

LOW RANK COAL AND ITS CONTRIBUTION TO THE ENERGY DEVELOPMENT IN INDONESIA

(Opportunities and Challenges)

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INTRODUCTION

(Why LRC?)

- Energy is a fundamental driver of economic development and contributor to people's quality of life and poverty alleviation.
- In order to fulfill the energy need, the GOI decided to use LRC for generating electricity, producing synthetic oil and gas fuel and other purposes. This effort is part of the national energy policy to stimulate possibilities of optimal utilization of coal in conjunction with the blue print of diversifying energy program.
- The idea of using LRC is mostly due to the abundant of its reserve, still unutilized so far, having low mining strip ratio, good quality in term of sulfur and ash content. All of those will generate the security of supply and low cost energy source.



THE ROLE OF COAL AS ENERGY, ECONOMIC AND SOCIAL DEVELOPMENT (1)

☑ Global

- Coal is vital for global energy security. It is abundantly available, affordable, and reliable.
- Coal is currently mined over 50 countries and about seven million people are employed in the industry (90% in the developing countries). Proven coal reserves have increased by over 50% in the past 22 years.
- Coal produces 39% of the world's electricity (the largest source) and is projected to grow 60% by 2030 and 70% of the world's steel.
- Coal generates around US\$ 7 billion per annum in export revenue for developing countries.
- 1.6 billion people in developing countries do not have access to electricity but 1 billion have gained electricity via coal on the past two decade.
- Coal provides 7 million jobs worldwide.



THE ROLE OF COAL AS ENERGY, ECONOMIC AND SOCIAL DEVELOPMENT (2)

☑ **National (2004)**

- Coal produces 46% of the national electricity in 2005 which is about double the share of gas and oil (25%). This will be projected to grow to 62% in 2010 and will affect to increase the electrification ratio from 54.8% to 70.0%. About 65% (2004) of coal for domestic is used for electricity.
- In cement industry, almost 100% of this industries used coal as an energy for the process and consumes about 15% (2004) of coal for domestic use.
- About 20% of coal for domestic are used for textile, pulp paper, metallurgy industry and small industry (in the form of briquette, etc.).
- In energy mix coal contribute 19,7% and will be around 25% in 2010.
- It contributes (2004) more than Rp 1,7 trillion / year to the government from tax, non tax and royalty.
- It generates about 36.000 employees.
- It contributes about Rp 74 billion/year to community development and social responsibility.



DEFINITION: LOW RANK

COAL (1)

(In General)

- ◆ There are various definitions; different things to different people to different country.
- ◆ US ASTM: LRC is Lignite (CV 3500 – 4600 kcal/kg, mmmf with a total moisture higher than 35%: Referred by USA, Indonesia (?).
- ◆ ISO system: LRC is Brown Coal (CV < 5700 kcal/kg, ash free): Referred by Australia/European/Japan.
- ◆ Graham Wallis (Coal Consultant PT Gantari Utama):
LRC is in the rank of Sub bituminous C to lignit (< 5.270 kcal/kg mmmf).
- ◆ Standard for scientific or trade (commercial) is generally using different approach in classification standard.



