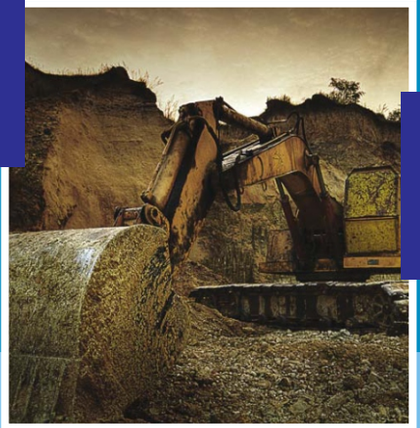
Investment Opportunities

EMR Sector



Investment Opportunities
EMR Sector

Ministry of Energy and Mineral Resources 2011

Investment Opportunities EMR Sector

Address by
Minister of Energy and Mineral Resources

The sector of Energy and Mineral Resources is tasked to manage Indonesia's abundance in oil and gas, coal and mineral resources. Therefore, this sector plays the vital role in the country's development and national economy, namely in securing domestic energy supply, raw material and feedstock for the industry, as well as a source for state revenue.

Development of the sector of Energy and Mineral Resources certainly requires not only prudent policy and regulation, but also substantial capital on investment. Subsequently, as the country is endowed with abundance in oil and gas, coal and mineral resources, Indonesia offers plenty opportunities in the sector of energy and mineral resources, making it an attractive investment destination for prospective investors.

Nonetheless, prospective investors would require more information on the country's resource potential and relevant law and regulation, before making the decision to invest in the sector of Energy and Mineral Resources in Indonesia. To that end, I trust that this "Book on Investment Opportunity in the Sector of Energy and Mineral Resources" is very important as a preliminary reference for the prospective investors. This book presents comprehensive information on investment opportunities in the sector of energy and mineral resources, including important relevant data, presented in attractive tables and figures, for the convenience of prospective investors

I do hope that this "Book on Investment Opportunity in the Sector of Energy and Mineral Resources" would benefit prospective investors with clear and complete information, and serve as the first step in accelerating the development of Energy and Mineral Resources in Indonesia.

Jakarta, April 2011
Minister of Energy and Mineral Resources

Darwin Zahedy Saleh

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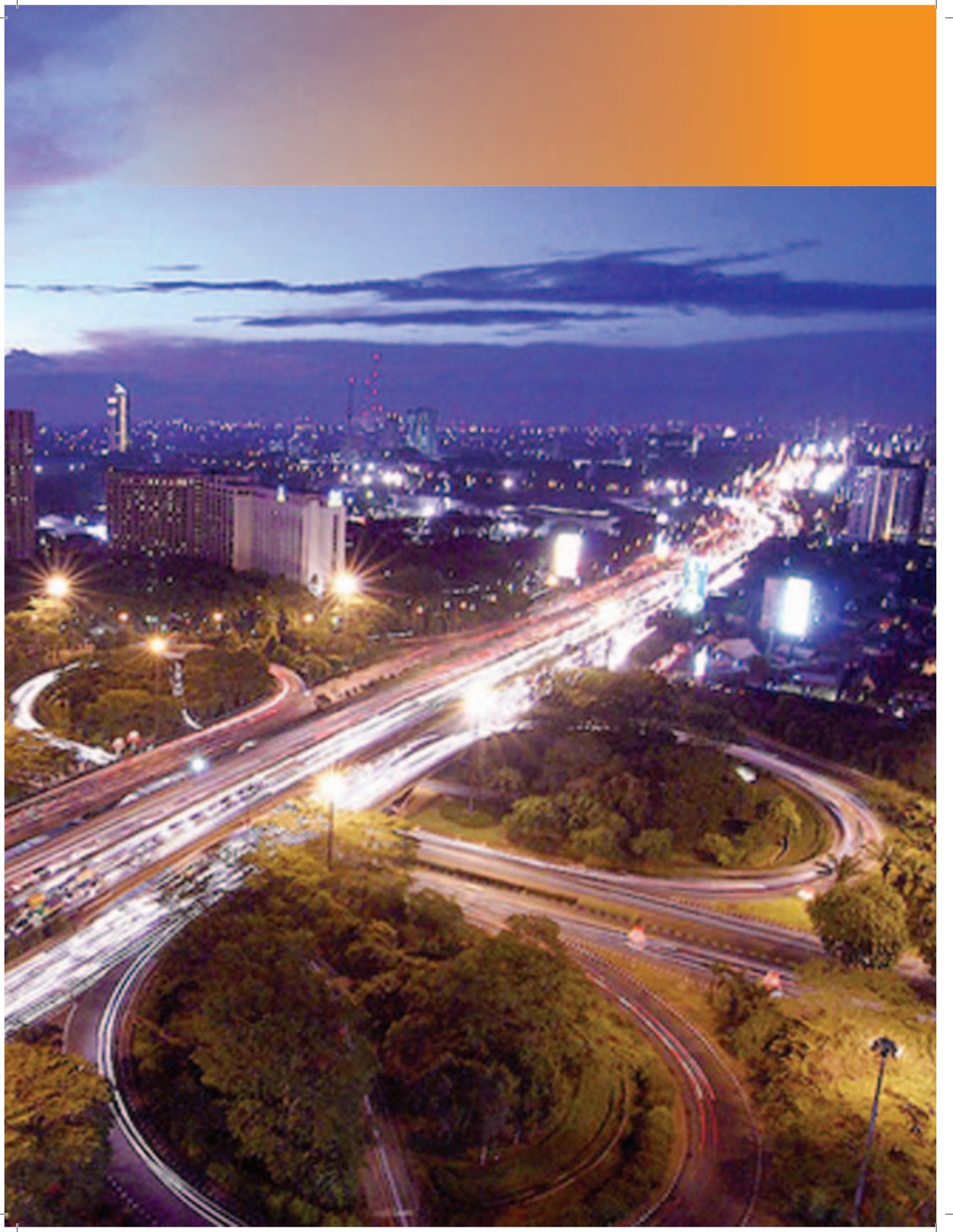


MINISTRY OF ENERGY AND MINERAL RESOURCES
REPUBLIC OF INDONESIA

INVESTMENT OPPORTUNITY IN OIL AND GAS SECTOR

MINISTRY OF ENERGY AND MINERAL RESOURCES
Jakarta, February 2011
















Located in South East Asia, Indonesia is endowed with abundant natural resources. It is estimated to contain up to 87.22 billion barrels of oil and gas and there are 594.42 TSCF throughout Indonesia. This makes Indonesia's oil and gas sector an interesting investment destination.

The long standing dynamism of Indonesia's oil and gas industry
enhances its reputation in developing contracts and policies to support investment.
Existing support in the form of regulations, incentives and contract compliance are all part of the Indonesian Government's efforts to guarantee the sustainability of investment in this country.

Introduction 1

Background

Oil and gas are still the most strategic natural resources in Indonesia, not only as a supply for energy consumption and raw material for domestic industries but also as the main sources of income and foreign exchange for the country.

The increase in energy and raw material demands for industry requires the right scenario to effectively fulfil the demands as well as to establish domestic security of supply.

Based on Presidential Decree No. 05 (2006), oil and gas represent 51.66% and 28.57% of the total national energy mix, respectively, in 2006. In 2005, the composition of oil is expected to be less then 20% and gas will increase more than 30%, therefore, alternative energy resources can be developed.

