	85.82	86.50	87.38	79.87	84.72
Gas(total)(daf, wt%)	4.21	6.98	5.56	7.06	1.02	7.81	5.49	5.75	5.48	5.46	5.37	10.01
C ₁ (daf, wt%)	1.30	2.54	1.88	2.40	0.09	2.86	1.91	1.89	1.86	1.84	1.64	4.00
CO (daf, wt%)	0.35	0.63	0.51	0.66	0.07	0.74	0.56	0.49	0.51	0.51	0.40	0.61
CO ₂ (daf, wt%)	1.28	1.23	1.33	1.53	0.77	1.26	1.26	1.40	1.32	1.30	1.62	1.69
C ₂ (daf, wt%)	0.77	1.47	1.07	1.32	0.07	1.70	1.07	1.14	1.09	1.07	1.03	2.18
C ₃ (daf, wt%)	0.37	0.79	0.58	0.82	0.92	0.93	0.51	0.60	0.51	0.53	0.45	1.01
C ₄ (daf, wt%)	0.14	0.30	0.19	0.33	0	0.30	0.18	0.21	0.19	0.19	0.19	0.40
H ₂ S (daf, wt%)	0	0.02	0	0	0	0.02	0	0.02	0	0.02	0.04	0.12
Oil+Water (daf, wt%)	35.84	38.78	38.52	41.73	19.03	39.69	37.07	35.99	34.96	36.52	29.78	24.42
SRC (daf, wt%)	45.91	46.14	43.37	42.25	17.22	43.20	47.67	45.26	47.25	46.65	47.05	54.01
H ₂ -Consumption (daf, wt%)	1.23	2.09	1.19	2.05	0.45	1.80	1.79	1.18	1.18	1.24	2.32	3.72

Annex 3.3.1 LIST OF EXPERIMENTAL DATA OF AUTOCLAVE TESTS (9/12)

Experimental Number	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225
Test condition													
Coal name	SAMLA Anthra.	SAMLA Anthra.	SAMLA Anthra.	SAMLA Anthra.	SAMLA Anthra.	SAMLA Anthra.	SAMLA Anthra.	SAMLA Anthra.	SAMLA Anthra.	SAMLA Anthra.	SAMLA Anthra.	SAMLA Anthra.	SAMLA Anthra.
Coal/Solvent Ratio(wt/wt)	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Reaction Temperature(°C)	430	430	360	450	430	430	430	430	380	410	430	430	430
Residence time(min)	60	60	60	60	60	60	60	60	60	60	60	60	90
Initial pressure(Kg/cm ² G)	80	120	100	100	100	100	100	100	100	100	100	100	100
Catalyst (wt%)	3.0	3.0	3.0	3.0	6.0	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0
H ₂ -Partial pressure(%)	100	100	100	100	100	70	80	90	100	100	100	100	100
Raw material													
Coal (g)	50.34	50.41	50.41	50.27	50.35	50.36	50.39	50.41	50.43	50.43	50.40	50.39	50.36
Moisture(wt%)	1.97	1.91	1.89	2.02	2.02	1.89	1.85	1.89	1.85	2.00	1.94	1.94	1.97
Ash(wt%)	13.47	13.47	13.49	13.46	13.47	13.49	13.50	13.49	13.50	13.48	13.54	13.54	13.47
Solvent(g)	100.10	100.46	100.40	100.20	100.37	99.36	101.16	100.96	101.02	100.19	100.13	100.28	100.03
Catalyst(g)	1.50	1.50	1.50	1.50	3.00	1.50	1.50	1.50	1.50	1.50	0.00	1.50	1.50
Hydrogen(g)	2.85	4.23	3.49	3.37	3.55	2.31	2.79	3.15	3.49	3.42	3.46	3.40	3.44
Product yield													
Solubility(daf,wt%)	78.85	84.29	52.64	79.96	85.16	72.92	77.70	76.55	66.71	78.03	73.40	80.95	82.86
Gas(total)(daf,wt%)	6.44	8.54	1.08	11.88	7.26	6.31	6.92	6.94	1.66	3.57	7.49	7.28	8.73
C ₁ (daf,wt%)	2.47	2.53	0.09	4.90	2.58	2.09	2.39	2.37	0.19	0.82	2.54	2.56	3.38
CO (daf,wt%)	0.45	0.47	0.05	0.73	0.52	0.37	0.45	0.47	0.12	0.26	0.47	0.50	0.54
CO ₂ (daf,wt%)	1.41	1.29	0.82	1.69	1.67	1.62	1.60	1.64	1.05	1.43	1.83	1.69	1.64
C ₂ (daf,wt%)	1.18	1.24	0.07	2.57	1.50	1.29	1.43	1.41	0.16	0.52	1.48	1.50	1.86
C ₃ (daf,wt%)	0.63	0.73	0.05	1.20	0.68	0.66	0.75	0.73	0.12	0.42	0.70	0.68	0.87
C ₄ (daf,wt%)	0.23	0.21	0.00	0.47	0.26	0.23	0.23	0.23	0.02	0.12	0.31	0.28	0.35
H ₂ S (daf,wt%)	0.07	0.07	0.00	0.12	0.05	0.05	0.07	0.09	0.00	0.00	0.16	0.07	0.09
Oil+Water (daf,wt%)	24.54	30.72	17.44	20.54	27.60	19.45	28.70	24.43	21.68	16.25	14.66	20.74	25.39
SRC (daf,wt%)	50.46	51.11	34.84	51.52	53.50	49.29	44.54	47.60	44.42	60.31	53.65	55.88	52.34
H ₂ -Consumption (daf,wt%)	2.58	4.08	0.71	3.77	3.20	2.13	2.56	2.41	1.05	2.09	2.39	2.95	3.61

Annex 3.3.1 LIST OF EXPERIMENTAL DATA OF AUTOCLAVE TESTS (10/12)

Experimental Number	3101	3102	3103	3104	3105	3106	3107	3108	3109	3110	3111	3112
Test condition												
Coal name	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.	ASSAM Anthra.	ASSAM Recy. I	ASSAM Recy. I	ASSAM Recy. I	ASSAM Recy. I	ASSAM Recy. I	ASSAM Recy. I
Solvent name	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Coal/Solvent Ratio(wt/wt)	430	430	430	430	430	430	430	430	430	430	430	430
Reaction Temperature(°C)	60	60	60	60	60	60	60	60	60	60	60	60
Residence time(min)	100	100	100	100	100	100	100	100	100	100	100	100
Initial pressure(kg/cm ² G)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Catalyst (wt%)	100	100	100	100	100	100	100	100	100	100	100	100
H ₂ -Partial pressure(%)												
Raw material												
Coal (g)	50.20	50.08	50.15	50.18	50.12	50.13	50.18	50.24	50.14	50.21	50.08	50.16
Moisture(wt%)	0.86	0.74	0.80	0.80	0.80	0.74	0.80	0.80	0.69	0.69	0.69	0.69
Ash(wt%)	2.26	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.23	2.23	2.23	2.23
Solvent(g)	100.58	103.77	100.63	100.57	100.55	100.51	100.17	100.16	100.23	100.24	100.33	100.36
Catalyst(g)	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Hydrogen(g)	3.51	3.55	3.54	3.54	3.49	3.51	3.39	3.39	3.40	3.42	3.34	3.37
Product yield												
Solubility(daf,wt%)	99.02	99.01	99.01	98.99	98.01	99.01	98.59	99.07	99.07	99.07	99.07	99.07
Gas(total)(daf,wt%)	6.19	6.42	6.56	6.50	6.77	6.36	7.18	6.88	7.75	7.57	6.44	7.52
C ₁ (daf.,wt%)	2.28	2.35	2.43	2.37	2.47	2.32	2.70	2.61	2.96	2.95	2.39	2.86
CO (daf,wt%)	0.50	0.53	0.53	0.51	0.54	0.54	0.64	0.59	0.70	0.68	0.60	0.66
CO ₂ (daf,wt%)	1.02	1.05	1.07	1.07	1.09	1.07	1.09	1.11	1.15	1.11	1.11	1.19
C ₂ (daf,wt%)	1.09	1.13	1.17	1.15	1.21	1.11	1.24	1.15	1.29	1.27	1.07	1.27
C ₃ (daf,wt%)	0.74	0.78	0.76	0.78	0.82	0.74	0.87	0.82	0.95	0.90	0.74	0.90
C ₄ (daf,wt%)	0.28	0.31	0.33	0.33	0.35	0.31	0.37	0.33	0.41	0.37	0.29	0.35
H ₂ S (daf,wt%)	0.28	0.27	0.27	0.29	0.29	0.27	0.27	0.27	0.29	0.29	0.24	0.29
Oil+Water (daf,wt%)	25.77	27.36	26.68	30.12	28.23	27.09	23.09	23.94	25.09	27.63	20.74	23.20
SRC (daf,wt%)	70.17	68.57	68.87	65.66	69.09	68.71	71.01	70.90	68.86	66.55	74.24	71.01
H ₂ -Consumption (daf,wt%)	3.11	3.35	3.10	3.29	3.09	3.15	2.69	2.65	2.62	2.78	2.35	2.65

Annex 3.3.1 LIST OF EXPERIMENTAL DATA OF AUTOCLAVE TESTS (11/12)