DEFINITION: LOW RANK COAL

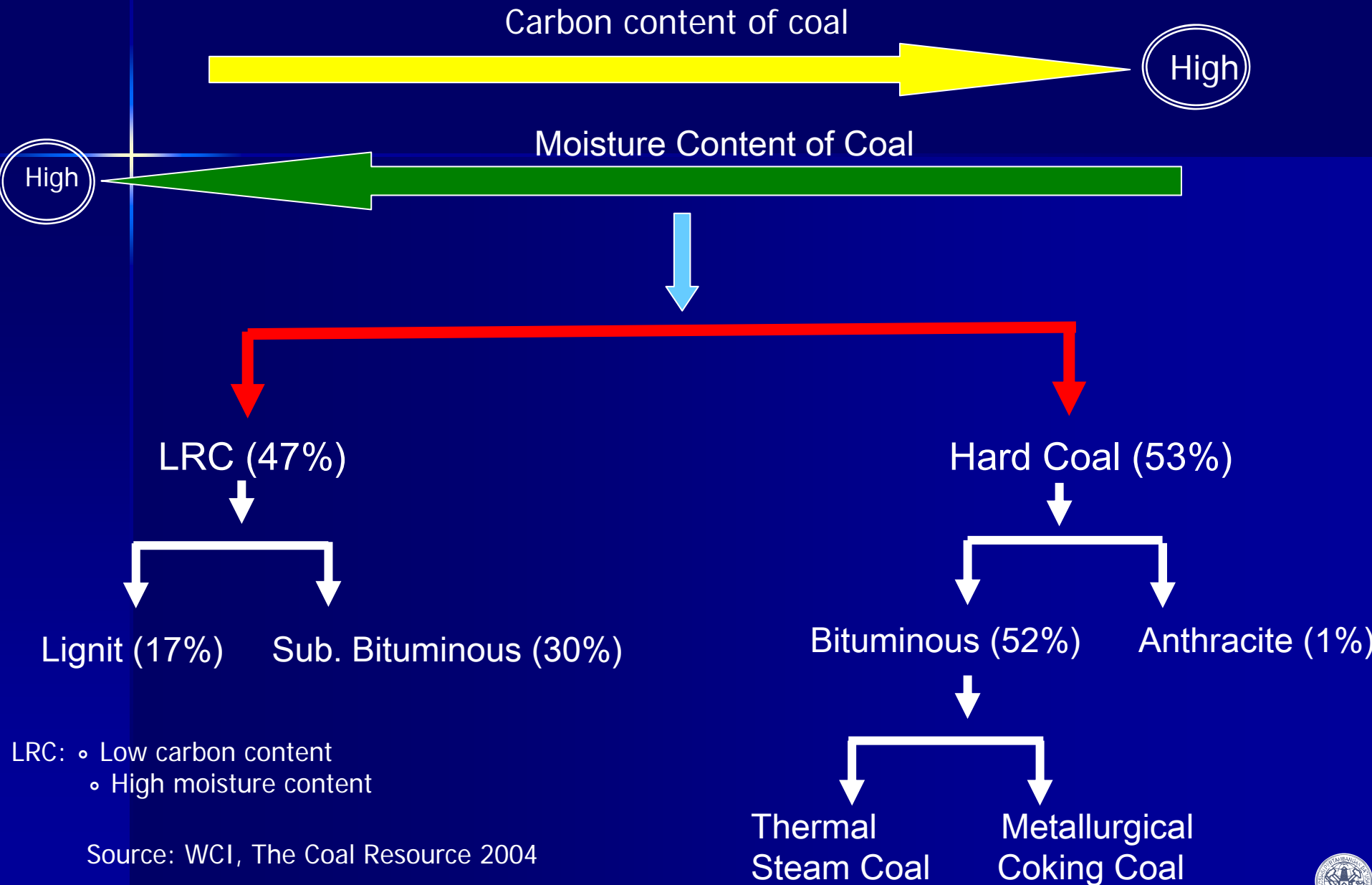
(2)

(Government Version)