In light of this situation, it is predicted that there will be significant opportunities for investment in the development of the oil and gas sector in Indonesia, both in upstream and downstream sectors. According to the geology of the country, there remains a very large amount of hydrocarbon reserves in the country. The government's plan to maintain oil production at the level of 1 million barrels per day will provide investment opportunity in the upstream sector.

In the downstream sector, in order to meet the domestic needs for energy, investments are required to build and develop oil and gas refineries as well as to develop other infrastructure such as storage tanks, transmission pipes, oil and gas distribution and other modes of transportation.

All the investment potential in the upstream and downstream sectors provide excellent opportunities for oil and gas support activities, both the industry and other services.

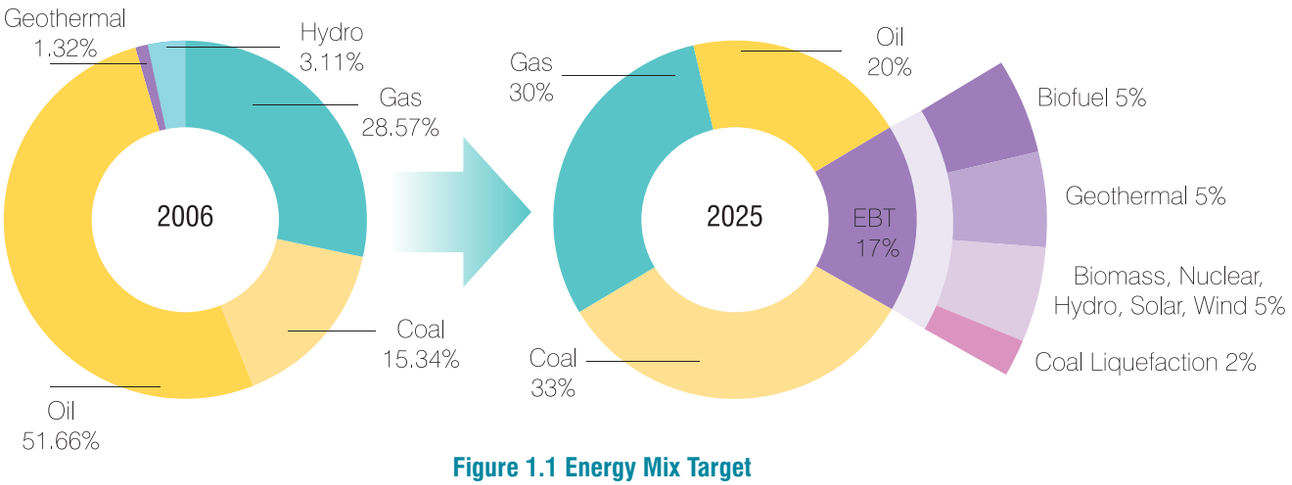
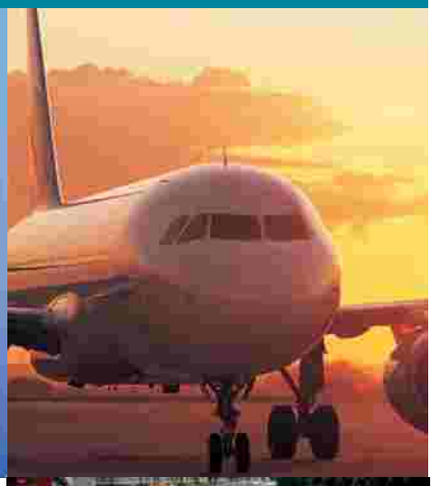


Figure 1.1 Energy Mix Target

Scope of Commodities



The Commodities for production and business investment in the oil and gas industry consists of:

Oil

Oil is the result of a natural hydrocarbon process which occurs under pressure and atmospheric temperature conditions and results in a liquid or solid including asphalt, mineral wax or ozocerite and bitumen which are the result of the mining process but excluding coal or other solid hydrocarbon deposits which are not related to oil and gas.

Natural Gas

Natural gas is produced by a natural hydrocarbon process which occurs under pressure and atmospheric temperature conditions and appears in the form of gas which is the result of oil and gas mining.

Coal Bed Methane

Coal bed methane is a natural gas (hydrocarbon) in which the methane gas is the main component that occurs naturally during the process of coal formation and is trapped or absorbed in the coal and within the layers of coal.

Petroleum Fuel

Petroleum fuel is fuel which is burned material originated and/or processed from liquid petroleum.

Gas Fuel

Gas fuel is fuel which is used in transportation activities originating from natural gas and/or processed from liquid petroleum.

Other Fuels

Other fuels are fuels which occur in the form of a liquid or gas originating from other than oil and gas and refined products.

LPG

LPG is hydrocarbon gas processed with liquefaction and pressure and consists of propane and butane. It is produced for easy storage, transportation, and handling purposes.

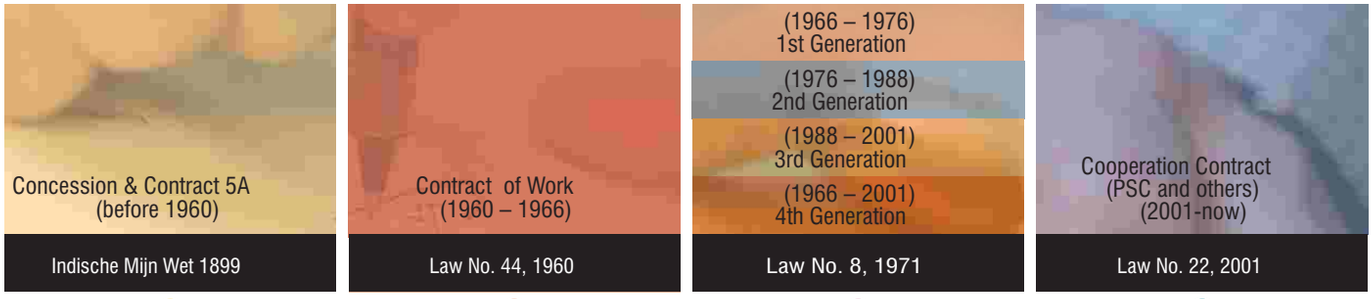
LNG

LNG is natural gas consisting of methane which is cooled and compressed at a very low temperature (-160< Celsius) into liquid for easy transportation and storage purposes.

The Other Refined Products

Other refined products are products other than oil and gas fuels, occurring as the result of oil and gas refining activities and as final products or by products, except lube oil and petrochemical products.

Legal Support



Gambar 1.2. Changes in Policies and Contract

Oil and Gas Law

Oil and Gas Law No. 22 (2001) contains basic changes in the national oil and gas industry. Upstream business activities (exploration and exploitation) are executed and controlled by an Executing Body through the cooperation contracts. While the oil and gas operations (downstream activities) are executed by the granting of business licenses which are opened for business operators.

According to the new oil and gas bill, the oil and gas business will be opened to business operators such as BUMN (government-owned enterprises), BUMD (local government companies), cooperatives, small-scale businesses, and private business entities and permanent establishment (multinational/foreign companies) have the opportunity to participate in the oil and gas business. The criteria required to perform the business are as follows :

1. the business permanent establishment (fixed business operators) can only perform upstream business activities
2. the business entities or permanent establish ment that conduct upstream business activities are not allowed to carry out downstream business activities
3. business operators that perform down stream business activities are not allowed to conduct upstream business activities

Government Regulation

Upstream Regulation

Government regulations on upstream oil and gas activities (No. 55/2009 on the Second Amendment to Government Regulation No. 35/2004 on Oil and Gas Upstream Business Activities) are derivative of the Oil and Gas Bill with special emphasis on executing and controlling oil and gas upstream business activity. This upstream government regulation regulates the execution and monitoring of the cooperation contract business in producing oil and gas between contractors and BP Migas. The purpose of this upstream regulation is to ensure that the extraction of oil and gaspro-vides the maximum possible benefit for the people of Indonesia as well as for state income.

