

Indonesian Coal Utilization and Its Environmental Issues

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I. INTRODUCTION

- After first oil shock in 1970s → Indonesia Gov. has decided to use more coal
- Presidential Decree No. 49/1981 → set up Coal Cooperation Contract (CCC) as basis of coal investment → later on is called Coal Contract of Work (CCoW).
- The rapid growth of coal industry :
 - domestic consumption from 0,2 million tons in 1983, 8.4 million tons in 1990 and became 29.4 mt in 2002.
 - export increased from 0.4 million tons in 1983, 4.3 million tons in 1990 and became 74.2 million tons in 2002.
- Indonesia's coal becomes very important → fulfilling national energy need & improving regional energy security.
- Dual role of coal sector → as a key energy supplier to the domestic market & as coal exporter in the international trading of thermal coal.

➤ **Two big issues on coal utilization and environment:**

- **Increase of coal utilization as the sources of energy**
- **Reduction of impact of such utilization by promoting CCT (to respond environment problems and to increase efficiency)**

Some problem are still existing:

- ✓ **Cost consideration**
- ✓ **Fine coal treatment**
- ✓ **Coal ash handling**

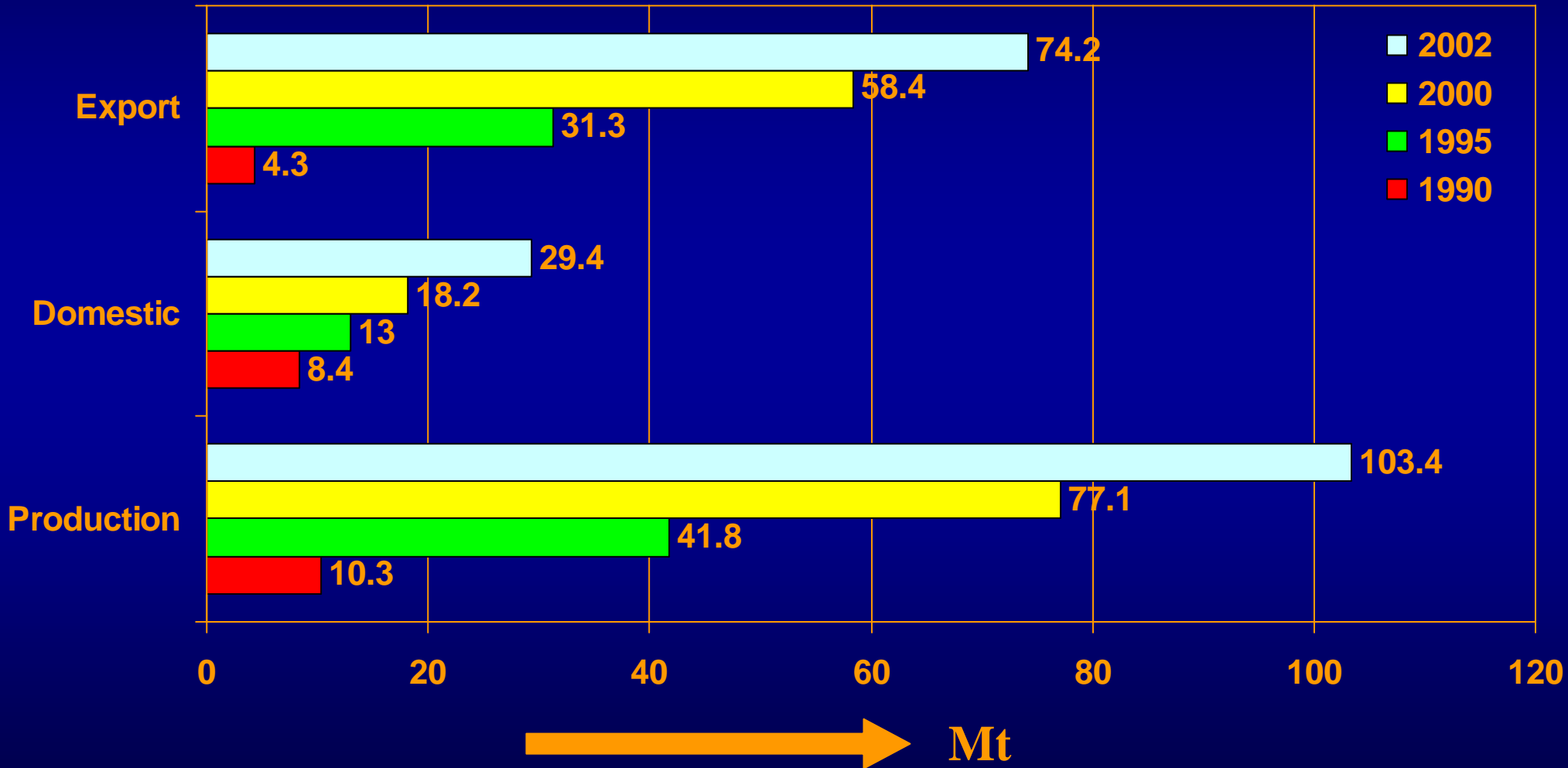
LOCATION OF INDONESIAN COAL

Reserve (%)	Location/Province	Resource (%)
0.0	Central Kalimantan	44.8
50.1	East Kalimantan	9.9
23.5	South Kalimantan	11.9
23.2	South Sumatra	25.1
3.2	Others	9.3
100.0 = 4.7 bt *)	Indonesia	100.0 = 50.6 bt

Source: Directorate of Mineral Inventory, 2003

**) = 0.4% of the world reserves*

ACTUAL OF COAL PRODUCTION, DOMESTIC AND EXPORT



INDONESIAN COAL PRODUCTION (1990 – 2002)

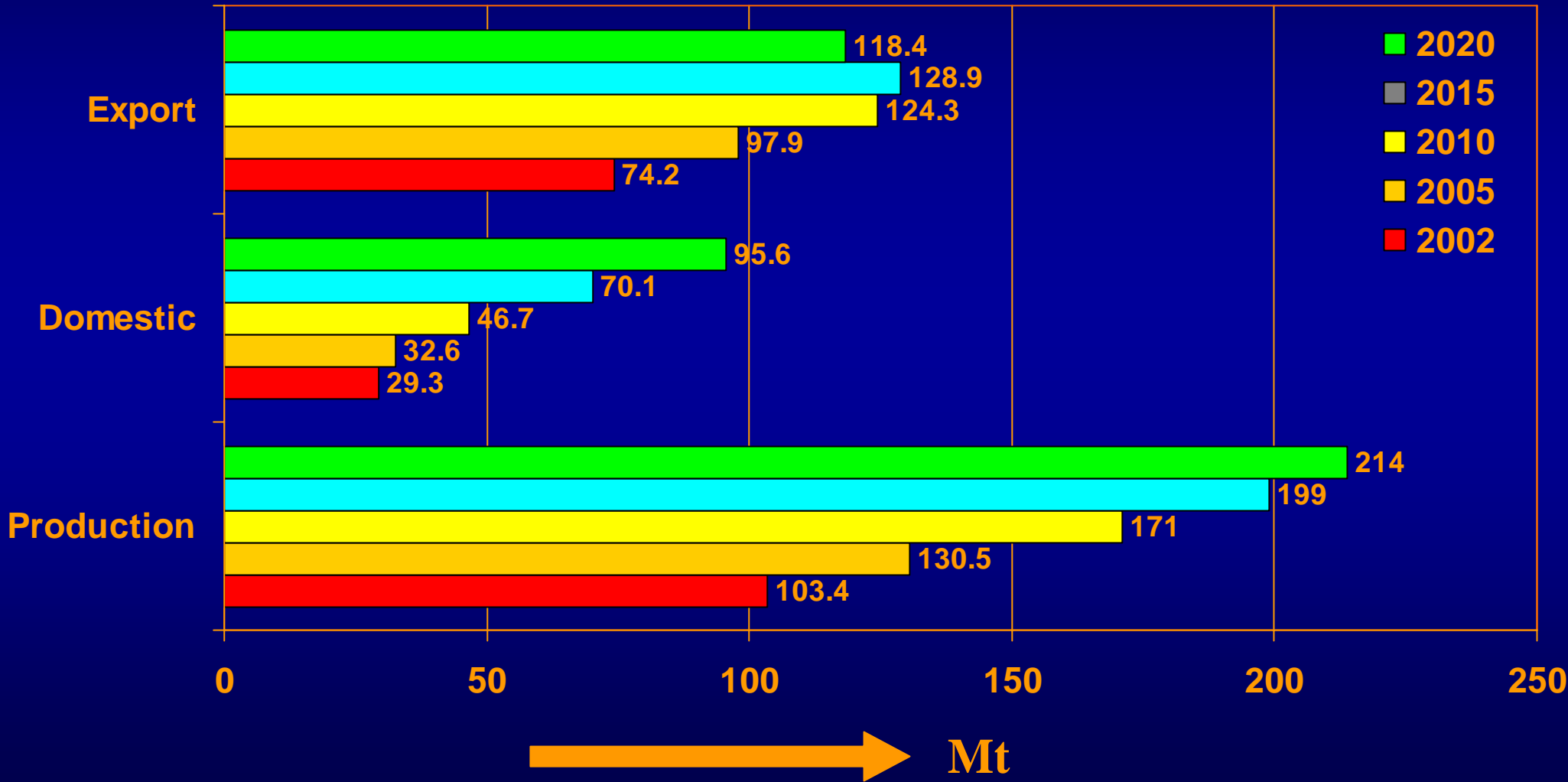
COAL PLAYERS	1990	1995	2000	2002	GROWTH RATE, Mt/Yr (2002/1990)
PT BA/STATE-OWNED COMPANY	4.8	8.0	10.7	9.5	0.39
PKP2B/CCoW	3.8	29.6	61.7	87.1	6.94
KP/KUD/MA+COOPERATIVE UNIT	2.0	4.2	4.7	6.8	0.40
TOTAL	10.6	41.8	77.1	103.4	7.73