Experimental Number	3113	3114	3115	3116	3117	3118	3119	3120	3121	3122	3123	3124
Test condition												
Coal name	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM
Solvent name	Recy. I	Recy. I	Recy. I	Recy. I	Recy. I	Recy. I	Recy. I	Recy. I	Recy. I	Recy. I	Recy. II	Recy. II
Coal/Solvent Ratio(wt/wt)	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Reaction Temperature(°C)	430	430	430	430	430	430	430	430	430	430	430	430
Residence time(min)	60	60	60	60	60	60	60	60	60	60	60	60
Initial pressure(Kg/cm ² G)	100	100	100	100	100	100	100	100	100	100	100	100
Catalyst (wt%)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
H ₂ -Partial pressure(%)	100	100	100	100	100	100	100	100	100	100	100	100
Raw material												
Coal (g)	50.20	50.21	50.18	50.18	50.22	50.20	50.15	50.17	50.14	50.17	50.11	50.16
Moisture(wt%)	0.69	0.69	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.94	0.94
Ash(wt%)	2.23	2.23	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.23	2.23
Solvent(g)	100.24	100.41	100.36	100.45	100.18	100.39	100.16	100.08	100.17	100.35	100.29	100.85
Catalyst(g)	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Hydrogen(g)	3.39	3.38	3.39	3.40	3.35	3.40	3.37	3.40	3.30	3.30	3.53	3.52
Product yield												
Solubility(daf.wt%)	99.07	99.07	99.11	99.07	99.07	99.09	99.07	99.07	99.07	99.07	99.14	99.15
Gas(total)(daf.wt%)	7.24	7.41	7.07	7.50	7.35	8.50	7.46	7.48	6.60	6.49	6.51	6.44
C ₁ (daf., wt%)	2.79	2.87	2.77	2.98	2.85	3.41	2.90	2.88	2.40	2.32	2.57	2.39
CO (daf.wt%)	0.62	0.66	0.62	0.66	0.64	0.74	0.68	0.66	0.41	0.39	0.44	0.45
CO ₂ (daf.wt%)	1.11	1.13	1.09	1.11	1.13	1.17	1.13	1.15	1.21	1.23	1.03	1.05
C ₂ (daf.wt%)	1.23	1.23	1.15	1.23	1.23	1.43	1.25	1.25	1.24	1.21	1.19	1.15
C ₃ (daf.wt%)	0.86	0.88	0.82	0.88	0.86	1.03	0.84	0.88	0.76	0.76	0.79	0.80
C ₄ (daf.wt%)	0.37	0.37	0.35	0.35	0.37	0.41	0.39	0.37	0.33	0.33	0.33	0.35
H ₂ S (daf.wt%)	0.26	0.27	0.29	0.29	0.27	0.31	0.27	0.29	0.25	0.25	0.26	0.25
Oil+Water (daf.wt%)	24.64	24.55	24.83	24.89	24.28	27.20	23.98	24.73	24.85	24.39	23.15	22.14
SRC (daf.wt%)	69.79	69.66	69.82	69.52	70.03	66.37	70.26	69.82	70.21	70.62	72.04	73.21
H ₂ -Consumption (daf.wt%)	2.60	2.74	2.61	2.83	2.59	2.98	2.63	2.75	2.58	2.42	2.65	2.64

Annex 3.3.1 LIST OF EXPERIMENTAL DATA OF AUTOCLAVE TESTS (12/12)

Experimental Number	3125	3126	3127	3128	3129	3130	3131	3132	3133	3134	3135
Test condition											
Coal name	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM	ASSAM
Solvent name	Recy. II	Recy. II	Recy. II	Recy. II	Recy. II	Recy. II	Recy. III	Recy. III	Recy. III	Recy. III	Recy. III
Coal/Solvent Ratio(wt/wt)	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Reaction Temperature(°C)	430	430	430	430	430	430	430	430	430	430	430
Residence time(min)	60	60	60	60	60	60	60	60	60	60	60
Initial pressure(Kg/cm ² G)	100	100	100	100	100	100	100	100	100	100	100
Catalyst (wt%)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
H ₂ -Partial pressure(%)	100	100	100	100	100	100	100	100	100	100	100
Raw material											
Coal (g)	50.14	50.19	50.17	50.16	50.19	50.22	50.12	50.24	50.20	50.19	50.20
Moisture(wt%)	0.94	0.94	0.94	0.94	0.94	0.94	0.75	0.75	0.75	0.75	0.75
Ash(wt%)	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Solvent(g)	100.49	100.80	100.35	100.68	100.43	100.70	100.38	100.47	100.82	100.40	100.87
Catalyst(g)	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Hydrogen(g)	3.52	3.52	3.48	3.50	3.41	3.41	3.45	3.44	3.40	3.44	3.43
Product yield											
Solubility(daf.wt%)	99.15	99.15	99.13	99.15	99.13	99.15	99.17	99.18	99.17	99.17	99.17
Gas(total)(daf.wt%)	6.90	6.60	6.09	5.72	6.60	6.79	7.53	7.18	7.72	7.21	8.60
C ₁ (daf.wt%)	2.57	2.45	2.24	2.04	2.43	2.53	2.61	2.42	2.77	2.42	3.14
CO (daf.wt%)	0.49	0.45	0.43	0.41	0.47	0.47	0.52	0.47	0.55	0.47	0.47
CO ₂ (daf.wt%)	1.07	1.05	1.01	0.99	1.07	1.09	1.27	1.23	1.25	1.25	1.27
C ₂ (daf.wt%)	1.26	1.19	1.09	1.01	1.19	1.21	1.41	1.35	1.44	1.36	1.73
C ₃ (daf.wt%)	0.87	0.86	0.76	0.74	0.82	0.89	1.01	0.99	1.01	0.99	1.19
C ₄ (daf.wt%)	0.39	0.35	0.33	0.31	0.37	0.35	0.43	0.43	0.43	0.43	0.49
H ₂ S (daf.wt%)	0.25	0.25	0.23	0.22	0.25	0.25	0.28	0.29	0.27	0.29	0.31
Oil+Water (daf.wt%)	23.24	23.51	23.29	22.42	23.44	25.92	23.13	24.54	23.23	20.22	22.96
SRC (daf.wt%)	71.84	71.77	72.32	73.55	71.57	69.05	71.09	70.05	70.71	74.33	70.32
H ₂ -Consumption (daf.wt%)	2.92	2.73	2.57	2.55	2.48	2.61	2.58	2.60	2.49	2.59	2.71

Annex 3.3.2 LIST OF JAPANESE INDUSTRIAL STANDARD (JIS)
USED IN SRC PRODUCTION TESTS

- * K 2425-1983 Methods for Testing Creosote Oil, Prepared Tar and Tar Pitch.
- * M 8801-1979 Methods for Testing of Coal.
- * M 8811-1976 Methods for Sampling and Determination of Total Moisture and Adherent Moisture of Coal and Coke.
- * M 8812-1984 Methods for Proximate Analysis of Coal and Coke.
- * M 8813-1988 Methods for Ultimate Analysis of Coal and Coke.
- * M 8814-1985 Determination of Calorific Value of Coal and Coke.
- * M 8815-1976 Methods for Analysis of Coal Ash and Coke Ash.
- * M 8816-1986 Methods for Microscopical Measurement for the Macerals and Reflectance of Coal.

Annex 5.3.1 CERTIFICATE OF ANALYSIS OF SELECTED HEAVY METALS CONTAINED
IN INDIAN COAL SAMPLES

(Unit: mg/kg dry coal)

Item \ Sample	SAMLA Coal	ASSAM Coal	AGRADA SIRKA Coal	Neyveli Lignite	O/A Middlings
T - Hg	< 0.01	< 0.01	< 0.01	0.05	0.05
Pb	11	3	15	2	11
Cr ⁺⁶	< 1	< 1	< 1	< 1	< 1
As	1.8	6.3	2.8	1.1	1.6
Cd	< 0.1	< 0.1	0.1	< 0.1	0.2
T - Cr	10	3	19	5	38
Cu	14	5	23	6	26
Zn	33	92	42	67	45
Se	< 2	< 2	< 2	< 2	< 2

Remarks: 1. Analysis was made in accordance with the standard analytical methods specified by the Environment Agency, Government of Japan.
2. Se is analysed by atomic absorption spectroscopy.

Annex 5.3.2 QUALITIES OF SUPPLIED RAW WATER IN R.S.P.
(FURNISHED BY MECON (April 11, 1991))

The typical analysis data of raw water to be supplied by R.S.P. (Unit: ppm)

Item	Season		Monsoon Period (May~Oct.)			Non Monsoon Period (Nov.~Apr.)			
	min.	max.	min.	max.	average	min.	max.	average	
pH	6.4	8.35	7.7	8.2	7.7~8.2	7.7	8.5	8~8.5	
P-Value (carbonate alkalinity)	0	10	0	10	0.8	0	12	5.10	
M-Value (bicarbonate alkalinity)	12	90	25	70	25~70	50	111	65~105	
Total Hardness (max. hardness 8°C)	41	86	44	70	44~70	50	100	55~95	
Carbonate hardness	20	86	25	70	25~70	50	100	55~95	
Free carbonic acid	0.4	12	1.5	2.25	1.5~2.25	0.3	1.6	0.6~0.8	
O ₂ consumption by KMnO ₄	0.6	1.5	0.6	0.8	0.6~0.8	0.55	1.8	0.85~1.25	
Chloride	1.5	3	2	3	2	2	3.5	2.5~3.5	
Iron	0.04	0.6	0.05	0.4	0.05~0.4	0.03	7.0	0.03~2.0	
Turbidity	5 ~ 25			10~50, occasionally 100					
Dissolver Total Solids	90 ~ 110								
Sulfate	1 ~ 20								

The guaranteed value will be obtained during six months of the year without the addition of coagulants.

Iron sulfate obtained as a byproduct in the Iron and Steel works shall be used as coagulant, for economical reasons.

The iron sulfate may be replaced by some other coagulant, either periodically or continuously, should this prove necessary from the operational point of view.

The make-up water will be treated in the water works to give a pH value of between 7.5 and 8.0 (maximum 8.5).

Annex 8.2.1 FINANCIAL ANALYSIS ON DEMONSTRATION PLANT
IN AUG., 1991 FIXED PRICES

I. Financial Analysis on SRC Blended Coke Test

Base Case (A-A5) : Assam Coal as a Feedstock, 80% Import Duty
with Solid Separation and without Premium

- a. Production Cost with SRC
- b. Coke Saving Cost (Without SRC - With SRC)
- c. Financial I.R.R. on Investment
- d. Foreign Exchange Balance

Case with Premium in a form of Item c.

Sensitivity Analysis in a form of Item c.

- Imported Coal (+10%, +20%)
- Domestic Non-coking Coal (-10%, -20%)
- Capital Investment Cost (-10%, -20%)

Alternative Case in a form Item d.