Downstream regulation

Government regulations upstream activity (No. 30/2009 on Amendment to Government Regulation No. 36/2004 on Oil and Gas Downstream Business Activities) are the derivative of Oil and Gas Bill concerning the implementation and control of downstream oil and gas business activities which are expected to create the principle of business competition that is reasonable, fair, and transparent. The implementation and control of downstream business activities is also contained within the framework of the supply and distribution of fuels which are continuous and affordable for the public. Considering the downstream business activities which consist of processing, transportation, storage, and trading, each business operator must have a business license for each segment being implemented.

Government regulations on upstream oil and gas activities (No. 35/2004)

Government regulations on Downstream oil and gas activites (No. 36/2004)

Upstream Business Activity

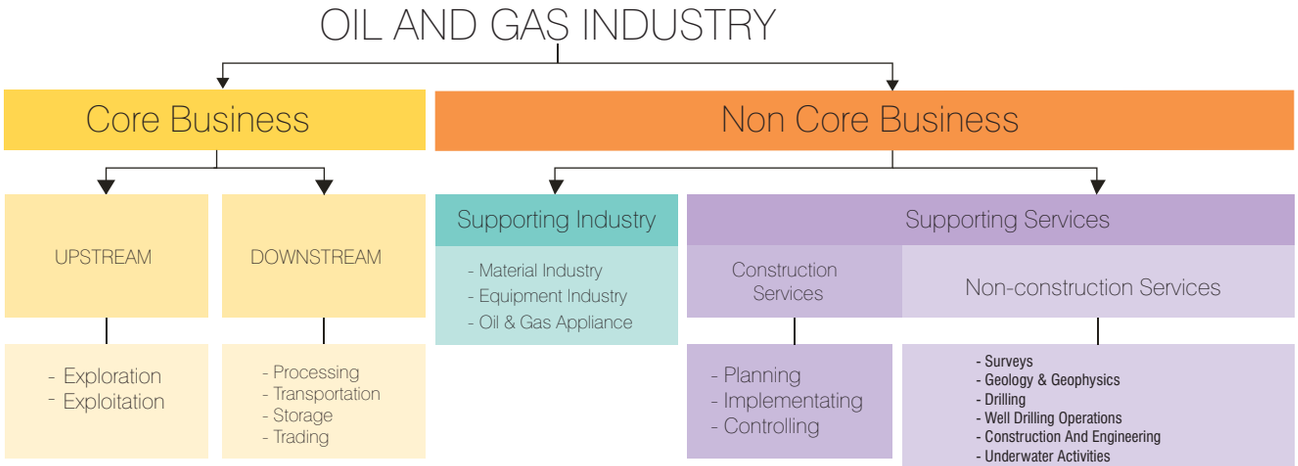


Figure 1.3 Taxonomy of Oil and Gas Industries

The oil and gas business in Indonesia is classified into two types, namely the core business and the non-core business. The core business consists of upstream and downstream business, whereas non-core business includes services and supporting industries. Preliminary activities such as field surveys are done to determine the working areas for oil and gas exploration. The scope of the activities in the national oil and gas industry can be seen in Figure 1.3

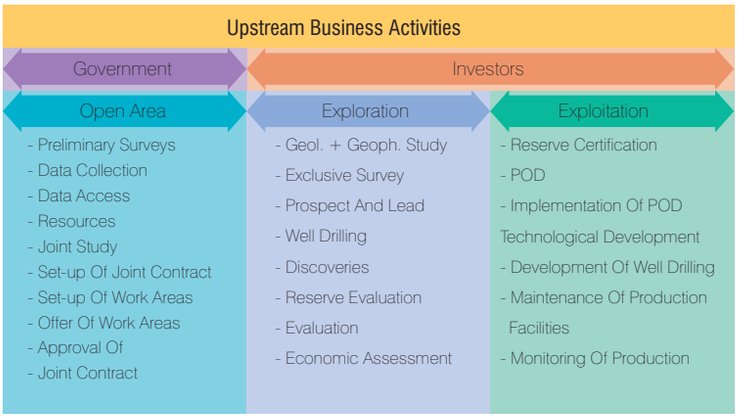


Figure 1.4 Upstream Business Activities Scheme

A. Core Business

1. Upstream Business Activity

The Upstream business activities consist of exploration and exploitation. The purpose of exploration activities is to get information about the geological conditions in order to discover estimated. oil and gas reserves. The exploitation activities consist of drilling and finalizing the well, development of transportation facilities, storage, refining of oil and gas on the spot and other supporting activities.