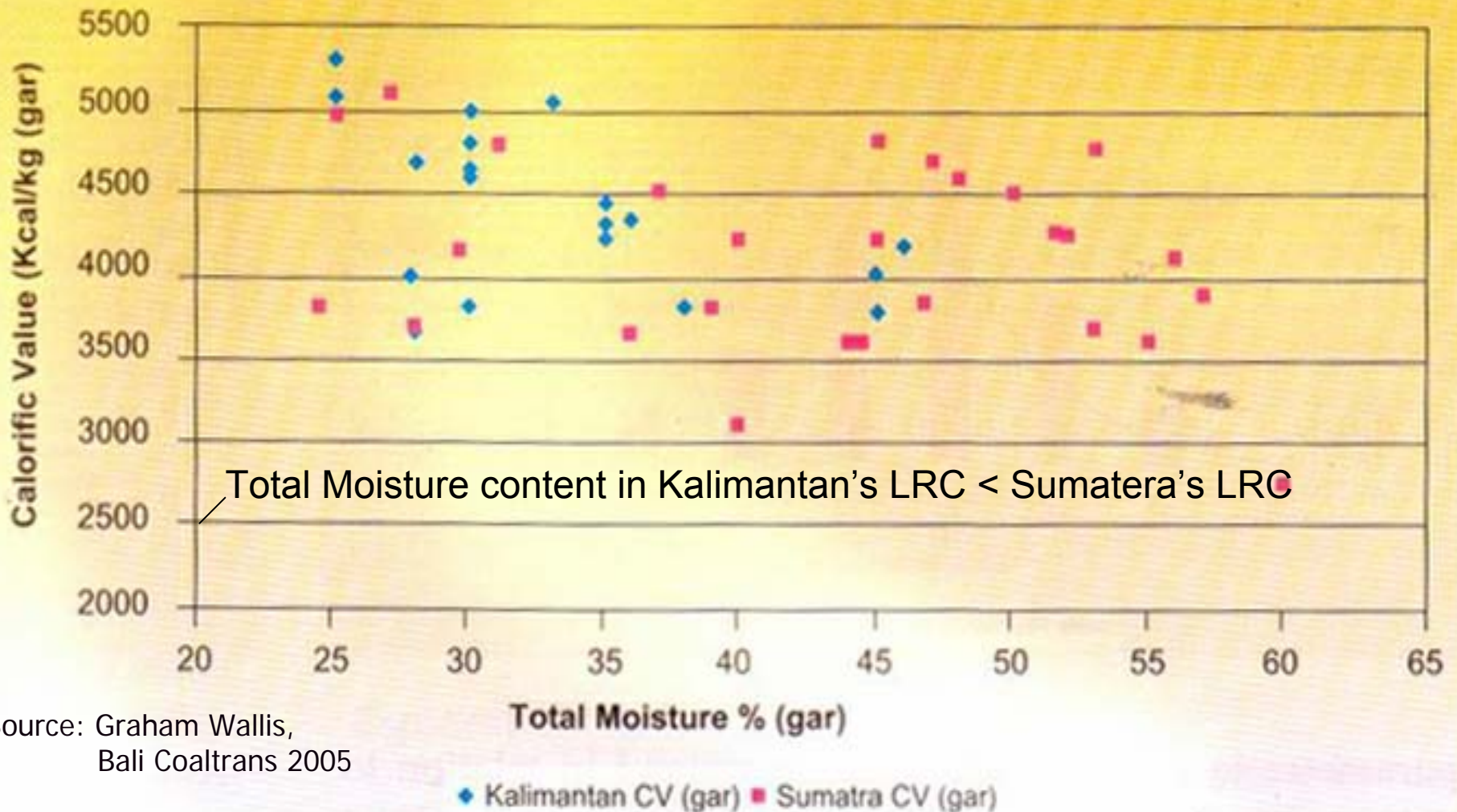
For more practical and commercial means, LRC in this paper refers to Government version i.e.:

- a. Coal with high moisture content ($>35\%$), and low calorific value (<5100 kcal/kg adb*).
- b. Coal Rank Lignit to sub bituminous C included.

*) GR No.45/2004 and Keppres No.13/2000



TOTAL MOISTURE VS CALORIFIC VALUE OF LRC



Source: Graham Wallis,
Bali Coaltrans 2005

LRC Potentials in Indonesia (2003)

M Tons

No.	Location	Resources	Reserves
1.	Java		
	Central Java	0.82	n.a.
2.	Sumatera		
	Aceh	91.76	n.a.
	North Sumatera	19.97	n.a.
	Riau	126.32	n.a.
	Bengkulu	21.92	n.a.
	Jambi	51.13	n.a.
	South Sumatera	11,384.89	2,653.98
3.	Kalimantan:		
	West Kalimantan	420.92	n.a.
	Central Kalimantan	483.92	n.a.
	South Kalimantan	971.86	536.33
	East Kalimantan	1,959.50	261.73
4.	Sulawesi		
	Central Sulawesi	117.33	0.06
5.	Papua	n.a.	n.a.
	Total	15,114.07 *)	3,452.04 **)

n.a. = data not available

*) 26,13% of national coal resources, **) 49,44% of national coal reserves

Source: Coal Division, Directorate of Mineral Resources Inventory (2003)