- Loan (38.3% of capital investment cost)

Base Case (A-A5) : Assam Coal as a Feedstock, No Import Duty
with Solid Separation and without Premium

- a. Production Cost with SRC
- c. Financial I.R.R. on Investment
- d. Foreign Exchange Balance

Case with Premium in a form of Item c.

Base Case (A-A5) : Assam Coal as a Feedstock, 80% Import Duty
with Solid Separation and without Premium

- a. Production Cost with SRC
- c. Financial I.R.R. on Investment
- d. Foreign Exchange Balance

Case with Premium in a form of Item c.

Base Case (A-A5) : Assam Coal as a Feedstock, No Import Duty
with Solid Separation and without Premium

- a. Production Cost with SRC
- c. Financial I.R.R. on Investment
- d. Foreign Exchange Balance

Case with Premium in a form of Item c.

Base Case (S-A5) : Samla Coal as a Feedstock, 80% Import Duty
with Solid Separation and without Premium

- a. Production Cost with SRC
- c. Financial I.R.R. on Investment
- d. Foreign Exchange Balance

Base Case (H-A5) : Both Assam and Samla Coal as a Feedstock,
80% Import Duty with Solid Separation and
without Premium

- a. Production Cost with SRC
- c. Financial I.R.R. on Investment
- d. Foreign Exchange Balance

Base Case (A-B3) : Assam Coal as a Feedstock, 80% Import Duty
with Solid Separation and without Premium

- a. Production Cost with SRC
- b. Coke Saving Cost (Without SRC - With SRC)
- c. Financial I.R.R. on Investment
- d. Foreign Exchange Balance

Case with Premium in a form of Item c.

Sensitivity Analysis in a form of Item c.

- Imported Coal (+10%, +20%)
- Domestic Non-coking Coal (-10%, -20%)
- Capital Investment Cost (-10%, -20%)

II. Financial Analysis on Additional Cases

Common Condition : - Assam Coal as a Feedstock
- 80% Import Duty with Solid Separation
- Without Premium
- Same as Production Cost with SRC of
Base Case (A-A5)

Base Case (A-C1) :

- b. Coke Saving Cost (Without SRC - With SRC)
- c. Financial I.R.R. on Investment
- d. Foreign Exchange Balance

Base Case (A-C2) :

- b. Coke Saving Cost (Without SRC - With SRC)
- c. Financial I.R.R. on Investment
- d. Foreign Exchange Balance

Base Case (A-P1) :

- b. Coke Saving Cost (Without SRC - With SRC)
- c. Financial I.R.R. on Investment
- d. Foreign Exchange Balance

Base Case (A-P2) :

- b. Coke Saving Cost (Without SRC - With SRC)
- c. Financial I.R.R. on Investment
- d. Foreign Exchange Balance

Base Case (A-P3) :

- b. Coke Saving Cost (Without SRC - With SRC)
- c. Financial I.R.R. on Investment
- d. Foreign Exchange Balance

CASE (A-A5)
 - BASE CASE -
 (US\$ MILLION)

YEAR	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
SRC PRODUCTION (1000TPY)	0.0	0.0	0.0	0.0	89.650	100.857	112.063	112.063	112.063	112.063
RAW MATERIAL COST	0.0	0.0	0.0	0.0	13.660	15.368	17.075	17.075	17.075	17.075
FEEDSTOCK COAL	0.0	0.0	0.0	0.0	8.189	9.212	10.236	10.236	10.236	10.236
COKE OVEN GAS	0.0	0.0	0.0	0.0	5.471	6.155	6.839	6.839	6.839	6.839
UTILITIES COST	0.0	0.0	0.0	0.0	2.671	3.005	3.338	3.338	3.338	3.338
FUEL COAL	0.0	0.0	0.0	0.0	1.589	1.787	1.986	1.986	1.986	1.986
ELECTRICITY	0.0	0.0	0.0	0.0	0.393	0.374	0.416	0.416	0.416	0.416
STEAM	0.0	0.0	0.0	0.0	0.619	0.697	0.774	0.774	0.774	0.774
MAKE-UP WATER	0.0	0.0	0.0	0.0	0.039	0.043	0.048	0.048	0.048	0.048
NITROGEN	0.0	0.0	0.0	0.0	0.091	0.103	0.114	0.114	0.114	0.114
CATALYST & CHEMICALS	0.0	0.0	0.0	0.0	0.681	0.767	0.852	0.852	0.852	0.852
IRON ORE	0.0	0.0	0.0	0.0	0.149	0.163	0.182	0.182	0.182	0.182
SULFUR	0.0	0.0	0.0	0.0	0.133	0.149	0.166	0.166	0.166	0.166
FILTER AID	0.0	0.0	0.0	0.0	0.389	0.416	0.462	0.462	0.462	0.462
CHEMICALS, ETC.	0.0	0.0	0.0	0.0	0.084	0.098	0.104	0.104	0.104	0.104
CREDITS	0.0	0.0	0.0	0.0	-6.252	-7.034	-7.815	-7.815	-7.815	-7.815
RETURN GAS	0.0	0.0	0.0	0.0	-5.340	-6.007	-6.674	-6.674	-6.674	-6.674
LIGHT DISTILLATE	0.0	0.0	0.0	0.0	-0.741	-0.833	-0.926	-0.926	-0.926	-0.926
MIDDLE DISTILLATE	0.0	0.0	0.0	0.0	-0.112	-0.126	-0.140	-0.140	-0.140	-0.140
RESIDUE	0.0	0.0	0.0	0.0	-0.060	-0.068	-0.075	-0.075	-0.075	-0.075
VARIABLE COST	0.0	0.0	0.0	0.0	10.760	12.105	13.450	13.450	13.450	13.450
OPERATING LABOR COST	0.0	0.0	0.0	0.0	0.447	0.447	0.447	0.447	0.447	0.447
OPERATING LABOR OVERHEAD	0.0	0.0	0.0	0.0	0.298	0.298	0.298	0.298	0.298	0.298
MAINTENANCE COST	0.0	0.0	0.0	0.0	0.149	0.149	0.149	0.149	0.149	0.149
MAINTENANCE MATERIALS	0.0	0.0	0.0	0.0	3.252	3.252	3.252	3.252	3.252	3.252
MAINTENANCE LABOR	0.0	0.0	0.0	0.0	3.134	3.134	3.134	3.134	3.134	3.134
ADMINISTRATION	0.0	0.0	0.0	0.0	0.118	0.118	0.118	0.118	0.118	0.118
TAX & INSURANCE	0.0	0.0	0.0	0.0	0.100	0.100	0.100	0.100	0.100	0.100
DIRECT FIXED COST	0.0	0.0	0.0	0.0	1.205	1.145	1.024	1.024	1.024	1.024
CASH FACTORY COST	0.0	0.0	0.0	0.0	5.005	4.944	4.884	4.823	4.763	4.702
ERECTED PLANT COST	0.0	0.0	0.0	0.0	15.764	17.049	18.333	18.273	18.212	18.152
PRE-OPERATIONAL EXPENSE	0.0	0.0	0.0	0.0	10.761	10.761	10.761	10.761	10.761	10.761
INTEREST DURING CONSTRUCTION	0.0	0.0	0.0	0.0	0.231	0.231	0.231	0.231	0.231	0.231
DEPRECIATION AND AMORTIZATION	0.0	0.0	0.0	0.0	1.100	1.100	1.100	1.100	1.100	1.100
TOTAL FACTORY COST	0.0	0.0	0.0	0.0	27.857	29.142	30.426	30.366	30.305	30.245
UNIT FACTORY COST (\$/T)	0.0	0.0	0.0	0.0	310.7291	288.9398	271.5082	270.9687	270.4291	269.8896
INTEREST ON LONG TERM DEBT	0.0	0.0	0.0	0.0	12.248	12.248	12.248	11.635	11.023	10.411
INTEREST ON SHORT TERM DEBT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL PRODUCTION COST	0.0	0.0	0.0	0.0	40.105	41.389	42.674	42.001	41.328	40.555
UNIT PRODUCTION COST (\$/T)	0.0	0.0	0.0	0.0	447.3451	410.3762	380.8010	374.7988	368.7926	362.7884

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 PRODUCTION COST WITH SRC

(US\$ MILLION)

CASE (A-A5)