Downstream Business Activity

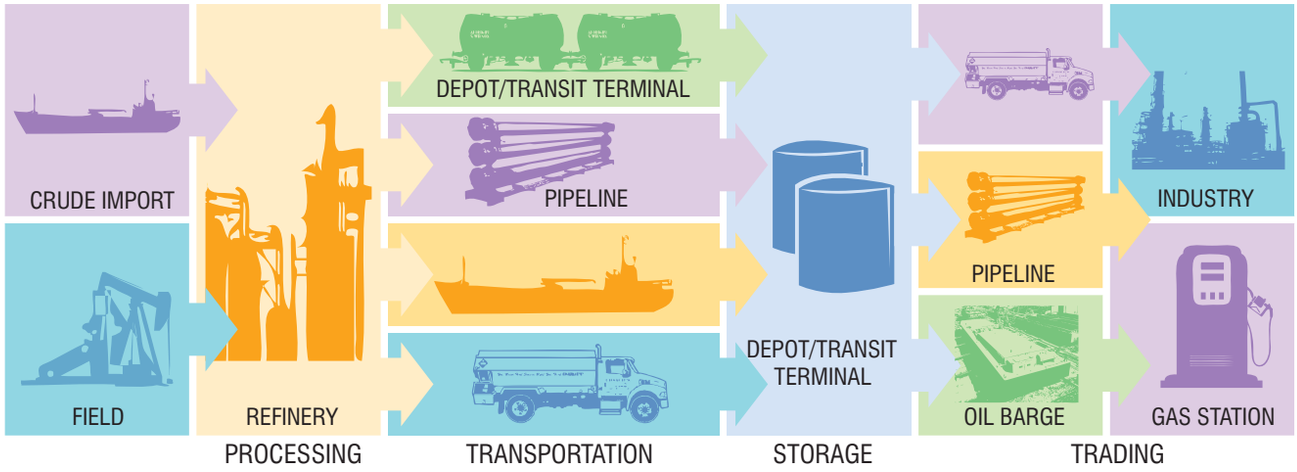


Figure 1.5 Downstream Business Activities Scheme

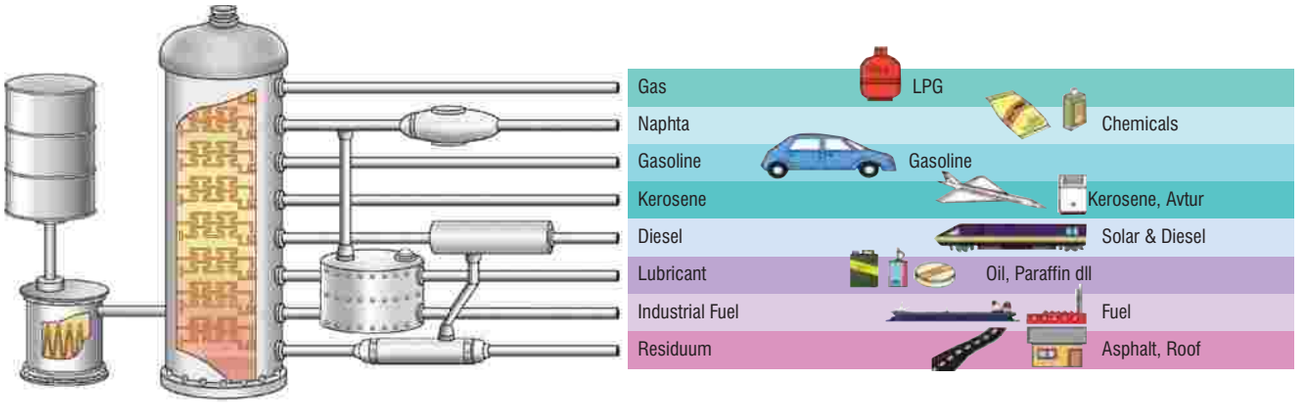
2. Downstream Business Activity

The Downstream sector of oil and gas business consists of refineries, transportation, storage and or the sale of oil and gas.

a. Processing

Processing is an activity to purify, obtain parts, increase quality and improve the added value of crude oil and/or natural gas, excluding field processing.

Crude oil processing is conducted in an oil refinery, a system of plant that processes crude oil into refined products and results in various refined oil fuel and non-fuel products. As an illustration, picture 1.6 shows various products resulted from oil refining.



Picture 1.6 Products Resulted from Oil Refining

Downstream Business Activity

b. Transportation

Oil and gas transportation refers to activities to transport crude oil, gas, and/or its refined products from a Work Site or storage and processing area, including the transportation of gas through transmission and distribution pipes.

c. Storage

Oil and gas storage refers to the receipt, collection, storage, and delivering of crude oil and/or gas, refined oil fuel, gas fuel, and/or refined products above/below the ground for commercial purposes. An example is a depot and floating storage.

d. Trade

Trade activities consist of the purchase, sale, export, and import of crude oil, refined oil fuel, gas fuel, and/or its refined products, including gas through pipes.

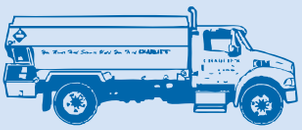
Trade Business Activities are divided into two types, namely:

1. General Business Trade (Wholesale)
i.e. large scale purchase, sale, export and import of Refined Oil Fuel, Gas Fuel, Other Fuel and Refined Products with business facilities and infrastructure at its disposal and the right to distribute them to any end users by applying particular brands.

2. Limited Business Trade (Trading)
i.e. the trading of commercial oil and gas products, namely crude oil, refined oil fuel, gas fuel and other fuel and refined products without business facilities and the limited trade of LNG.

LPG storage tanker loading, karawang offshore

RAIL TANK WAGON



TRUCK

PIPE

TANKER

Oil and Gas Supporting Business (Non-Core Business)

5 Major Products, Supporting Business

B. Oil and Gas Supporting Business (Non-Core Business)

This refers to business activities which support oil and gas business activities such as:

• Supporting Services

This refers to service activities within both the upstream and downstream oil and gas business activities. Supporting activities includes Oil and Gas Construction Services and Non-Construction Services. Construction Services consist of planning (design engineering), implementation (EPC, installation and commissioning) and Construction Supervision services. Non-Construction Services refer to supporting activities such as seismic & non-seismic survey, drilling, inspection and others.

• Supporting Industry

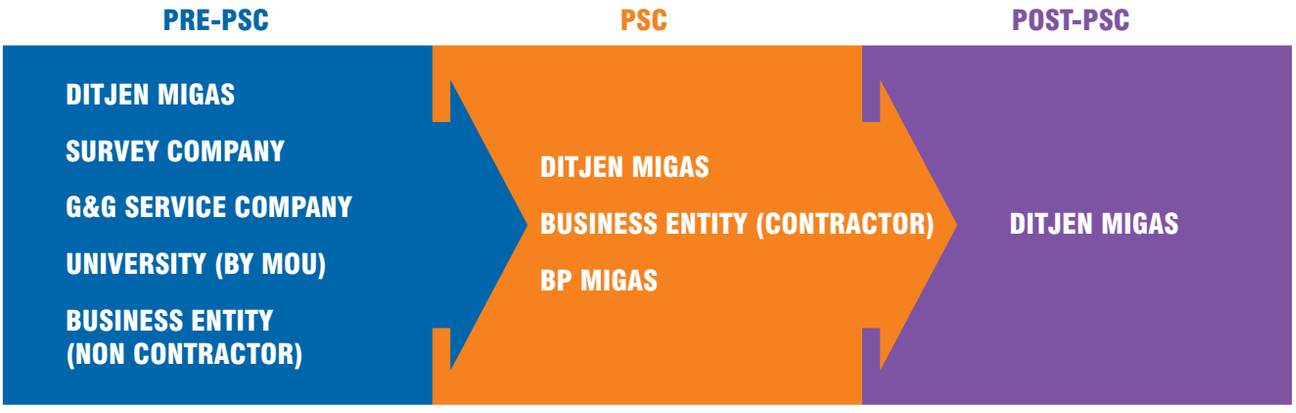
This refers to the industry resulting in goods, material and/or equipment used to directly support oil and gas business activities. Supporting Industry includes the Material Industry, Oil and Gas Equipment and Oil and Gas User Industry.

With reference to Law No. 22/2001 on Oil and Gas, in order to nurture and develop national capability to compete at national, regional and international level, Enterprises and Permanent Establishment must prioritize the utilization of local labor, goods and services, as well as domestic engineering and design build capability in a transparent and competitive manner. With the purpose of encouraging the use of domestic products, the Directorate General of Oil and Gas as an advisor to domestic manufacturers has published a book entitled "Domestic Product Appreciation" to be used as a reference in controlling the import of operational goods and the provision of goods and/or services within oil and gas business activities.

Overview Of Condition
Oil And Gas National 2

Signature Oil And Gas Working Areas, 2010

The upstream business activity of national oil and gas is related to the regulations governing ownership of oil and gas resources by the state. Based on the regulations, there are three stages in oil and gas upstream business. The first is pre-production sharing contract (pre-PSC), production sharing contract (PSC), and post-production sharing contract (post-PSC). The activities in pre-PSC include general survey activities to obtain technical data through geological studies in order to find new working areas. The production sharing contract stage is related to exploration activities to discover oil and gas deposits and the exploitation activities which are conducted by contractors. In the final stage, the post-production sharing contract is over and the oil and gas reserves are not exploited for economic reasons. The working areas are then returned to the government and they are then offered as new working areas.