DOMESTIC USE OF COAL (1993 – 2002)

Mt

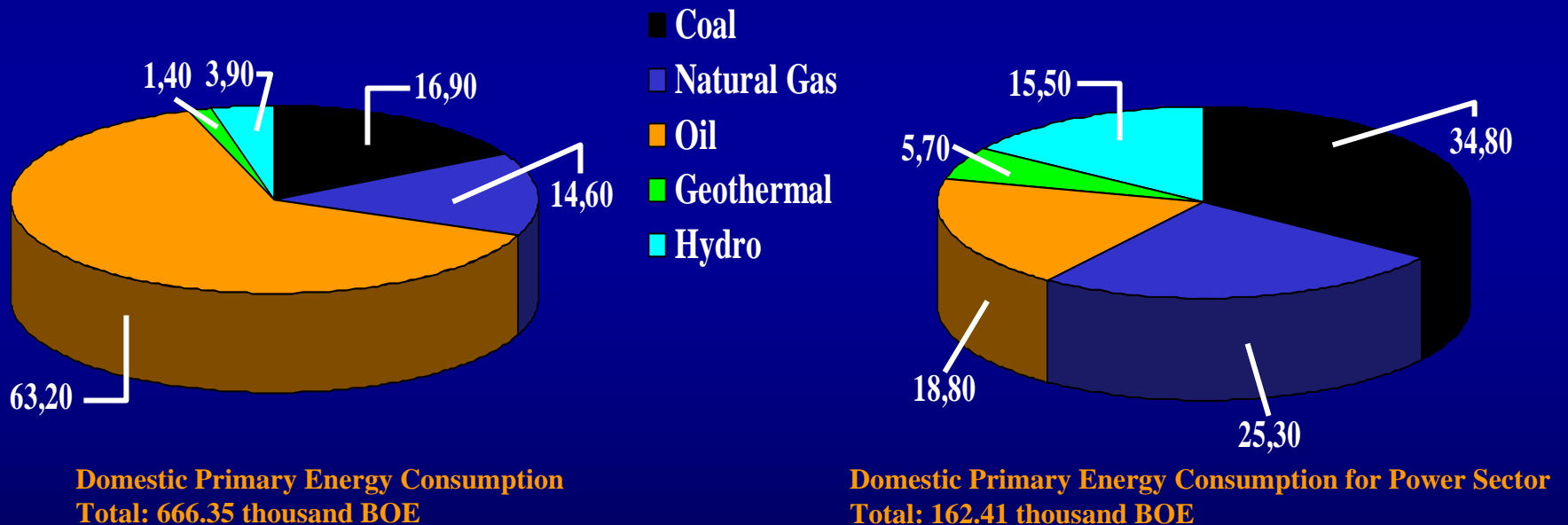
USE	1993	1995	2001	2002	GROWTH RATE, Mt/Yr (2002/1993)
- Electricity	5.4	9.8	19.52	20.02	1.62
- Cement	2.6	2.7	5.14	4.68	0.23
- Other industries (metallurgy, textile, pulp/paper)	0.5	0.5	2.64	4.53	0.45
- Small Industry (briquette)	0.008	0.015	0.03	0.03	0.002
Total	8.4	13.0	24.98	29.26	2.32