YEAR	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
SRC PRODUCTION (1000TPY)	112.063	112.063	112.063	112.063	112.063	112.063	112.063	112.063	112.063	112.063
RAW MATERIAL COST	17.075	17.075	17.075	17.075	17.075	17.075	17.075	17.075	17.075	17.075
FEEDSTOCK COAL	10.236	10.236	10.236	10.236	10.236	10.236	10.236	10.236	10.236	10.236
COKE OVEN GAS	6.839	6.839	6.839	6.839	6.839	6.839	6.839	6.839	6.839	6.839
UTILITIES COST	3.338	3.338	3.338	3.338	3.338	3.338	3.338	3.338	3.338	3.338
FUEL COAL	1.986	1.986	1.986	1.986	1.986	1.986	1.986	1.986	1.986	1.986
ELECTRICITY	0.416	0.416	0.416	0.416	0.416	0.416	0.416	0.416	0.416	0.416
STEAM	0.774	0.774	0.774	0.774	0.774	0.774	0.774	0.774	0.774	0.774
MAKE-UP WATER	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048
NITROGEN	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
CATALYST & CHEMICALS	0.852	0.852	0.852	0.852	0.852	0.852	0.852	0.852	0.852	0.852
IRON ORE	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
SULFUR	0.166	0.166	0.166	0.166	0.166	0.166	0.166	0.166	0.166	0.166
FILTER AID	0.462	0.462	0.462	0.462	0.462	0.462	0.462	0.462	0.462	0.462
CHEMICALS, ETC.	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043
CREDITS	-7.815	-7.815	-7.815	-7.815	-7.815	-7.815	-7.815	-7.815	-7.815	-7.815
RETURN GAS	-6.674	-6.674	-6.674	-6.674	-6.674	-6.674	-6.674	-6.674	-6.674	-6.674
LIGHT DISTILLATE	-0.926	-0.926	-0.926	-0.926	-0.926	-0.926	-0.926	-0.926	-0.926	-0.926
MIDDLE DISTILLATE	-0.140	-0.140	-0.140	-0.140	-0.140	-0.140	-0.140	-0.140	-0.140	-0.140
RESIDUE	-0.075	-0.075	-0.075	-0.075	-0.075	-0.075	-0.075	-0.075	-0.075	-0.075
VARIABLE COST	13.450	13.450	13.450	13.450	13.450	13.450	13.450	13.450	13.450	13.450
OPERATING LABOR COST	0.447	0.447	0.447	0.447	0.447	0.447	0.447	0.447	0.447	0.447
OPERATING LABOR	0.298	0.298	0.298	0.298	0.298	0.298	0.298	0.298	0.298	0.298
OVERHEAD	0.149	0.149	0.149	0.149	0.149	0.149	0.149	0.149	0.149	0.149
MAINTENANCE COST	3.252	3.252	3.252	3.252	3.252	3.252	3.252	3.252	3.252	3.252
MAINTENANCE MATERIALS	3.134	3.134	3.134	3.134	3.134	3.134	3.134	3.134	3.134	3.134
MAINTENANCE LABOR	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118
ADMINISTRATION	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
TAX & INSURANCE	0.843	0.782	0.722	0.661	0.601	0.540	0.480	0.419	0.359	0.298
DIRECT FIXED COST	4.642	4.581	4.521	4.460	4.400	4.339	4.279	4.219	4.158	4.098
CASH FACTORY COST	18.092	18.031	17.971	17.910	17.850	17.789	17.729	17.668	17.608	17.547
ERECTED PLANT COST	10.761	10.761	10.761	10.761	10.761	10.761	10.761	10.761	10.761	10.761
PRE-OPERATIONAL EXPENSE	0.231	0.231	0.231	0.231	0.231	0.231	0.231	0.231	0.231	0.231
INTEREST DURING CONSTRUCTION	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100
DEPRECIATION AND AMORTIZATION	12.093	12.093	12.093	12.093	12.093	12.093	12.093	12.093	12.093	12.093
TOTAL FACTORY COST	30.184	30.124	30.063	30.003	29.942	29.882	29.821	29.761	29.700	29.640
UNIT FACTORY COST (\$/T)	269.3500	268.8105	268.2710	267.7314	267.1919	266.6523	266.1128	265.5732	265.0337	264.4941
INTEREST ON LONG TERM DEBT	9.798	9.186	8.573	7.961	7.349	6.736	6.124	5.511	4.899	4.287
INTEREST ON SHORT TERM DEBT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL PRODUCTION COST (\$/T)	39.982	39.309	38.637	37.964	37.291	36.618	35.945	35.272	34.600	33.927
UNIT PRODUCTION COST (\$/T)	356.7842	350.7801	344.7759	338.7717	332.7675	326.7633	320.7591	314.7549	308.7507	302.7465

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 CASE (A-AS) PRODUCTION COST WITH SRC (US\$ MILLION)
 - BASE CASE -

YEAR	2016	2017	2018	2019
SRC PRODUCTION (1000TPY)	112,063	112,063	112,063	112,063
RAW MATERIAL COST	17,075	17,075	17,075	17,075
FEEDSTOCK COAL	10,236	10,236	10,236	10,236
COKE OVEN GAS	6,839	6,839	6,839	6,839
UTILITIES COST	3,338	3,338	3,338	3,338
FUEL COAL	1,986	1,986	1,986	1,986
ELECTRICITY	0,416	0,416	0,416	0,416
STEAM	0,774	0,774	0,774	0,774
MAKE-UP WATER	0,048	0,048	0,048	0,048
NITROGEN	0,114	0,114	0,114	0,114
CATALYST & CHEMICALS	0,852	0,852	0,852	0,852
IRON ORE	0,182	0,182	0,182	0,182
SULFUR	0,166	0,166	0,166	0,166
FILTER AID	0,462	0,462	0,462	0,462
CHEMICALS, ETC.	0,043	0,043	0,043	0,043
CREDITS	-7,815	-7,815	-7,815	-7,815
RETURN GAS	-6,674	-6,674	-6,674	-6,674
LIGHT DISTILLATE	-0,926	-0,926	-0,926	-0,926
MIDDLE DISTILLATE	-0,140	-0,140	-0,140	-0,140
RESIDUE	-0,075	-0,075	-0,075	-0,075
VARIABLE COST	13,450	13,450	13,450	13,450
OPERATING LABOR COST	0,447	0,447	0,447	0,447
OPERATING LABOR OVERHEAD	0,298	0,298	0,298	0,298
MAINTENANCE COST	0,149	0,149	0,149	0,149
MAINTENANCE MATERIALS	3,252	3,252	3,252	3,252
MAINTENANCE LABOR	3,134	3,134	3,134	3,134
ADMINISTRATION	0,118	0,118	0,118	0,118
TAX & INSURANCE	0,100	0,100	0,100	0,100
DIRECT FIXED COST	0,238	0,178	0,117	0,057
CASH FACTORY COST	4,037	3,977	3,916	3,856
ERECTED PLANT COST	17,487	17,426	17,366	17,306
PRE-OPERATIONAL EXPENSE	10,761	10,761	10,761	10,761
INTEREST DURING CONSTRUCTION	0,231	0,231	0,231	0,231
DEPRECIATION AND AMORTIZATION	1,100	1,100	1,100	1,100
TOTAL FACTORY COST	12,093	12,093	12,093	12,093
UNIT FACTORY COST (\$/T)	29,580	29,519	29,459	29,398
INTEREST ON LONG TERM DEBT	263,9546	263,4150	262,8755	262,3360
INTEREST ON SHORT TERM DEBT	3,674	3,062	2,450	1,837
TOTAL PRODUCTION COST (\$/T)	0,0	0,0	0,0	0,0
UNIT PRODUCTION COST (\$/T)	39,254	92,581	31,908	31,235
	296,7424	290,7382	284,7340	278,7298

YEAR	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
TOTAL COALS FOR COKE (1000TPY)	0.0	0.0	0.0	0.0	1606.311	2017.134	2241.260	2241.260	2241.260	2241.260
SRC PRODUCTION (1000TPY)	0.0	0.0	0.0	0.0	89.650	100.857	112.063	112.063	112.063	112.063
BLEND RATIO W/O SRC (%)	0.0	0.0	0.0	0.0	30.000	30.000	30.000	30.000	30.000	30.000
IMPORTED COAL (1000TPY)	0.0	0.0	0.0	0.0	468.815	588.717	654.130	654.130	654.130	654.130
COAL PRICE (\$/T, DRY)	0.0	0.0	0.0	0.0	103.5800	103.5800	103.5800	103.5800	103.5800	103.5800
COAL COST	0.0	0.0	0.0	0.0	48.560	60.979	67.755	67.755	67.755	67.755
BLEND RATIO W/O SRC (%)	0.0	0.0	0.0	0.0	30.000	30.000	30.000	30.000	30.000	30.000
P.C.C COAL (1000TPY)	0.0	0.0	0.0	0.0	468.815	588.717	654.130	654.130	654.130	654.130
COAL PRICE (\$/T, DRY)	0.0	0.0	0.0	0.0	41.7900	41.7900	41.7900	41.7900	41.7900	41.7900
COAL COST	0.0	0.0	0.0	0.0	19.592	24.602	27.336	27.336	27.336	27.336
BLEND RATIO W/O SRC (%)	0.0	0.0	0.0	0.0	40.000	40.000	40.000	40.000	40.000	40.000
M.C.C COAL (1000TPY)	0.0	0.0	0.0	0.0	625.087	784.957	872.174	872.174	872.174	872.174
COAL PRICE (\$/T, DRY)	0.0	0.0	0.0	0.0	41.7400	41.7400	41.7400	41.7400	41.7400	41.7400
COAL COST	0.0	0.0	0.0	0.0	26.091	32.764	36.405	36.405	36.405	36.405
COKE PRODUCTION W/O SRC	0.0	0.0	0.0	0.0	1074.611	1349.449	1499.387	1499.387	1499.387	1499.387
COG & B.P PRODUCTION (1000TPY)	0.0	0.0	0.0	0.0	1074.611	1349.449	1499.387	1499.387	1499.387	1499.387
COG & B.P PRICE (\$/T)	0.0	0.0	0.0	0.0	18.9200	18.9200	18.9200	18.9200	18.9200	18.9200
COG & B.P CREDIT	0.0	0.0	0.0	0.0	-20.332	-25.532	-28.368	-28.368	-28.368	-28.368
BLEND RATIO WITH SRC (%)	0.0	0.0	0.0	0.0	30.000	30.000	30.000	30.000	30.000	30.000
P.C.C COAL (1000TPY)	0.0	0.0	0.0	0.0	481.893	605.140	672.378	672.378	672.378	672.378
COAL PRICE (\$/T, DRY)	0.0	0.0	0.0	0.0	41.7900	41.7900	41.7900	41.7900	41.7900	41.7900
COAL COST	0.0	0.0	0.0	0.0	-20.138	-25.289	-28.099	-28.099	-28.099	-28.099
BLEND RATIO WITH SRC (%)	0.0	0.0	0.0	0.0	40.000	40.000	40.000	40.000	40.000	40.000
M.C.C COAL (1000TPY)	0.0	0.0	0.0	0.0	642.525	806.854	896.504	896.504	896.504	896.504
COAL PRICE (\$/T, DRY)	0.0	0.0	0.0	0.0	41.7400	41.7400	41.7400	41.7400	41.7400	41.7400
COAL COST	0.0	0.0	0.0	0.0	-26.819	-33.678	-37.420	-37.420	-37.420	-37.420
BLEND RATIO WITH SRC (%)	0.0	0.0	0.0	0.0	15.000	15.000	15.000	15.000	15.000	15.000
IMPORTED COAL (1000TPY)	0.0	0.0	0.0	0.0	240.947	302.570	336.189	336.189	336.189	336.189
COAL PRICE (\$/T, DRY)	0.0	0.0	0.0	0.0	103.5800	103.5800	103.5800	103.5800	103.5800	103.5800
COAL COST	0.0	0.0	0.0	0.0	-24.957	-31.340	-34.822	-34.822	-34.822	-34.822
BLEND RATIO WITH SRC (%)	0.0	0.0	0.0	0.0	10.000	10.000	10.000	10.000	10.000	10.000
N.C.C COAL (1000TPY)	0.0	0.0	0.0	0.0	160.631	201.713	224.126	224.126	224.126	224.126
COAL PRICE (\$/T, DRY)	0.0	0.0	0.0	0.0	36.5700	36.5700	36.5700	36.5700	36.5700	36.5700
COAL COST	0.0	0.0	0.0	0.0	-5.874	-7.377	-8.196	-8.196	-8.196	-8.196
BLEND RATIO WITH SRC (%)	0.0	0.0	0.0	0.0	5.000	5.000	5.000	5.000	5.000	5.000
S.R.C COAL (1000TPY)	0.0	0.0	0.0	0.0	89.650	100.857	112.063	112.063	112.063	112.063
INC. IN INVENTORY (1000TPY)	0.0	0.0	0.0	0.0	9.335	0.0	0.0	0.0	0.0	0.0
S.R.C SALE (1000TPY)	0.0	0.0	0.0	0.0	80.316	100.857	112.063	112.063	112.063	112.063