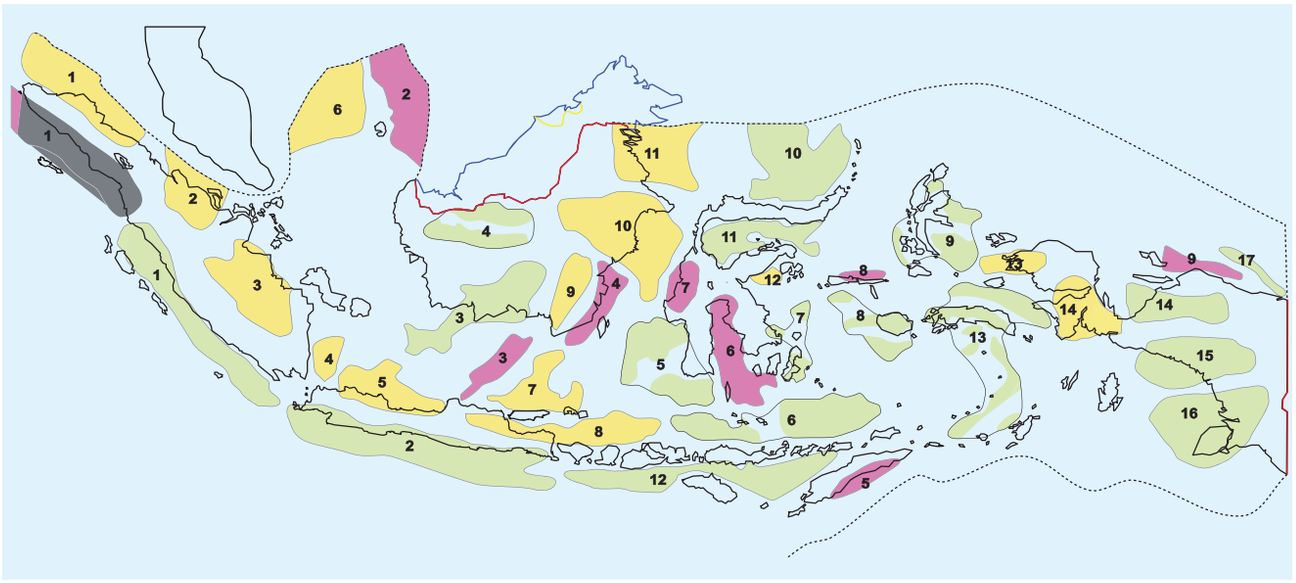


Gambar 2.1 Stages in Upstream Sector Business

Potential of Sediment Basins

Based on national surveys, the potential of oil and gas resources are accumulated in approximately 60 sediment basins which are spread over the islands of the country.

Of the 60 basins, 38 have been explored and those remaining are awaiting development by investors. Of the 38 explored basins, 16 have produced hydrocarbon, 9 basins are not in production but have shown hydrocarbon potential, while the remaining 15 have not indicated any sign of hydrocarbon. The above explanation shows that the opportunities for exploration activities in Indonesia remain wide open, especially the 22 unexplored basins of which most are in deep seawater in the z eastern part of Indonesia. The spread of oil and gas basins can be seen in Figure 2.2 and Table 2.1



MATURE

1. North Sumatera Basin
2. Central Sumatera Basin
3. South Sumatera Basin
4. Sunda Basin
5. North West Java Basin
6. West Natuna Basin
7. Northeast Java Sea Basin
8. Northeast Java Basin
9. Barito Basin
10. Kutei Basin
11. Tarakan Basin
12. Banggai Basin
13. Salawati Basin
14. Bintuni Basin

SEMI MATURE

1. Sibolga Basin
2. East Natuna Basin
3. Pati Basin
4. Asem-Asem Basin
5. Timor Basin
6. Bone Basin
7. Lariang Basin
8. Sula Basin
9. Biak Basin

FRONTIER

1. Bengkulu Basin
2. Java Fore Arc Basin
3. Biliton and Pembuang Basins
4. Ketungau Basin
5. South Makassar & Spermonde Basins
6. Flores and Tukang Besi Basins
7. Salabangka, Manui & Buton Basins
8. Buru, West Buru & South Sula Basins
9. North Halmahera, East, South & North Obi Basins
10. Minahasa Basin
11. Gorontalo Basin
12. Bali - Lombok & Savu Basins
13. Misool, Seram, South Seram, W. Weber, Weber & Tanimbar Basins
14. Waiponga Basin
15. Akimegah Basin
16. Sahul Basin

Figure 2.2 The Spread of Sediment Basins in Indonesia

Location and Status of Sediment Basins in Indonesia

Table 2.1 Location and Status of Sediment Basins in Indonesia

Sedimentary/Basin	West Indonesia	East Indonesia	
Operation	North Sumatera	Seram	
	Central Sumatera	Salawati	
	South Sumatera	Bintuni	
	Sunda	Bone	
	Northen West Java		
	Northen East Java		
	Northen Sea East Java		
	West Natuna		
	Tarakan		
	Kutai		
	Barito		
Sub Total	11	4	
Drilling but Production	Sibolga	Banggai	
	East Natuna	Sula	
	Bengkulu	Blak	
	Pati	Timor	
Sub Total	4	4	
Drilling but not found	Biliton	Akimegah	Sahul
	South Jawa	Buton	Sawu
	Melawai	Manui	Spermonde
	Asem-asem	South Makasar	Waipoga
		Missol	Lairing
		Aru Riverbed	
Sub Total	4	11	
Eksploration not yet	Pambuang	Lombok Bali	South Sula
	Ketungau	Flores	Buru
		Gorontalo	West Buru
		Salabangka	North Halmahera
		West Weber	East Halmahera
		South Halmahera	South Halmahera
		Weber	North Obi
		Waropen	South Obi
		Tiukang Besi	South Seram
		Tanimbar	Jayapura
Sub Total	2	20	
TOTAL	**21**	**39**	

Coal Bed Methane (CBM) Resources

In addition to oil and gas potential, Indonesia also has Coal Bed Methane (CBM) reserves. Coal Bed Methane is trapped gas in the pores of coal. CBM can be found in coal mining areas or in oil mining areas where coal sediment occurs. CBM can be developed as an alternative energy source in the future and such resources have been identified in 11 sediment basins spread over Sumatra, Java, Kalimantan, and Sulawesi (figure 2.3)