PROJECTION OF COAL PRODUCTION, DOMESTIC AND EXPORT IN INDONESIA



- Coal has been playing a significant role among the fuel used for commercial energy → In 2001, coal contributed 13.1% in energy mix and 34.8% in power sector

Energy Mix and Coal Contribution to Electricity Sector (Year 2001)



II. STRATEGY OF INDONESIAN COAL UTILIZATION CURRENT AND FUTURE PROSPECT

2.1. Coal Players Status

- **Presently four groups of coal producers in Indonesia:**
 - **State-Owned Coal Company (PTBA)**
 - **CCoW (Generation I, II, and III)**
 - **Mining Authorization Holders (MA or Kuasa Pertambangan/KP)**
 - **Cooperative Units (Koperasi Unit Desa/KUD)**
- **Every player has different rights and obligations according to Mining Law No. 11/1967, Presidential Decree No. 49/81, No. 23/93 and No. 75/1996.**
- **The Major Coal Producers: 5 companies of First Generation of CCoW and 8 companies of MA Holders**

Coal Player Status of CCoW

COMPANY	STAGE						TOTAL
	GENERAL SURVEY	EXPLORATION	FEASIBILITY STUDY	CONSTRUCTION	PRODUCTION	TERMINATED/ SUSPENDED	
GENERATION I	-	-	-	-	10	1 + 0	11
GENERATION II	-	4	2	4	5	3 + 9	27
GENERATION III	7	45	14	2	8	37 + 10	123
TOTAL	7	49	16	6	23	41 + 19	161

Sources: Directorate of Mineral and Coal Enterprises, September 2003

INDONESIAN COAL EXPORT (1990 – 2002)

COAL PLAYERS	1990	1995	2000	2002	GROWTH RATE, Mt/Yr (2002/1990)
PT BA/STATE-OWNED COMPANY	1.50	2.16	2.14	1.85	0.04
PKP2B/CCoW	2.30	25.90	52.17	66.50	5.19
KP/KUD/MA+COOPERATIVE UNIT	0.50	3.26	4.10	5.82	0.34
TOTAL	4.30	31.32	58.41	74.17	5.82

- **PTBA → The only state-owned company on coal mining sector (operates two coal mining areas located in Central Sumatra and South Sumatra) → Contributes ± 11% of the total national coal production in 2002 : 9.5 million tons) → 80% of prod. goes to Indonesia's largest power plant Suralaya-West Java**
- **MA Holders → About 104 companies, only 12 companies are in production stage with small to medium capacities (100,000 to 2,000,000 tons annually).**
- **Cooperative Unit → one Cooperative Unit actively producing coal with capacities 17,000 tons per year in 2002.**

Actual Coal Production and Future Outlook up to 2006

PLAYERS	ACTUAL			FORECAST			
	2000	2001	2002	2003	2004	2005	2006
PT BA	10,746	10,211	9,482	12,500	12,500	12,500	13,000
CCoW Gen I	55,298	66,690	75,750	76,050	75,800	77,550	77,300
CCoW Gen II & III	6,409	9,843	11,328	14,200	19,600	22,600	25,000
Mining Authorization	4,388	5,781	6,795	5,000	5,000	5,000	5,000
Cooperative Unit	199	15	17	300	300	300	300
Total Production	77,040	92,540	103,372	108,050	113,200	117,950	120,600

Sources: Directorate of Mineral and Coal Enterprises, 2002; Company Work and Budget, 2002

2.2. Domestic Demand

Indonesian coal demand:

- **Domestic demand is mainly coming from electricity and cement sector**
- **Export demand is expected to grow continually**

2.3. Coal Export

Coal export has increased → from over 16 million tons in 1992 to 31.5 million tons in 1995 (double) and 74.2 million tons in 2002 (more than tripled):

- **During the period of 1997-1999 (as economical and political crisis) → export is still continued to grow.**
- **Indonesian coal market (export) mainly to Asia Pacific economies → in 2001, 58% to East Asia (Japan, South Korea, Taiwan, Hong Kong), 15% to ASEAN countries and 15% to Europe**

Estimation for year 2003 → Indonesia will be able to contribute about 22% of the steam coal world trade (about 319 million tons) → Some interested factors: low cost of production, attractive coal quality (low sulfur and ash), availability of world class operator and geographical advantage of transportation.