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 COKE SAVING COST (WITHOUT SRC - WITH SRC)
 (US\$ MILLION)

CASE (A-A5)

YEAR	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
COAL PRICE EXC. D&I (\$/T, DRY)	0.0	0.0	0.0	0.0	175.8427	169.0407	163.5991	153.0595	152.5200	161.9304
COAL COST	0.0	0.0	0.0	0.0	-14.123	-17.049	-18.333	-18.273	-18.212	-18.152
COKE PRODUCTION WITH SRC	0.0	0.0	0.0	0.0	1087.426	1365.541	1517.268	1517.268	1517.268	1517.268
COG & B.P. PRODUCTION (1000TPY)	0.0	0.0	0.0	0.0	1163.811	1461.538	1623.987	1623.987	1623.987	1623.987
COG & B.P. PRICE (\$/T)	0.0	0.0	0.0	0.0	18.9200	18.9200	18.9200	18.9200	18.9200	18.9200
COG & B.P. CREDIT	0.0	0.0	0.0	0.0	22.021	27.653	30.726	30.726	30.726	30.726
COKE PRODUCTION WITH SRC	0.0	0.0	0.0	0.0	1087.426	1365.541	1517.268	1517.268	1517.268	1517.268
COKE BREEZE PRODUCTION (1000TPY)	0.0	0.0	0.0	0.0	1087.426	1365.541	1517.268	1517.268	1517.268	1517.268
COKE BREEZE PRICE (\$/T)	0.0	0.0	0.0	0.0	3.2800	3.2800	3.2800	3.2800	3.2800	3.2800
COKE BREEZE CREDIT	0.0	0.0	0.0	0.0	3.567	4.479	4.977	4.977	4.977	4.977
COKE PRODUCTION W/O SRC	0.0	0.0	0.0	0.0	1074.611	1349.449	1499.387	1499.387	1499.387	1499.387
COKE BREEZE PRODUCTION (1000TPY)	0.0	0.0	0.0	0.0	1074.611	1349.449	1499.387	1499.387	1499.387	1499.387
COKE BREEZE PRICE (\$/T)	0.0	0.0	0.0	0.0	3.2800	3.2800	3.2800	3.2800	3.2800	3.2800
COKE BREEZE CREDIT	0.0	0.0	0.0	0.0	-3.525	-4.426	-4.918	-4.918	-4.918	-4.918
COKE SAVING COST (W/O - WITH)	0.0	0.0	0.0	0.0	4.063	5.788	7.041	7.101	7.162	7.222

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 COKE SAVING COST (WITHOUT SRC - WITH SRC)
 - BASE CASE -
 (US\$ MILLION)

CASE (A-A5)

YEAR	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
TOTAL COALS FOR COKE (1000TPY)	2241.260	2241.260	2241.260	2241.260	2241.260	2241.260	2241.260	2241.260	2241.260	2241.260
SRC PRODUCTION (1000TPY)	112.063	112.063	112.063	112.063	112.063	112.063	112.063	112.063	112.063	112.063
BLEND RATIO W/O SRC (%)	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000
IMPORTED COAL (1000TPY)	654.130	654.130	654.130	654.130	654.130	654.130	654.130	654.130	654.130	654.130
COAL PRICE (\$/T.DRY)	103.5800	103.5800	103.5800	103.5800	103.5800	103.5800	103.5800	103.5800	103.5800	103.5800
COAL COST	67.755	67.755	67.755	67.755	67.755	67.755	67.755	67.755	67.755	67.755
BLEND RATIO W/O SRC (%)	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000
P.C.C COAL (1000TPY)	654.130	654.130	654.130	654.130	654.130	654.130	654.130	654.130	654.130	654.130
COAL PRICE (\$/T.DRY)	41.7900	41.7900	41.7900	41.7900	41.7900	41.7900	41.7900	41.7900	41.7900	41.7900
COAL COST	27.336	27.336	27.336	27.336	27.336	27.336	27.336	27.336	27.336	27.336
BLEND RATIO W/O SRC (%)	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000
M.C.C COAL (1000TPY)	872.174	872.174	872.174	872.174	872.174	872.174	872.174	872.174	872.174	872.174
COAL PRICE (\$/T.DRY)	41.7400	41.7400	41.7400	41.7400	41.7400	41.7400	41.7400	41.7400	41.7400	41.7400
COAL COST	36.405	36.405	36.405	36.405	36.405	36.405	36.405	36.405	36.405	36.405
COKE PRODUCTION W/O SRC	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387
COG & B.P PRODUCTION (1000TPY)	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387
COG & B.P PRICE (\$/T)	18.9200	18.9200	18.9200	18.9200	18.9200	18.9200	18.9200	18.9200	18.9200	18.9200
COG & B.P CREDIT	-28.368	-28.368	-28.368	-28.368	-28.368	-28.368	-28.368	-28.368	-28.368	-28.368
BLEND RATIO WITH SRC (%)	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000
P.C.C COAL (1000TPY)	672.378	672.378	672.378	672.378	672.378	672.378	672.378	672.378	672.378	672.378
COAL PRICE (\$/T.DRY)	41.7900	41.7900	41.7900	41.7900	41.7900	41.7900	41.7900	41.7900	41.7900	41.7900
COAL COST	-28.099	-28.099	-28.099	-28.099	-28.099	-28.099	-28.099	-28.099	-28.099	-28.099
BLEND RATIO WITH SRC (%)	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000
M.C.C COAL (1000TPY)	896.504	896.504	896.504	896.504	896.504	896.504	896.504	896.504	896.504	896.504
COAL PRICE (\$/T.DRY)	41.7400	41.7400	41.7400	41.7400	41.7400	41.7400	41.7400	41.7400	41.7400	41.7400
COAL COST	-37.420	-37.420	-37.420	-37.420	-37.420	-37.420	-37.420	-37.420	-37.420	-37.420
BLEND RATIO WITH SRC (%)	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000
IMPORTED COAL (1000TPY)	336.189	336.189	336.189	336.189	336.189	336.189	336.189	336.189	336.189	336.189
COAL PRICE (\$/T.DRY)	103.5800	103.5800	103.5800	103.5800	103.5800	103.5800	103.5800	103.5800	103.5800	103.5800
COAL COST	-34.822	-34.822	-34.822	-34.822	-34.822	-34.822	-34.822	-34.822	-34.822	-34.822
BLEND RATIO WITH SRC (%)	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
N.C.C COAL (1000TPY)	224.126	224.126	224.126	224.126	224.126	224.126	224.126	224.126	224.126	224.126
COAL PRICE (\$/T.DRY)	36.5700	36.5700	36.5700	36.5700	36.5700	36.5700	36.5700	36.5700	36.5700	36.5700
COAL COST	-8.196	-8.196	-8.196	-8.196	-8.196	-8.196	-8.196	-8.196	-8.196	-8.196
BLEND RATIO WITH SRC (%)	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000
S.R.C COAL (1000TPY)	112.063	112.063	112.063	112.063	112.063	112.063	112.063	112.063	112.063	112.063
INC. IN INVENTORY (1000TPY)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S.R.C SALE (1000TPY)	112.063	112.063	112.063	112.063	112.063	112.063	112.063	112.063	112.063	112.063

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 COKE SAVING COST (WITHOUT SRC - WITH SRC)
 (US\$ MILLION)

CASE (A-45)

YEAR	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
COAL PRICE EXC. D&I (\$/T DRY)	161.4409	160.9013	160.3618	159.8223	159.2827	158.7432	158.2036	157.6641	157.1245	156.5850
COAL COST	-18.092	-18.031	-17.971	-17.910	-17.850	-17.789	-17.729	-17.668	-17.608	-17.547
COKE PRODUCTION WITH SRC	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268
COG & B.P. PRODUCTION (1000TPY)	1623.987	1623.987	1623.987	1623.987	1623.987	1623.987	1623.987	1623.987	1623.987	1623.987
COG & B.P. PRICE (\$/T)	18.9200	18.9200	18.9200	18.9200	18.9200	18.9200	18.9200	18.9200	18.9200	18.9200
COG & B.P. CREDIT	30.726	30.726	30.726	30.726	30.726	30.726	30.726	30.726	30.726	30.726
COKE PRODUCTION WITH SRC	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268
COKE BREEZE PRODUCTION (1000TPY)	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268	1517.268
COKE BREEZE PRICE (\$/T)	3.2800	3.2800	3.2800	3.2800	3.2800	3.2800	3.2800	3.2800	3.2800	3.2800
COKE BREEZE CREDIT	4.977	4.977	4.977	4.977	4.977	4.977	4.977	4.977	4.977	4.977
COKE PRODUCTION W/O SRC	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387
COKE BREEZE PRODUCTION (1000TPY)	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387	1499.387
COKE BREEZE PRICE (\$/T)	3.2800	3.2800	3.2800	3.2800	3.2800	3.2800	3.2800	3.2800	3.2800	3.2800
COKE BREEZE CREDIT	-4.918	-4.918	-4.918	-4.918	-4.918	-4.918	-4.918	-4.918	-4.918	-4.918
COKE SAVING COST (W/O - WITH)	7.282	7.343	7.403	7.464	7.524	7.585	7.645	7.706	7.766	7.827