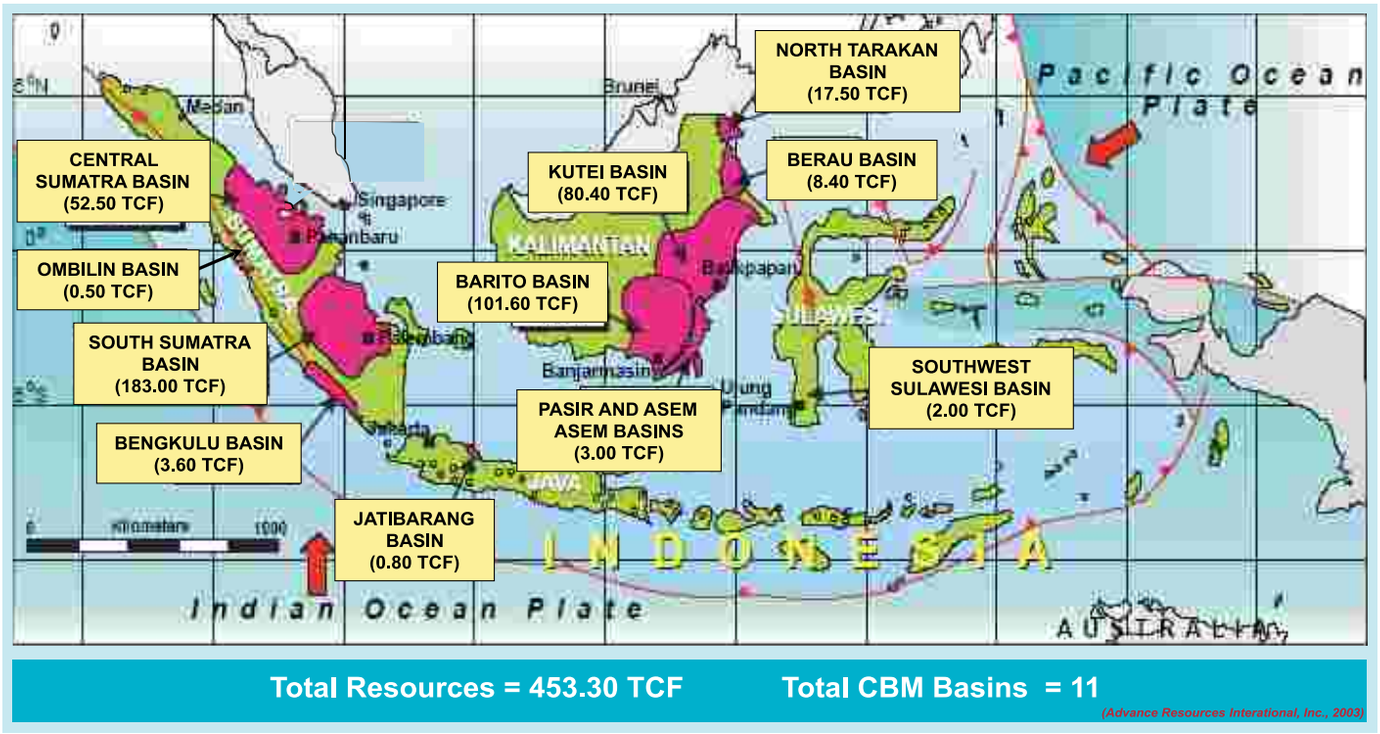


Figure 2.3 CBM Resources

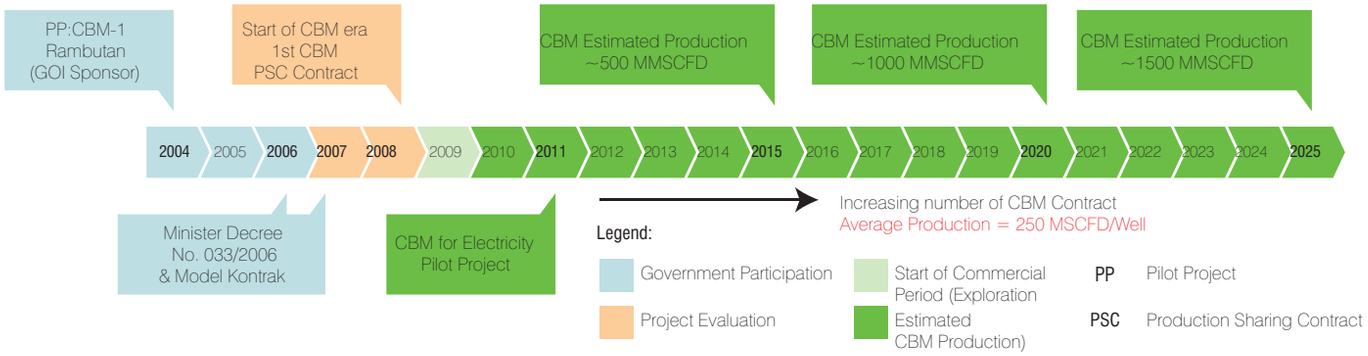


Figure 2.4 Road Map of CBM Development

Oil and Gas Reserves in Indonesia

Open, to see the map

Table 2.2 Oil and Gas Resources & Reserves

Fossil Energy	Resources	Reserve	Production	Ratio C/P
Oil	87.22 billion barrels	7.76 billion barrels	344.8 million barrels	22
Gas	594.43 TSCF	157.14 TSCF	3.408 TSCF	46
CBM	453 TSCF			

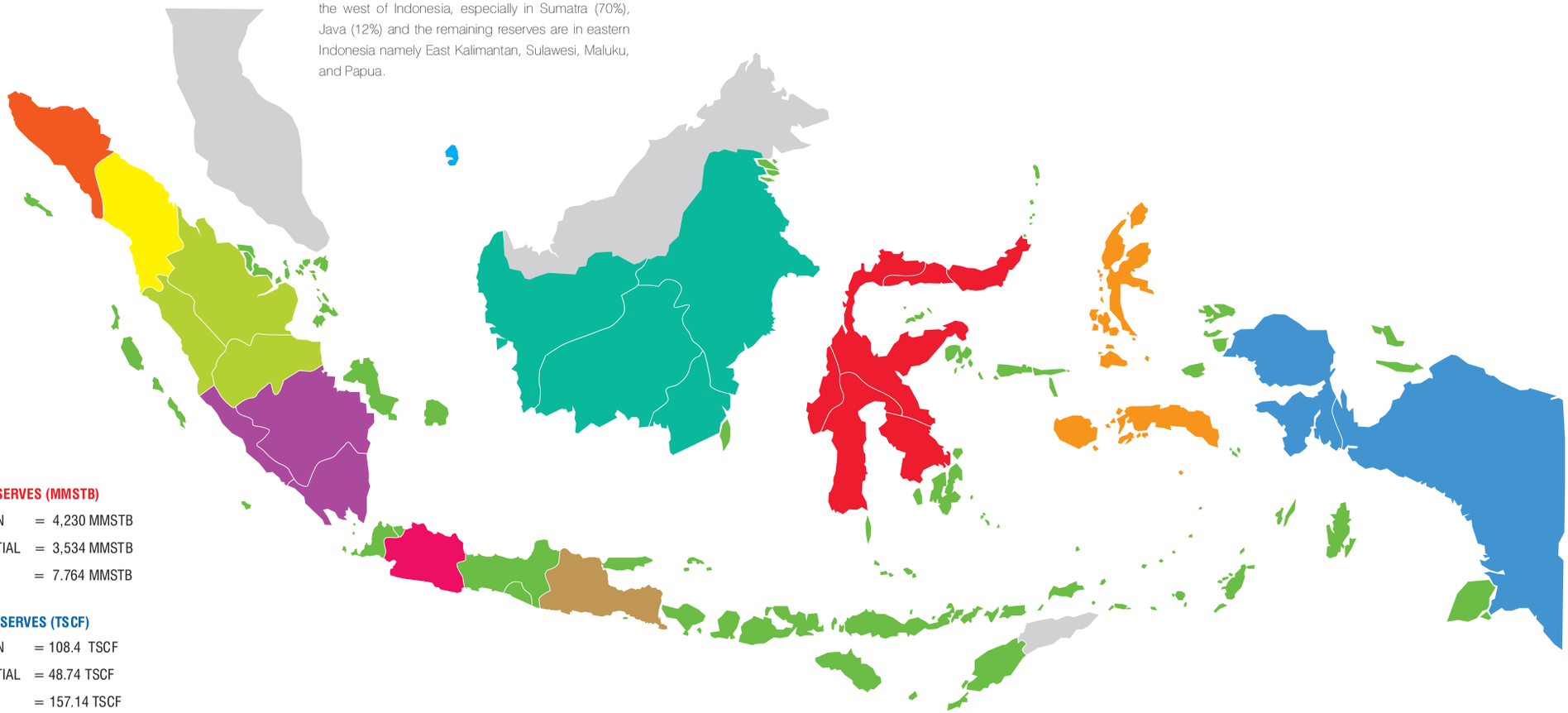
* Data Source by Ditjen Migas 2010

Oil Reserves (MMSTB)

Gas Reserves (TSCF)

The total oil reserves in 2010 amounted to 7.764 billion barrels, consisting of proven reserves amounting to 4.230 billion barrels and potential reserves of 3.534 billion barrels. Most of these oil reserves are located in the west of Indonesia, especially in Sumatra (70%), Java (12%) and the remaining reserves are in eastern Indonesia namely East Kalimantan, Sulawesi, Maluku, and Papua.