Actual and Future Outlook of Coal Production, Domestic and Export

000 tons

YEAR	PRODUCTION	DOMESTIC				EXPORT
		ELECTRICITY	CEMENT	OTHERS (*)	TOTAL	
2001 (ACTUAL)	92,540	19,517	4,388	1,075	24,980	65,281
2002 (ACTUAL)	103,372	20,018	4,685	4,554	29,257	74,178
2003	108,050	21,500	5,000	2,000	28,500	79,550
2004	113,200	25,500	6,000	2,500	34,000	79,200
2005	117,450	25,500	6,000	3,500	35,000	82,450
2006	120,600	28,000	6,000	4,000	38,000	82,600

Sources: Directorate of Mineral and Coal Enterprises, 2002

(*) metallurgy, pulp industry, briquette, etc.

Indonesia Coal Export Destination

REGION	COUNTRY	2000	2001	2002
1. ASIA	China	212,676.00	628,811.00	2,875,950.00
	Arab Saudi	-	-	37,639.00
	Sri Langka	-	-	26,622.41
	Hong Kong	2,914,242.32	4,661,925.00	5,564,020.00
	India	3,150,644.49	3,129,712.00	4,585,997.43
	Japan	13,177,438.00	15,216,261.00	16,529,755.00
	Malaysia	2,760,835.43	2,098,277.00	6,239,174.66
	Singapore	368,973.00	70,987.00	488,627.00
	South Korea	4,779,341.70	5,552,188.00	5,633,099.00
	Taiwan	13,519,593.76	11,506,807.00	13,099,985.00
	Thailand	2,653,711.34	2,328,199.00	3,154,602.74
	The Philippines	2,979,044.34	1,980,466.00	2,018,159.46
	Sub Total	46,516,500.38	47,163,633.00	60,235,631.70
2. EUROPE	Finland	-	132,058.00	129,568.00
	Germany	98,311.00	502,08.00	557,341.00
	Greece	132,645.00	-	213,408.00
	Ireland	163,359.00	454,636.00	294,522.00
	Italy	1,419,899.00	1,584,440.00	2,095,666.00
	Netherlands	3,478,899.00	2,410,110.00	1,514,654.00
	Portugal	-	948,141.00	444,451.00
	Slovenia	470,803.00	563,035.00	71,461.00
	Spain	2,868,761.00	3,203,255.00	3,001,016.00
	Switzerland	59,008.0	379,395.00	357,398.00
	United Kingdom	170,547.00	49,500.00	69,584.00
	Croatia	-	-	641,575.00
	Sub Total	8,861,562.00	10,226,650.00	9,936,175.00
3. AUSTRALIA - AMERICA	Argentina	46,326.00	-	-
	Australia	-	160,214.00	0.00
	Brasilia	427,449.00	283,786.00	356,020.00
	Canada	-	35,518.00	0.00
	Chile	718,763.00	642,130.00	553,610.00
	Peru	24,854.00	-	535,376.00
	USA	658,718.00	1,039,18.00	1,110,167.00
	Sub Total	1,876,110.00	2,160,831.00	2,555,173.00
4. OTHERS		1,206,319014	5,729,972.24	1,450,946.51
TOTAL (1+2+3+4)		58,460,491.52	65,281,081.24	74,177,926.21

III. CHALLENGING ISSUES

Indonesian coal industry is facing a number of challenges:

3.1. Autonomy (Decentralization) Policy

- **Law No. 22 of 1999 concerning Regional Autonomy & Law No. 25 of 1999 concerning Financial Proportional between the Central Government and the Regional Administration; Central and Local Government represent the state in managing natural resources**
- **Law No. 22 of 1999 → more authority to the regional governments, including right to give mining license → Problems may be inevitable because of the transition period.**
- **Adjustment in mining law and regulatory framework**