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 COKE SAVING COST (WITHOUT SRC - WITH SRC)
 - BASE CASE -
 (US\$ MILLION)

CASE (A-A5)

YEAR	2016	2017	2018	2019
TOTAL COALS FOR COKE (1000TPY)	2241.260	2241.260	2241.260	2241.260
SRC PRODUCTION (1000TPY)	112.063	112.063	112.063	112.063
BLEND RATIO W/O SRC (%)	30.000	30.000	30.000	30.000
IMPORTED COAL (1000TPY)	654.130	654.130	654.130	654.130
COAL PRICE (\$/T, DRY)	103.5800	103.5800	103.5800	103.5800
COAL COST	67.755	67.755	67.755	67.755
BLEND RATIO W/O SRC (%)	30.000	30.000	30.000	30.000
P.C.C COAL (1000TPY)	654.130	654.130	654.130	654.130
COAL PRICE (\$/T, DRY)	41.7900	41.7900	41.7900	41.7900
COAL COST	27.336	27.336	27.336	27.336
BLEND RATIO W/O SRC (%)	40.000	40.000	40.000	40.000
M.C.C COAL (1000TPY)	872.174	872.174	872.174	872.174
COAL PRICE (\$/T, DRY)	41.7400	41.7400	41.7400	41.7400
COAL COST	36.405	36.405	36.405	36.405
COKE PRODUCTION W/O SRC	1499.387	1499.387	1499.387	1499.387
COG & B.P PRODUCTION (1000TPY)	1499.387	1499.387	1499.387	1499.387
COG & B.P PRICE (\$/T)	18.9200	18.9200	18.9200	18.9200
COG & B.P CREDIT	-28.368	-28.368	-28.368	-28.368
BLEND RATIO WITH SRC (%)	30.000	30.000	30.000	30.000
P.C.C COAL (1000TPY)	672.378	672.378	672.378	672.378
COAL PRICE (\$/T, DRY)	41.7900	41.7900	41.7900	41.7900
COAL COST	-28.099	-28.099	-28.099	-28.099
BLEND RATIO WITH SRC (%)	40.000	40.000	40.000	40.000
M.C.C COAL (1000TPY)	896.504	896.504	896.504	896.504
COAL PRICE (\$/T, DRY)	41.7400	41.7400	41.7400	41.7400
COAL COST	-37.420	-37.420	-37.420	-37.420
BLEND RATIO WITH SRC (%)	15.000	15.000	15.000	15.000
IMPORTED COAL (1000TPY)	336.189	336.189	336.189	336.189
COAL PRICE (\$/T, DRY)	103.5800	103.5800	103.5800	103.5800
COAL COST	-34.822	-34.822	-34.822	-34.822
BLEND RATIO WITH SRC (%)	10.000	10.000	10.000	10.000
N.C.C COAL (1000TPY)	224.126	224.126	224.126	224.126
COAL PRICE (\$/T, DRY)	36.5700	36.5700	36.5700	36.5700
COAL COST	-8.196	-8.196	-8.196	-8.196
BLEND RATIO WITH SRC (%)	5.000	5.000	5.000	5.000
S.R.C COAL (1000TPY)	112.063	112.063	112.063	112.063
INC. IN INVENTORY (1000TPY)	0.0	0.0	0.0	0.0
S.R.C SALE (1000TPY)	112.063	112.063	112.063	112.063

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 COKE SAVING COST (WITHOUT SRC - WITH SRC)
 CASE (A-A5) - BASE CASE - (US\$ MILLION)

YEAR	2016	2017	2018	2019
COAL PRICE EXC. D&I (\$/T DRY)	156.0454	155.5059	154.9663	154.4268
COAL COST	-17.487	-17.426	-17.366	-17.306
COKE PRODUCTION WITH SRC	1517.268	1517.268	1517.268	1517.268
COG & B.P. PRODUCTION (1000TPY)	1623.987	1623.987	1623.987	1623.987
COG & B.P. PRICE (\$/T)	18.9200	18.9200	18.9200	18.9200
COG & B.P. CREDIT	30.726	30.726	30.726	30.726
COKE PRODUCTION WITH SRC	1517.268	1517.268	1517.268	1517.268
COKE BREEZE PRODUCTION (1000TPY)	1517.268	1517.268	1517.268	1517.268
COKE BREEZE PRICE (\$/T)	3.2800	3.2800	3.2800	3.2800
COKE BREEZE CREDIT	4.977	4.977	4.977	4.977
COKE PRODUCTION W/O SRC	1499.387	1499.387	1499.387	1499.387
COKE BREEZE PRODUCTION (1000TPY)	1499.387	1499.387	1499.387	1499.387
COKE BREEZE PRICE (\$/T)	3.2800	3.2800	3.2800	3.2800
COKE BREEZE CREDIT	-4.918	-4.918	-4.918	-4.918
COKE SAVING COST (W/O - WITH)	7.887	7.948	8.008	8.069

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 FINANCIAL I.R.R. ON INVESTMENT (IN FIXED PRICE)
 CASE (A-A5) - BASE CASE - (US\$ MILLION)

YEAR	FIXED CAPITAL EXPEND.	CHANGE IN WORKING CAPITAL	(1) GROSS CAPITAL EXPENDTR	COKE COST WITHOUT SRC	COKE COST WITH SRC	(2) GROSS CASH IN-FLOW	(3) INCOME TAX	(4) BFR-TAX NET IN-FLOW (2)-(1)	(5) AFT-TAX NET IN-FLOW (4)-(3)
1996	11,559	0.0	11,559	0.0	0.0	0.0	0.0	-11,559	-11,559
1997	80,913	0.0	80,913	0.0	0.0	0.0	0.0	-80,913	-80,913
1998	92,472	0.0	92,472	0.0	0.0	0.0	0.0	-92,472	-92,472
1999	46,236	0.0	46,236	0.0	0.0	0.0	0.0	-46,236	-46,236
2000	0.0	3,242	3,242	70,386	-66,324	4,063	0.0	0,821	0,821
2001	0.0	-0,161	-0,161	88,388	-82,600	5,788	0.0	5,948	5,948
2002	0.0	-0,120	-0,120	98,209	-91,168	7,041	0.0	7,161	7,161
2003	0.0	-0,005	-0,005	98,209	-91,108	7,101	0.0	7,106	7,106
2004	0.0	-0,005	-0,005	98,209	-91,048	7,162	0.0	7,167	7,167
2005	0.0	-0,005	-0,005	98,209	-90,987	7,222	0.0	7,227	7,227
2006	0.0	-0,005	-0,005	98,209	-90,927	7,282	0.0	7,288	7,288
2007	0.0	-0,005	-0,005	98,209	-90,866	7,343	0.0	7,348	7,348
2008	0.0	-0,005	-0,005	98,209	-90,806	7,403	0.0	7,408	7,408
2009	0.0	-0,005	-0,005	98,209	-90,745	7,464	0.0	7,469	7,469
2010	0.0	-0,005	-0,005	98,209	-90,685	7,524	0.0	7,529	7,529
2011	0.0	-0,005	-0,005	98,209	-90,624	7,585	0.0	7,590	7,590
2012	0.0	-0,005	-0,005	98,209	-90,564	7,645	0.0	7,650	7,650
2013	0.0	-0,005	-0,005	98,209	-90,503	7,706	0.0	7,711	7,711
2014	0.0	-0,005	-0,005	98,209	-90,443	7,766	0.0	7,771	7,771
2015	0.0	-0,005	-0,005	98,209	-90,382	7,827	0.0	7,832	7,832
2016	0.0	-0,005	-0,005	98,209	-90,322	7,887	0.0	7,892	7,892
2017	0.0	-0,005	-0,005	98,209	-90,261	7,948	0.0	7,953	7,953
2018	0.0	-0,005	-0,005	98,209	-90,201	8,008	0.0	8,013	8,013
2019	-11,328	-2,881	-14,208	98,209	-90,141	8,069	0.0	22,277	22,277
	219,852	-0,000	219,852	1926,536	-1780,704	145,833	0.0	-74,020	-74,020

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) -2.77 PER CENT
 ON (5) AFT-TAX NET IN-FLOW (4)-(3) -2.77 PER CENT

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 FOREIGN EXCHANGE BALANCE (IN FIXED PRICE)
 - BASE CASE -
 (US\$ MILLION)

YEAR	(1) IN-FLOW OF IMPORT COAL	ACC. IN-FLOW	MAINTENANCE COST	INTEREST REPAYMENT		TOTAL OUT-FLOW	ACC. OUT-FLOW	(3) NET IN-FLOW (1)-(2)	ACC. NET IN-FLOW
				ON L/T	ON L/T				
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	18.856	18.856	0.940	12.248	0.0	13.188	13.188	5.669	5.669
2001	23.679	42.536	0.940	12.248	0.0	13.188	26.375	10.491	16.160
2002	26.310	68.846	0.940	12.248	10.206	23.394	49.769	2.916	19.076
2003	26.310	95.156	0.940	11.635	10.206	22.782	72.551	3.528	22.605
2004	26.310	121.466	0.940	11.023	10.206	22.169	94.720	4.141	26.746
2005	26.310	147.776	0.940	10.411	10.206	21.557	116.277	4.753	31.499
2006	26.310	174.086	0.940	9.798	10.206	20.945	137.222	5.366	36.864
2007	26.310	200.396	0.940	9.186	10.206	20.332	157.554	5.978	42.842
2008	26.310	226.707	0.940	8.573	10.206	19.720	177.274	6.590	48.433
2009	26.310	253.017	0.940	7.961	10.206	19.107	196.381	7.203	54.036
2010	26.310	279.327	0.940	7.349	10.206	18.495	214.876	7.815	59.636
2011	26.310	305.637	0.940	6.736	10.206	17.883	232.759	8.428	65.236
2012	26.310	331.947	0.940	6.124	10.206	17.270	250.029	9.040	70.836
2013	26.310	358.257	0.940	5.511	10.206	16.658	266.687	9.652	76.436
2014	26.310	384.567	0.940	4.899	10.206	16.045	282.732	10.265	82.036
2015	26.310	410.878	0.940	4.287	10.206	15.433	298.165	10.877	87.636
2016	26.310	437.188	0.940	3.674	10.206	14.821	312.986	11.489	93.236
2017	26.310	463.498	0.940	3.062	10.206	14.208	327.194	12.102	98.836
2018	26.310	489.808	0.940	2.450	10.206	13.596	340.790	12.714	104.436
2019	26.310	516.118	0.940	1.837	30.619	33.956	374.187	7.086	110.036
	516.117		18.800	151.259	204.128	374.136		141.931	