The total gas reserves in Indonesia in 2010 amounted to 157.14 TCF, or 3% of the world's total gas reserves. This figure consists of proven reserves of 108.4 TCF and potential reserves of 48.29 TCF.



OIL RESERVES (MMSTB)

PROVEN = 4,230 MMSTB

POTENTIAL = 3,534 MMSTB

TOTAL = 7.764 MMSTB

GAS RESERVES (TSCF)

PROVEN = 108.4 TSCF

POTENTIAL = 48.74 TSCF

TOTAL = 157.14 TSCF

PROVINCE	NAD	NORTH SUMATERA	CENTRAL SUMATERA	SOUTH SUMATERA	NATUNA	WEST JAVA	EAST JAVA	KALIMANTAN	SULAWESI	MALUKU	PAPUA
MMSTB	127.21	111.89	3.790	909.80	383.35	556.62	1,022,35	670.00	49.78	48.07	94.93
TSCF	5.74	1.28	8.56	17.90	51.46	3.70	6.40	18.33	4.23	15.22	24.32

Figure 2.5 Indonesia Oil and Gas Reserve, 2010

Exploration Activity

In an effort to locate oil and gas reserves, exploration activities have included seismic surveys and exploration drilling conducted in working areas that have been productive as well as in those which have not been productive.

Seismic Survey

Seismic survey activity consists of 2D seismic surveys implemented by either government or production sharing contractors in existing fields and 3D seismic surveys conducted by production sharing contractors. 2D seismic surveys conducted by the government (general surveys) are intended to obtain data on oil and gas resource potential to support block offering activities, while 2D seismic surveys conducted by production sharing contractors are intended to further analyze the potential reserves of oil and gas related to exploration activities. 3D seismic surveys are conducted by contractors to obtain more detailed description of the reservoirs in order to minimize the risks of uncertainty associated with field development.

In 2010, 2D seismic surveys were completed on 27,242 km of the planned 28,760 km, with most of the areas surveyed were offshore. Meanwhile, 3D seismic surveys were performed on 7,865 km2 of the planned 9,642 km2, with most of the areas surveyed were offshore.

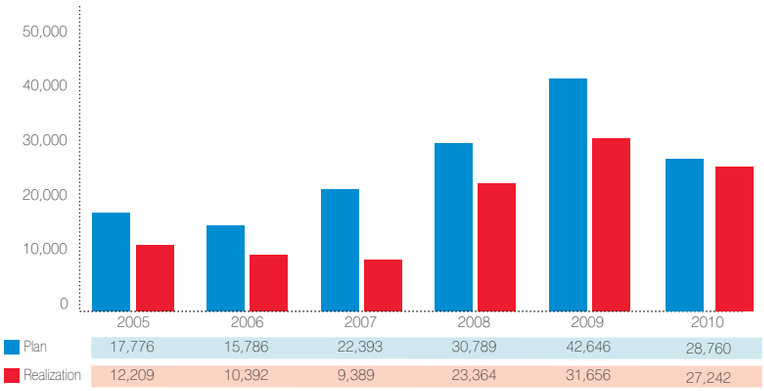


Figure 2.6 2D Seismic Surveys (in KM^2)

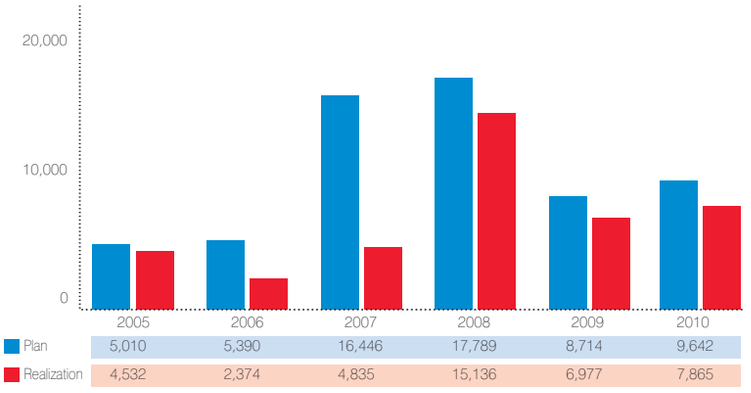


Figure 2.7 3D Seismic Surveys (in KM^3)

Drilling Exploration

In 2010, drilling exploration activities were conducted on 90 wells of the planned 126 wells. Of 90 wells drilled, 27 were identified as containing oil and gas, with a success ratio of 30%.