3.2. Environment

Development Strategy → *To adopt the Clean Coal Technology in coal industry*

- **Ministry of Environment has issued Decree KEP-13/MNLH/3/1995 → Emission of sulfur dioxide must be below 750 mg/m³ by the year 2000.**
- **To meet the standard, the power plants should apply the “Clean Coal Technology”, i.e. by installing de-SO_x (FGD) system**
- **Consequently bring additional cost to investment and the maintenance of power plant**
- **If the government regulation can be revised → It is proposed that the standard of emission should be formulated into the lowest and the highest. The highest standard of emission is applied for power generation located in the remote area and the lowest for the dense area.**

1. PRE - COMBUSTION

- Aim** : • **to improve coal quality**
- **to increase transportation efficiency**

- Technology** : • **Advanced Coal Preparation**
- **Conversion (Carbonization, Liquefaction, Gasification)**
 - **Coal Water Fuel, Coal Oil Fuel, Liquid From Coal**
 - **Substitution and Blending**

2. ONGOING - COMBUSTION

Aim : • **to increase combustion efficiency**
• **to reduce pollution gas emission**

Technology : • **Fluidised Bed Combustion (FBC),
Integrated Gasification Combined Cycle (IGCC), Lime Direct Injection**

3. POST - COMBUSTION

Aim : • **to reduce pollution gas emission and ash**

Technology : • **Electrostatic Precipitator, Flue Gas Desulfurization, Ammonia-Selective Catalytic Reduction System, Electron Beam-SO_x and NO_x Removal**

LIST OF COAL FIRE POWER PLANT (EXISTING)

NO.	NAME	LOCATION	CAPACITY (MW)	OP. TIME	COAL (t/yr)	COAL TYPE	LOCATION/ PROVINCE
I.	PLN						
1	PLTU Ombilin	Sawalunto – Sumbar	200	1996	630,720	Sub Bituminous	Sumbar
2	PLTU Bukit Asam	Tanjung Enim – Sumsel	260	1987	1,002,144	Sub Bituminous	Sumsel
3	PLTU Suralaya	Merak – Banten	3,400	1984	11,913,600	Sub Bituminous	Sumsel, Kalsel
4	PLTU Paiton	Probolinggo – Jatim	800	1994	2,803,200	Sub Bituminous	Kalsel, Kaltim
5	PLTU Asam-asam #1&2	Banjarmasin – Kalsel	130	2000	592,176	Lignite	Kalsel
II	IPP						
1	PLTU Paiton I (PEC)	Probolinggo - Jatim	1.230	2000	3,878,928	Sub Bituminous	Kalsel
2	PLTU Paiton II (Jawa Power)	Probolinggo - Jatim	1,220	2000	3,847,392	Sub Bituminous	Kalsel
TOTAL			7,240		24,668,160		

LIST OF COAL FIRE POWER PLANT (ON GOING)

NO.	NAME	LOCATION	CAPACITY (MW)	OP. TIME	COAL (t/yr)	COAL TYPE	LOCATION/ PROVINCE
1.	PLTU Tanjung Jati B	Jebara – Kateng	1320	2005	4,162,752	Sub Bituminous	Kalsel, Kaltim
2.	PLTU Cilacap	Cilacap – Jateng	450	2006	1,419,120	Sub Bituminous	Kalsel, Sumsel
3.	PLTU Tarahan # 1 & 2	Tarahan - Lampung	200	2007	770,880	Sub Bituminous	Sumsel, Kalsel, Bengkulu
4.	PLTU Tarahan # 3 & 4	Tarahan - Lampung	200	2006	770,880	Sub Bituminous	Sumsel
5.	PLTU Labuan Angin	Sibolga – Sumut	230	2007	1,047,696	Lignite	Bengkulu, Sumsel, Riau
6.	PLTU Amurang	Manado – Sulut	110	2006	346,896	Sub Bituminous	Kaltim, Kalsel
7.	PLTU Sibolga	Sibolga – Sumut	200	2006	630,720	Sub Bituminous	Bengkulu, Sumsel, Riau
8.	PLTU Cilegon	Cilegon – Banten	450	2008	1,419,120	Sub Bituminous	Sumsel, Kalsel, Bengkulu
9.	PLTU MT Peranap	Riau	500	2007	2,277,600	Lignite	Riau
10.	PLTU Banjarsari	Sumatera Selatan	200	2007	911,040	Sub Bituminous	Sumsel
11.	PLTU Lubung Linggau	Sumatera Selatan	130	2007	592,176	Sub Bituminous	Sumsel
12.	PLTU Sarolangon	Jambi	14	2005	63,773	Sub Bituminous	Jambi
13.	PLTU Bangka	Bangka	30	2006	136,656	Sub Bituminous	Riau
14.	PLTU MT Lati	Kaltim	14	2003	68,678	Reject Coal	Kaltim
15.	PLTU MT Sangatta	Kaltim	14	2004	68,678	Reject Coal	Kaltim
16.	PLTU Sintang	Kalbar	14	2005	68,678	Reject Coal	Kalsel
17.	PLTU Kupang	NTT	30	2005	136,656	Sub Bituminous	Kalsel
18.	PLTU Palu	Sulteng	30	2005	136,656	Sub Bituminous	Kaltim, Kalsel
TOTAL			4,136		15,028,615		