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 FINANCIAL I.R.R ON INVESTMENT (IN FIXED PRICE)
 CASE (A-A5) WITH PREMIUM (US\$ MILLION)

YEAR	FIXED CAPITAL EXPEND.	CHANGE IN WORKING CAPITAL	GROSS CAPITAL EXPENDTR	COKE COST WITHOUT SRC	COKE COST WITH SRC	GROSS CASH IN-FLOW	INCOME TAX	BFR-TAX NET IN-FLOW (2)-(1)	AFT-TAX NET IN-FLOW (4)-(3)
1996	11.559	0.0	11.559	0.0	0.0	0.0	0.0	-11.559	-11.559
1997	80.913	0.0	80.913	0.0	0.0	0.0	0.0	-80.913	-80.913
1998	92.472	0.0	92.472	0.0	0.0	0.0	0.0	-92.472	-92.472
1999	46.236	0.0	46.236	0.0	0.0	0.0	0.0	-46.236	-46.236
2000	0.0	3.242	3.242	77.723	-70.095	7.629	0.0	4.537	4.537
2001	0.0	-0.161	-0.161	97.602	-87.336	10.266	0.0	10.427	10.427
2002	0.0	-0.120	-0.120	108.446	-96.430	12.016	0.0	12.136	12.136
2003	0.0	-0.005	-0.005	108.446	-96.369	12.077	0.0	12.082	12.082
2004	0.0	-0.005	-0.005	108.446	-96.309	12.137	0.0	12.142	12.142
2005	0.0	-0.005	-0.005	108.446	-96.248	12.198	0.0	12.203	12.203
2006	0.0	-0.005	-0.005	108.446	-96.188	12.258	0.0	12.263	12.263
2007	0.0	-0.005	-0.005	108.446	-96.127	12.319	0.0	12.324	12.324
2008	0.0	-0.005	-0.005	108.446	-96.067	12.379	0.0	12.384	12.384
2009	0.0	-0.005	-0.005	108.446	-96.007	12.440	0.0	12.445	12.445
2010	0.0	-0.005	-0.005	108.446	-95.946	12.500	0.0	12.505	12.505
2011	0.0	-0.005	-0.005	108.446	-95.886	12.561	0.0	12.566	12.566
2012	0.0	-0.005	-0.005	108.446	-95.825	12.621	0.0	12.626	12.626
2013	0.0	-0.005	-0.005	108.446	-95.765	12.682	0.0	12.687	12.687
2014	0.0	-0.005	-0.005	108.446	-95.704	12.742	0.0	12.747	12.747
2015	0.0	-0.005	-0.005	108.446	-95.644	12.802	0.0	12.807	12.807
2016	0.0	-0.005	-0.005	108.446	-95.583	12.863	0.0	12.868	12.868
2017	0.0	-0.005	-0.005	108.446	-95.523	12.923	0.0	12.928	12.928
2018	0.0	-0.005	-0.005	108.446	-95.462	12.984	0.0	12.989	12.989
2019	-11.328	-2.881	-14.209	108.446	-95.402	13.044	0.0	27.253	27.253
	219.852	-0.000	219.852	2127.354	-1883.914	243.441	0.0	23.589	23.589

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) 0.77 PER CENT
 ON (5) AFT-TAX NET IN-FLOW (4)-(3) 0.77 PER CENT

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 FINANCIAL I.R.R ON INVESTMENT (IN FIXED PRICE)
 - IMPORTED COAL : 10% UP - (US\$, MM)

YEAR	FIXED CAPITAL EXPEND.	CHANGE IN WORKING CAPITAL	(1) GROSS CAPITAL EXPENDTR	COKE COST WITHOUT SRC	COKE COST WITH SRC	(2) GROSS CASH IN-FLOW	(3) INCOME TAX	(4) BFR-TAX NET IN-FLOW (2)-(1)	(5) AFT-TAX NET IN-FLOW (4)-(3)
1986	11,559	0.0	11,559	0.0	0.0	0.0	0.0	-11,559	-11,559
1987	80,913	0.0	80,913	0.0	0.0	0.0	0.0	-80,913	-80,913
1988	92,472	0.0	92,472	0.0	0.0	0.0	0.0	-92,472	-92,472
1989	46,236	0.0	46,236	0.0	0.0	0.0	0.0	-46,236	-46,236
2000	0.0	3,242	3,242	75,242	-88,820	6,423	0.0	3,181	3,181
2001	0.0	-0.161	-0.161	94,486	-85,734	8,752	0.0	8,912	8,912
2002	0.0	-0.120	-0.120	104,985	-94,651	10,334	0.0	10,454	10,454
2003	0.0	-0.005	-0.005	104,985	-94,590	10,394	0.0	10,399	10,399
2004	0.0	-0.005	-0.005	104,985	-94,530	10,455	0.0	10,460	10,460
2005	0.0	-0.005	-0.005	104,985	-94,469	10,515	0.0	10,520	10,520
2006	0.0	-0.005	-0.005	104,985	-94,409	10,576	0.0	10,581	10,581
2007	0.0	-0.005	-0.005	104,985	-94,348	10,636	0.0	10,641	10,641
2008	0.0	-0.005	-0.005	104,985	-94,288	10,697	0.0	10,702	10,702
2009	0.0	-0.005	-0.005	104,985	-94,227	10,757	0.0	10,762	10,762
2010	0.0	-0.005	-0.005	104,985	-94,167	10,818	0.0	10,823	10,823
2011	0.0	-0.005	-0.005	104,985	-94,107	10,878	0.0	10,883	10,883
2012	0.0	-0.005	-0.005	104,985	-94,046	10,939	0.0	10,944	10,944
2013	0.0	-0.005	-0.005	104,985	-93,986	10,999	0.0	11,004	11,004
2014	0.0	-0.005	-0.005	104,985	-93,925	11,059	0.0	11,064	11,064
2015	0.0	-0.005	-0.005	104,985	-93,865	11,120	0.0	11,125	11,125
2016	0.0	-0.005	-0.005	104,985	-93,804	11,180	0.0	11,185	11,185
2017	0.0	-0.005	-0.005	104,985	-93,744	11,241	0.0	11,246	11,246
2018	0.0	-0.005	-0.005	104,985	-93,683	11,301	0.0	11,306	11,306
2019	-11,328	-2,881	-14,208	104,985	-93,623	11,362	0.0	25,570	25,570
	219,852	-0,000	219,852	2059,448	-1849,014	210,435	0.0	-9,417	-9,417

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) -0.32 PER CENT
 ON (5) AFT-TAX NET IN-FLOW (4)-(3) -0.32 PER CENT

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 FINANCIAL I.R.R. ON INVESTMENT (IN FIXED PRICE)
 - IMPORTED COAL : 20% UP -
 (US\$, MM)

YEAR	FIXED CAPITAL EXPEND.	CHANGE IN WORKING CAPITAL	(1) GROSS CAPITAL EXPENDITR	COKE COST WITHOUT SRC	COKE COST WITH SRC	(2) GROSS CASH IN-FLOW	(3) INCOME TAX	(4) BFR-TAX NET IN-FLOW (2)-(1)	(5) AFT-TAX NET IN-FLOW (4)-(3)
1996	11.559	0.0	11.559	0.0	0.0	0.0	0.0	-11.559	-11.559
1997	80.913	0.0	80.913	0.0	0.0	0.0	0.0	-80.913	-80.913
1998	92.472	0.0	92.472	0.0	0.0	0.0	0.0	-92.472	-92.472
1999	46.236	0.0	46.236	0.0	0.0	0.0	0.0	-46.236	-46.236
2000	0.0	3.242	3.242	80.098	-71.315	8.783	0.0	5.541	5.541
2001	0.0	-0.161	-0.161	100.584	-88.868	11.716	0.0	11.876	11.876
2002	0.0	-0.120	-0.120	111.760	-98.133	13.627	0.0	13.747	13.747
2003	0.0	-0.005	-0.005	111.760	-98.072	13.688	0.0	13.693	13.693
2004	0.0	-0.005	-0.005	111.760	-98.012	13.748	0.0	13.753	13.753
2005	0.0	-0.005	-0.005	111.760	-97.952	13.808	0.0	13.814	13.814
2006	0.0	-0.005	-0.005	111.760	-97.891	13.869	0.0	13.874	13.874
2007	0.0	-0.005	-0.005	111.760	-97.831	13.929	0.0	13.934	13.934
2008	0.0	-0.005	-0.005	111.760	-97.770	13.990	0.0	13.995	13.995
2009	0.0	-0.005	-0.005	111.760	-97.710	14.050	0.0	14.055	14.055
2010	0.0	-0.005	-0.005	111.760	-97.649	14.111	0.0	14.116	14.116
2011	0.0	-0.005	-0.005	111.760	-97.589	14.171	0.0	14.176	14.176
2012	0.0	-0.005	-0.005	111.760	-97.528	14.232	0.0	14.237	14.237
2013	0.0	-0.005	-0.005	111.760	-97.468	14.292	0.0	14.297	14.297
2014	0.0	-0.005	-0.005	111.760	-97.407	14.353	0.0	14.358	14.358
2015	0.0	-0.005	-0.005	111.760	-97.347	14.413	0.0	14.418	14.418
2016	0.0	-0.005	-0.005	111.760	-97.286	14.474	0.0	14.479	14.479
2017	0.0	-0.005	-0.005	111.760	-97.226	14.534	0.0	14.539	14.539
2018	0.0	-0.005	-0.005	111.760	-97.166	14.595	0.0	14.600	14.600
2019	-11.328	-2.881	-14.208	111.760	-97.105	14.655	0.0	28.863	28.863
	219.852	-0.000	219.852	2192.363	-1917.323	275.037	0.0	55.185	55.185