LRC RESERVES

M Tons

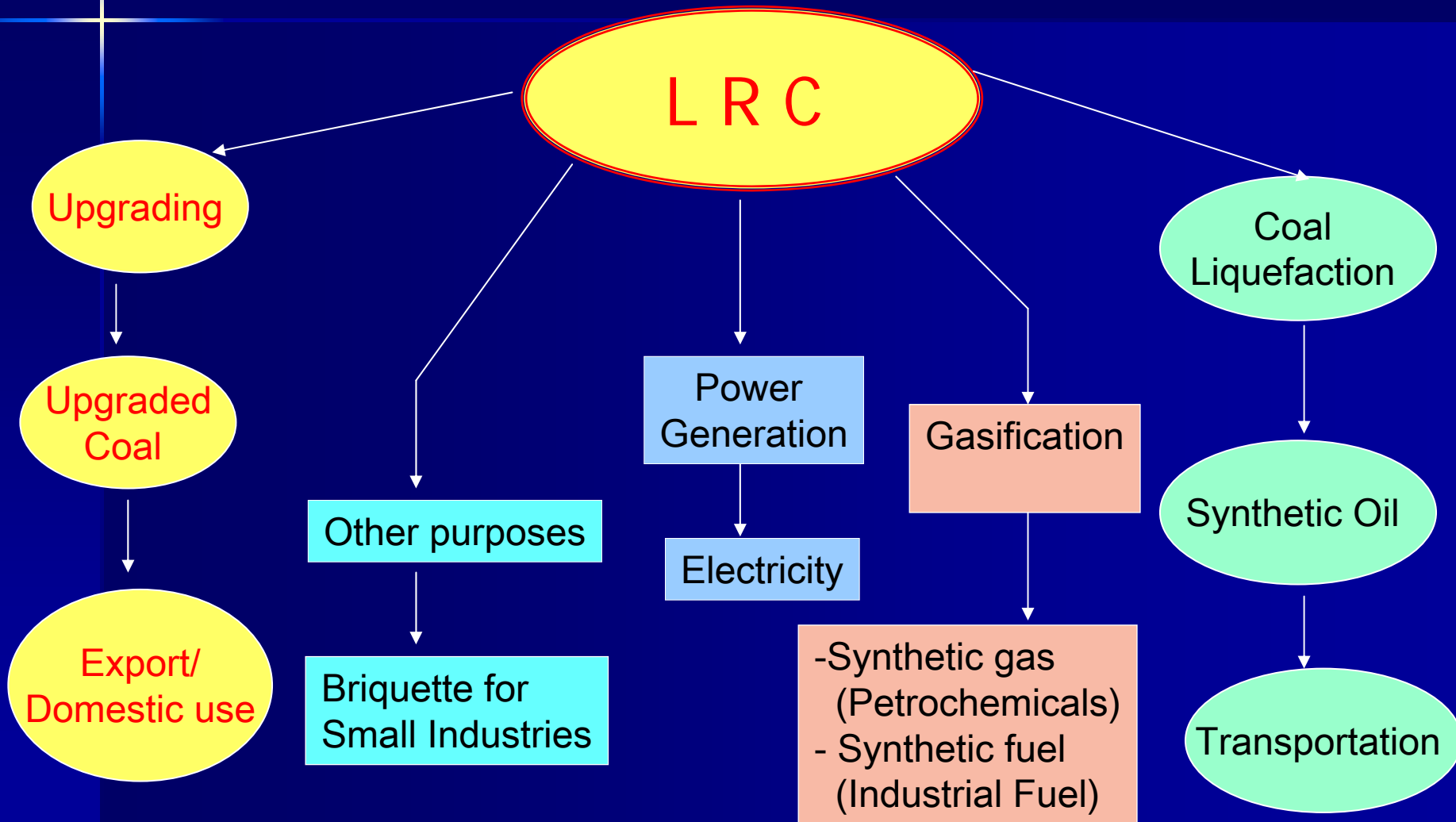
	Reserves	% of national reserves *)
- South Sumatera	2,653.98	38.01
- South Kalimantan	536.33	7.68
- East Kalimantan	261.73	3.75
Total	3,452.04	49.44