- **Promoting CCT, including CO₂ disposal, is important to reduce emissions and use coal efficiently and economically in view of global environmental problems such as global warming. In Indonesia, efforts to reduce CO₂, SO_x, NO_x and dust from combustion process have also been promoted. However, to certain extent, higher cost is still as a consideration to fully apply those of environment protection equipment.**

- **There are several reasons to justify for not using fully CCT in Indonesia:**
 - ✓ **Indonesian coal is clean enough, especially because its ash, sulphur, and nitrogen content are very low.**
 - ✓ **Indonesia has tropical forest that can absorb polluter.**
 - ✓ **Coal usage in Indonesia relatively small compared to other economies such as China, Japan, Australia, USA, and others.**

- **In the coal mining area or coal washing plant, one of most problems related to the environment issues is how to handle the produced fine coal. Although fine coal is actually fuel, but to some extent it is categorised as a waste. Appropriate technology to handle this fine coal is necessary**
- **Other important technology needed is how to handle coal ash properly. Some methods to investigate coal ash are also required, since Indonesian coal ash unfortunately is categorised as harmful waste. Some technologies to handle coal ash, such as technology for hardened substances and technology for utilization of molten coal ash, are also very important for Indonesian coal development**

3.3. Coal Upgrading Technology

- **Over 58% of Indonesian coal is classified as low-rank coal (lignite) with relatively high moisture content and low calorific values**
- **Coal Upgrading Tech. should be applied → i.e. UBC (Upgrading Brown Coal) Process, HWD (Hot Water Drying), K-Fuel, Syncoal, and Encoal processes.**
- **Regard to UBC technology → several kind of Indonesian lignite coal has been tested accordingly and gives satisfactory result → by UBC Process, the calorific value increases significantly about 1000 kcal/kg and the moisture content reduce about 80-95%**
- **The main problem of this process may come from economical aspect → Cost is approximately 6-7 US \$/ton**
- **Therefore, this tech. is more suitable only for lignite with very low coal mining cost (stripping ratio below 3). At the moment, there is no UBC factory has been developed commercially.**

IV. CLOSING REMARKS

- **The role of coal will be dominant enough to support Indonesia's energy in the future. Therefore, coal utilization should always be considered to the wholeness of the Republic of Indonesia and not just for the benefit of the region.**
- **Coal industries in Indonesia are still focussed on primary raw materials trading. It should be considered that coal processing should be applied in order to produce better coal products in term of economical and environment aspects.**
- **Several aspects such as management of coal mining activities efficiency and productivity, conservation and inventory of the resources should be taken into account to develop Indonesian coal. Besides, application of appropriate technologies, building up-and-down stream linkages, improving human resource skill as well as concerning social and environmental aspects should also be considered.**

- **Applying of processing technologies should be considered to produce better and cleaner coal products. For that reason, R&D processing of briquette, liquefaction, gasification and upgrading brown coal has been conducting. It is recommended to develop integrated mine mouth coal industries to yield some of low cost coal products.**
- **As energy source, coal can be used directly or through conversion process. Direct usage as fuel can have negative impact to environment, especially to the air quality. Steps should be taken to reduce the impact to air quality i.e. pre-combustion, ongoing combustion, and post combustion.**
- **There are several reasons for not using fully CCT in Indonesia: Indonesian coal is relatively clean, Indonesia has tropical forest, and the coal usage in Indonesia relatively small compared to other countries.**

THANK YOU

KAMSAHAMNIDA