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) 1.74 PER CENT
 ON (5) AFT-TAX NET IN-FLOW (4)-(3) 1.74 PER CENT

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 FINANCIAL I.R.R ON INVESTMENT (IN FIXED PRICE)
 - DOM. N.C.C. : 10% DOWN - (USS, MM)

YEAR	FIXED CAPITAL EXPEND.	CHANGE IN WORKING CAPITAL	GROSS CAPITAL EXPENDTR	COKE COST WITHOUT SRC	COKE COST WITH SRC	GROSS CASH IN-FLOW	(3) INCOME TAX	(4) BFR-TAX NET IN-FLOW (2)-(1)	(5) AFT-TAX NET IN-FLOW (4)-(3)
1996	11,559	0.0	11,559	0.0	0.0	0.0	0.0	-11,559	-11,559
1997	80,913	0.0	80,913	0.0	0.0	0.0	0.0	-80,913	-80,913
1998	92,472	0.0	92,472	0.0	0.0	0.0	0.0	-92,472	-92,472
1999	46,236	0.0	46,236	0.0	0.0	0.0	0.0	-46,236	-46,236
2000	0.0	3,106	3,106	70,386	-64,360	5,526	0.0	2,420	2,420
2001	0.0	-0.165	-0.165	88,388	-80,763	7,625	0.0	7,790	7,790
2002	0.0	-0.124	-0.124	98,209	-89,127	9,082	0.0	9,207	9,207
2003	0.0	-0.005	-0.005	98,209	-89,066	9,143	0.0	9,148	9,148
2004	0.0	-0.005	-0.005	98,209	-89,006	9,203	0.0	9,208	9,208
2005	0.0	-0.005	-0.005	98,209	-88,945	9,264	0.0	9,269	9,269
2006	0.0	-0.005	-0.005	98,209	-88,885	9,324	0.0	9,329	9,329
2007	0.0	-0.005	-0.005	98,209	-88,824	9,385	0.0	9,390	9,390
2008	0.0	-0.005	-0.005	98,209	-88,764	9,445	0.0	9,450	9,450
2009	0.0	-0.005	-0.005	98,209	-88,703	9,506	0.0	9,511	9,511
2010	0.0	-0.005	-0.005	98,209	-88,643	9,566	0.0	9,571	9,571
2011	0.0	-0.005	-0.005	98,209	-88,582	9,627	0.0	9,632	9,632
2012	0.0	-0.005	-0.005	98,209	-88,522	9,687	0.0	9,692	9,692
2013	0.0	-0.005	-0.005	98,209	-88,462	9,748	0.0	9,753	9,753
2014	0.0	-0.005	-0.005	98,209	-88,401	9,808	0.0	9,813	9,813
2015	0.0	-0.005	-0.005	98,209	-88,341	9,868	0.0	9,873	9,873
2016	0.0	-0.005	-0.005	98,209	-88,280	9,929	0.0	9,934	9,934
2017	0.0	-0.005	-0.005	98,209	-88,220	9,989	0.0	9,994	9,994
2018	0.0	-0.005	-0.005	98,209	-88,159	10,050	0.0	10,055	10,055
2019	-11,328	-2,736	-14,064	98,209	-88,099	10,110	0.0	24,174	24,174
	219,852	-0.000	219,852	1926,536	-1740,650	185,886	0.0	-33,966	-33,966

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) -1.20 PER CENT
 ON (5) AFT-TAX NET IN-FLOW (4)-(3) -1.20 PER CENT

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 FINANCIAL I.R.R ON INVESTMENT (IN FIXED PRICE)
 - DOM. N.C.C : 20% DOWN - (US\$, MM)

YEAR	FIXED CAPITAL EXPEND.	CHANGE IN WORKING CAPITAL	(1) GROSS CAPITAL EXPENDTR	COKE COST WITHOUT SRC	COKE COST WITH SRC	(2) GROSS CASH IN-FLOW	(3) INCOME TAX	(4) BFR-TAX NET IN-FLOW (2)-(1)	(5) AFT-TAX NET IN-FLOW (4)-(3)
1996	11,559	0.0	11,559	0.0	0.0	0.0	0.0	-11,559	-11,559
1997	80,913	0.0	80,913	0.0	0.0	0.0	0.0	-80,913	-80,913
1998	92,472	0.0	92,472	0.0	0.0	0.0	0.0	-92,472	-92,472
1999	46,236	0.0	46,236	0.0	0.0	0.0	0.0	-46,236	-46,236
2000	0.0	2,970	2,970	70,386	-63,397	6,989	0.0	4,019	4,019
2001	0.0	-0.169	-0.169	88,388	-78,925	9,463	0.0	9,632	9,632
2002	0.0	-0.129	-0.129	98,209	-87,085	11,124	0.0	11,253	11,253
2003	0.0	-0.005	-0.005	98,209	-87,024	11,185	0.0	11,190	11,190
2004	0.0	-0.005	-0.005	98,209	-86,964	11,245	0.0	11,250	11,250
2005	0.0	-0.005	-0.005	98,209	-86,903	11,306	0.0	11,311	11,311
2006	0.0	-0.005	-0.005	98,209	-86,843	11,366	0.0	11,371	11,371
2007	0.0	-0.005	-0.005	98,209	-86,783	11,427	0.0	11,432	11,432
2008	0.0	-0.005	-0.005	98,209	-86,722	11,487	0.0	11,492	11,492
2009	0.0	-0.005	-0.005	98,209	-86,662	11,547	0.0	11,552	11,552
2010	0.0	-0.005	-0.005	98,209	-86,601	11,608	0.0	11,613	11,613
2011	0.0	-0.005	-0.005	98,209	-86,541	11,668	0.0	11,673	11,673
2012	0.0	-0.005	-0.005	98,209	-86,480	11,729	0.0	11,734	11,734
2013	0.0	-0.005	-0.005	98,209	-86,420	11,789	0.0	11,794	11,794
2014	0.0	-0.005	-0.005	98,209	-86,359	11,850	0.0	11,855	11,855
2015	0.0	-0.005	-0.005	98,209	-86,299	11,910	0.0	11,915	11,915
2016	0.0	-0.005	-0.005	98,209	-86,238	11,971	0.0	11,976	11,976
2017	0.0	-0.005	-0.005	98,209	-86,178	12,031	0.0	12,036	12,036
2018	0.0	-0.005	-0.005	98,209	-86,117	12,092	0.0	12,097	12,097
2019	-11,326	-2,592	-13,919	98,209	-86,057	12,152	0.0	26,071	26,071
	219,852	-0.000	219,852	1926,536	-1700,597	225,939	0.0	6,087	6,087

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) 0.20 PER CENT
 ON (5) AFT-TAX NET IN-FLOW (4)-(3) 0.20 PER CENT

*** SOLVENT REFINED COAL PROJECT, INDIA ***
 FINANCIAL I.R.R ON INVESTMENT (IN FIXED PRICE)
 - CAPITAL COST : 10% DOWN - (U.S. MM)

YEAR	FIXED CAPITAL EXPEND.	CHANGE IN WORKING CAPITAL	GROSS CAPITAL EXPENDTR	COKE COST WITHOUT SRC	COKE COST WITH SRC	GROSS CASH IN-FLOW	INCOME TAX	BFR-TAX NET IN-FLOW (2)-(1)	AFT-TAX NET IN-FLOW (4)-(3)
1996	10.403	0.0	10.403	0.0	0.0	0.0	0.0	-10.403	-10.403
1997	72.822	0.0	72.822	0.0	0.0	0.0	0.0	-72.822	-72.822
1998	83.225	0.0	83.225	0.0	0.0	0.0	0.0	-83.225	-83.225
1999	41.612	0.0	41.612	0.0	0.0	0.0	0.0	-41.612	-41.612
2000	0.0	3.071	3.071	70.386	-65.935	4.451	0.0	1.380	1.380
2001	0.0	-0.141	-0.141	88.388	-82.173	6.216	0.0	6.357	6.357
2002	0.0	-0.104	-0.104	98.209	-90.747	7.462	0.0	7.567	7.567
2003	0.0	-0.005	-0.005	98.209	-90.692	7.517	0.0	7.521	7.521
2004	0.0	-0.005	-0.005	98.209	-90.638	7.571	0.0	7.576	7.576
2005	0.0	-0.005	-0.005	98.209	-90.583	7.626	0.0	7.630	7.630
2006	0.0	-0.005	-0.005	98.209	-90.529	7.680	0.0	7.685	7.685
2007	0.0	-0.005	-0.005	98.209	-90.475	7.735	0.0	7.739	7.739
2008	0.0	-0.005	-0.005	98.209	-90.420	7.789	0.0	7.794	7.794
2009	0.0	-0.005	-0.005	98.209	-90.366	7.843	0.0	7.848	7.848
2010	0.0	-0.005	-0.005	98.209	-90.311	7.898	0.0	7.902	7.902
2011	0.0	-0.005	-0.005	98.209	-90.257	7.952	0.0	7.957	7.957
2012	0.0	-0.005	-0.005	98.209	-90.202	8.007	0.0	8.011	8.011
2013	0.0	-0.005	-0.005	98.209	-90.148	8.061	0.0	8.066	8.066
2014	0.0	-0.005	-0.005	98.209	-90.094	8.115	0.0	8.120	8.120
2015	0.0	-0.005	-0.005	98.209	-90.039	8.170	0.0	8.174	8.174
2016	0.0	-0.005	-0.005	98.209	-89.985	8.224	0.0	8.229	8.229
2017	0.0	-0.005	-0.005	98.209	-89.930	8.279	0.0	8.283	8.283
2018	0.0	-0.005	-0.005	98.209	-89.876	8.333	0.0	8.338	8.338
2019	-10.195	-2.753	-12.948	98.209	-88.822	8.388	0.0	21.335	21.335
	197.867	-0.000	197.867	1926.536	-1773.218	159.318	0.0	-44.549	-44.549

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) -1.78 PER CENT

ON (5) AFT-TAX NET IN-FLOW (4)-(3) -1.78 PER CENT