*) National Coal Reserves = 6,981.62 M tons

Source: Coal Division, Directorate of Mineral Resources Inventory (2003)



LRC UTILIZATION CONCEPT (NCP, ESDM DECREE NO.1128/2004)



LRC FOR ELECTRICITY DEVELOPMENT PROGRAM

(Stipulated in Inpres No.71 & 72/2006)

☑ Objectives:

- To increase electricity ratio from 54% (2005) to 60% (2010)
- To reduce the use of oil fired power plant from 30% (2005) to 5% (2010)
- To increase the use of coal for fired power plant from 40% (2005) to 62% (2010)

☑ Initiative:

- To built additional coal fired power plant in Indonesia from 9.060 MW (2005) to 22.260 MW (2010)
- LRC will be used for an additional coal supply of 43 M tons in 2010
- Total coal consumption for power generation an 2010 will be 72,3 M ton.



CRASH PROGRAMS IN ACCELERATING ELECTRICITY DEVELOPMENT (2005 – 2010)

(2)

No.	Executing Agency	Power Generation Capacity (MW)	Coal Consumption M Tons* (est.)	Location Points
1.	PLN	Java : 7.870	27.5	12
		Outside Java: 3.038	11.8	29
		Sub Total : 10.900	38.3	41
2.	IPP	Java : 7,560	26.5	18
		Outside Java: 2.856	10.0	26
		Sub Total : 10.416	36.5	44
3.	Joint Venture	Private : 1.152	4.0	}
		IPP : 774	2.7	} 40
		Sub Total : 1.926	6.7	}

*) 1 MW = 3.500 tons LRC

Total 23.250 MW, consumed 81.5 M tons LRC



LRC FOR PRODUCING SYNTHETIC OIL (COAL LIQUEFACTION) (Stipulated by Keppres No.2/2006)

☑ Initiative

To replace the domestic use of natural oil by synthetic oil produced from coal (LRC) liquefaction.

☑ Target

- 2% of oil consumption in 2025 should be replaced by synthetic oil (7 modules). It will consume 25 M tons of LRC
- 1st coal liquefaction plant (1 module) will be built in 2016
- 1 module consume 9,1 M ton/year of LRC
- 1 BCL Technology will be used
- 1 ton of LRC (daf) will produce 4,5 bbl
- the production cost of crude synthetic oil will be about US\$30/bbl

☑ Current Status:

Still in the process of action by National Working Group.

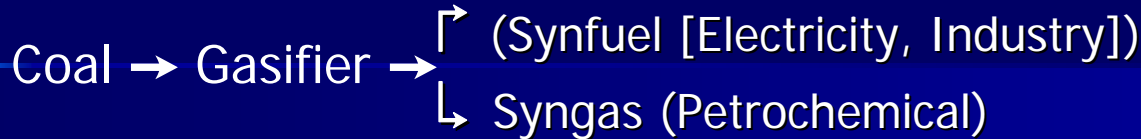


COAL GASIFICATION

(Stipulated by Keppres No.5/2006: Energy Diversification Policy)

☑ Objective:

- To convert coal to syngas or synfuel.



☑ Initiative:

The initiative is to replace the use of natural gas by LRC gasification in petrochemical industry and as gas fuel in other industrial purposes.

- 1 ton of coal (LRC) → 15-20 MMBTU of gas

➤ Initial Application (Indonesia)

- Simple Fix Bed Coal Gasifier (Agro – Drier, Burner)
Reduce Fuel Cost up to 60% (compared with oil)
- Hybrid – Diesel Application (80% coal gas + 20% diesel oil)
Reduce fuel costs up to 80% (compared with 100% diesel oil)

☑ Target:

- All fertilizer plant using natural gas is instructed by the Government to be replaced by coal gasification.
- The gasification process of LRC can produce also methanol, one of the fuel source for transportation in the future.
- Study shows (Humprey & Glasgow) that LRC with the level price of US\$ 30/ton will be equal to gas of US\$ 2/MMBTU. When the level price of gas become US\$ 3/MMBTU and the price level of coal still US\$ 30/ton then using coal (LRC) to produce fertilizer will much cheaper (less than US\$ 35/tons of product)

➤ Current Status:

The intensive R&D on Coal Gasification still to be seriously conducted by TEKMITRA.



UPGRADED LRC FOR BETTER USE

(an additional of exportable coal sources and other domestic use)

☑ Initiative

Due to the limitation of high coal grade reserves the initiative is to upgrade the LRC by UBC process into better coal grade.

☑ Target

- 1st upgrading plant (1,7 M tons/year) will be built in 2010.
- In 2025 about 7 Plant will be built and consume about 32 M tons /year of LRC and produced 22 M tons of better coal grade.

☑ Current Status:

The intensive R&D activities to scale up coal liquefaction from pilot plant to demo plant level still to be seriously conducted by TEK MIRA.



WHAT IS THE BENEFIT OF USING LRC? (OPPORTUNITIES)

- ◆ Supply will be secured, due to:
 - Large reserves.
 - Un-exportable grade coal → no conflict with export allocation.
 - Covered by many coal producers
- ◆ Competitive pricing
 - Low cost due to low mining strip ratio
- ◆ Incentive in royalty due to use Low Rank Coal (stipulated in Keppres No.75/96)
- ◆ Good quality in terms of ash and sulfur content.
- ◆ Some deposits are located near the seashore, it will reduce land transportation cost to the coal terminal.



WHAT IS THE RISK USING LRC FOR POWER PLANT ? (CHALLENGES)

- High moisture content affect to lower efficiency of combustion. (More coal being used per unit of electricity generated)
- Transportation cost will be higher per unit heat content.
- Tends to self combustion.
- Increasing CO₂ emission per unit of electricity generated due to higher volume of LRC consumed.
- Dust problem during handling and loading/unloading.

Question:

Why don't use LRC in the mine mouth power plant in order to minimize the inferior characteristic above?



THE LRC DEMAND ESTIMATION SCENARIO (2005 – 2025)

Consumer	2005	2010	2015	2020	2025
Electricity	0.5	43.0	49.0	45.0	85.0
Coal Liquefaction	-	2.3	13.8	24.0	32.0
Upgrading	-	1.7	8.5	12.0	17.0
Gasification	-	3.0	5.0	7.0	9.0
Others	-	-	-		
Total 1	40.0	50.0	76.3	108.0	143

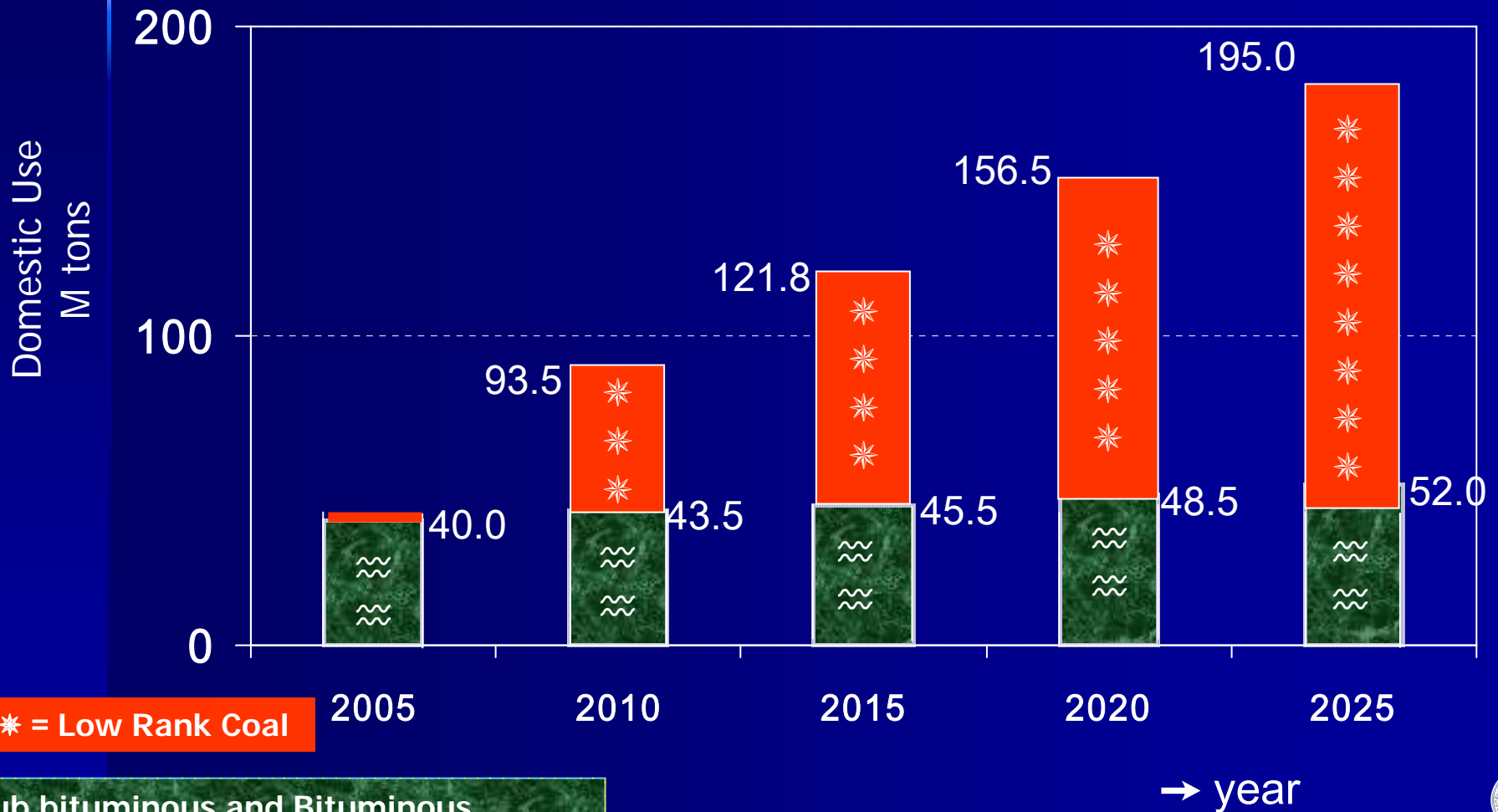
SUBBITUMINOUS + BITUMINOUS COAL ESTIMATION SCENARIO DEMAND (2005 – 2025)

Consumer	2005	2010	2015	2020	2025
Electricity	30.0	30.0	30.0	30.0	30.0
Cement	6.5	10.0	11.0	13.0	16.0
Other Industries	2.5	3.5	4.5	5.5	6.0
Total 2	39.0	43.5	45.5	48.5	52.0

Total 1 + 2 =	79.0	93.5	121.8	156.5	195.0
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THE ESTIMATION OF LRC COMPONENT IN DOMESTIC USE DEMAND (2005 – 2025)



CLOSING REMARKS

1. The overall picture shows that LRC will be able to provide the domestic coal consumption in Indonesia in the next decade.
2. LRC will be essential part of the energy mix and is vital for the continued secure of supply of affordable electricity.
3. Beside that, LRC is essential to be converted to liquid fuel, gas fuel, synthetic gas for petrochemical industry, to be upgraded for better use, etc. All of these will support to the energy demand in the country.