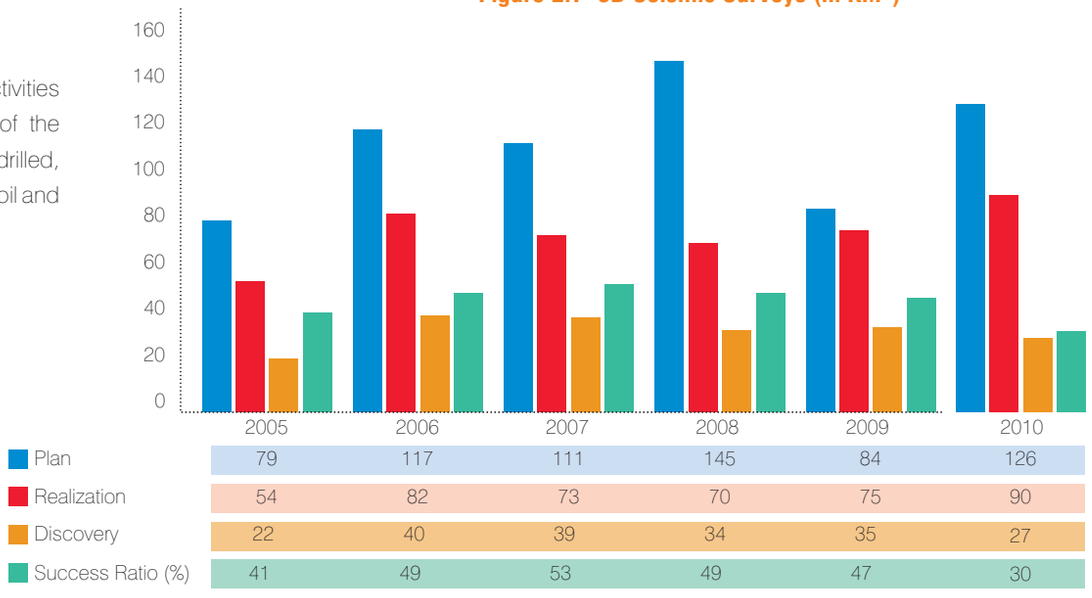


Figure 2.8 Drilling Exploration Well

Oil and Gas Production

In 2011 State Budget, The government has targeted

970.000 bpd

to beproduced on a daily basis while gas production is targeted at

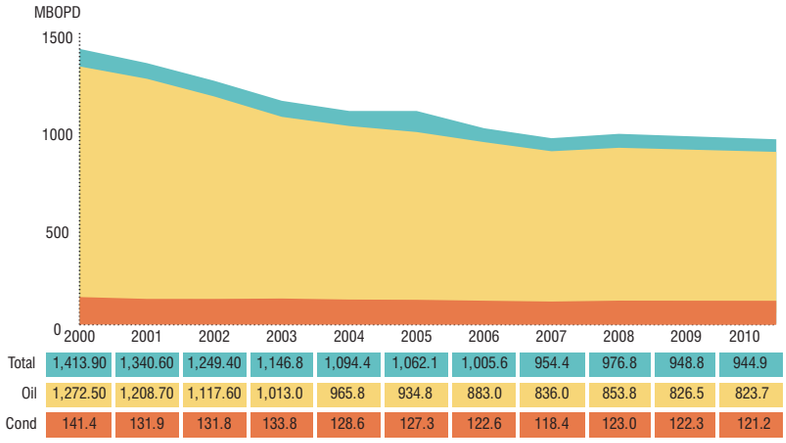
7.769 thousand mmbtu/day

Considering the above potential of the reserves, the government strives continuously to increase its oil and gas production. In its 2011 State Budget, the government has targeted 965,000 barrels of oil to be produced on a daily basis while gas production is targeted at 7,769 thousand mmbtu/day.

In order to achieve these targets, the government has formulated several policies as well as taken strategic measures such as offering new working areas; utilizing potential fields that are not yet in production; accelerating processes such as work program and budget (WP&B) approval, authorization for expenditure (AFE), and plan of development (PoD) approval; and reactivating old wells.

Oil Production

Oil and condensate production in 2010 reached 344.83 billion barrels, with a daily production of 944.90 bpd, which experienced a decrease of 3.90 bpd compared to oil and condensate production in 2009 which was 948.80 bpd. This decrease was caused by, amongst other things, delays in the early production schedule at several pre-sharing contractors, naturally occurring production decline, and technical operational issues.

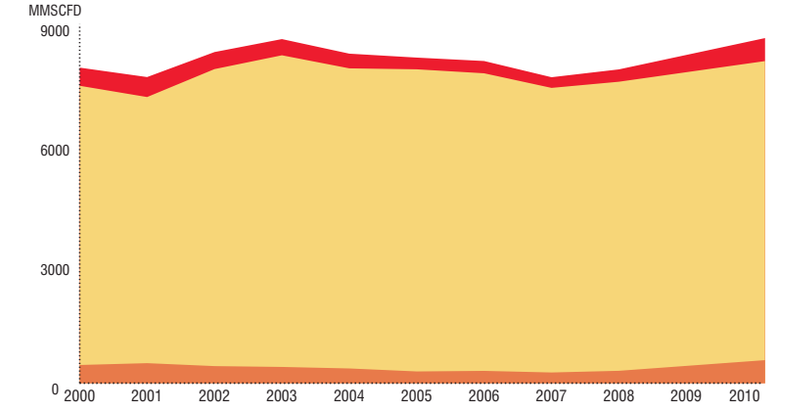


	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	1,413.90	1,340.60	1,249.40	1,146.8	1,094.4	1,062.1	1,005.6	954.4	976.8	948.8	944.9
Oil	1,272.50	1,208.70	1,117.60	1,013.0	965.8	934.8	883.0	836.0	853.8	826.5	823.7
Cond	141.4	131.9	131.8	133.8	128.6	127.3	122.6	118.4	123.0	122.3	121.2

Figure 2.9 Oil Production

Gas Production

In 2010, gas production reached 9,336 MMSCFD, with an increase of 1,034 MMSCFD from the 8,302 MMSCFD produced in 2009. This increase resulted from maximizing production and operating several new gas fields.



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total	7,927	7,690	8,318	8,644	8,278	8,179	8,093	7,686	7,883	8,302	9,336
Utilitation	7,471	7,188	7,890	8,237	7,909	7,885	7,785	7,418	7,573	7,816	8,829
Losses	456	502	428	407	369	294	308	268	310	486	507

Figure 2.10 Gas Production

Fuel Market Condition

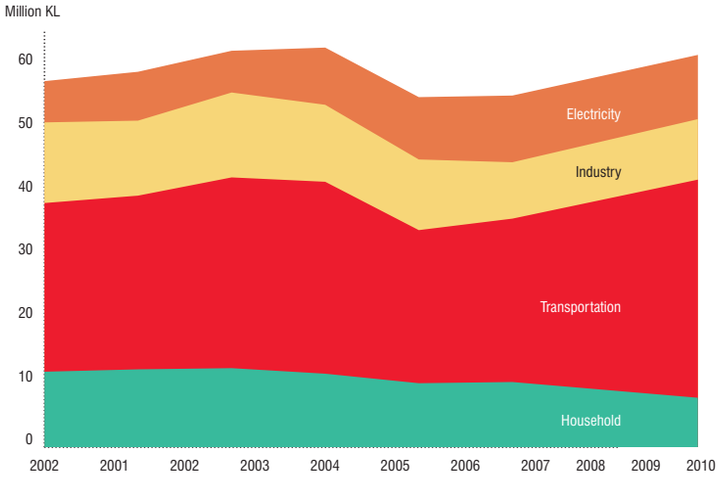


Figure 2.11 Domestic Fuel Consumption by Sector

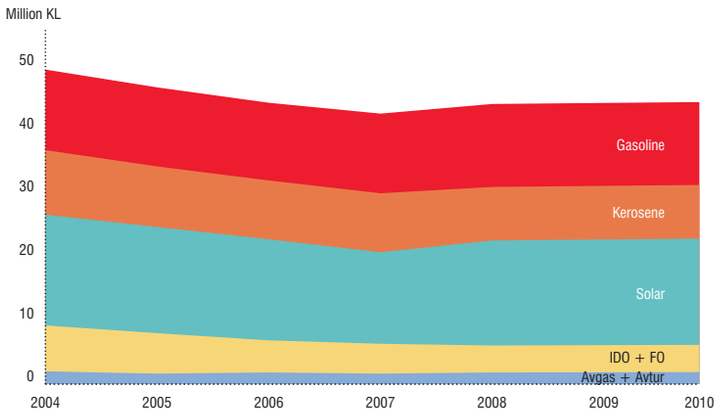


Figure 2.12 Fuel Production by Domestic Refinery

Over the last 10 years, domestic fuel consumption has been increasing at an average of 4.8% per year. Considering the increase in population and the improving domestic economy, it is predicted that oil fuel consumption will continue to increase. The transportation sector continues to consume the greatest share of fuel at over 50%, followed by industrial, electrical and household consumption.

The demand distribution of domestic oil fuel is determined by the spread of population and its economic activities. Java and Bali still dominate consumption with 62% of the total, Sumatra 20%, and the remainder is consumed by the eastern and central parts of Indonesia. Most of the oil fuel supply for domestic consumption, around 67%, comes from domestic refineries, while the remainder 33% comes from import markets. The capacity of domestic refineries is currently 1.157 million barrels per day, with oil fuel production of 40.42 million KL or an increase of 1.07% from 39.99 million KL in previous years.

Chemical Plant, Merak

Fuel Supply System

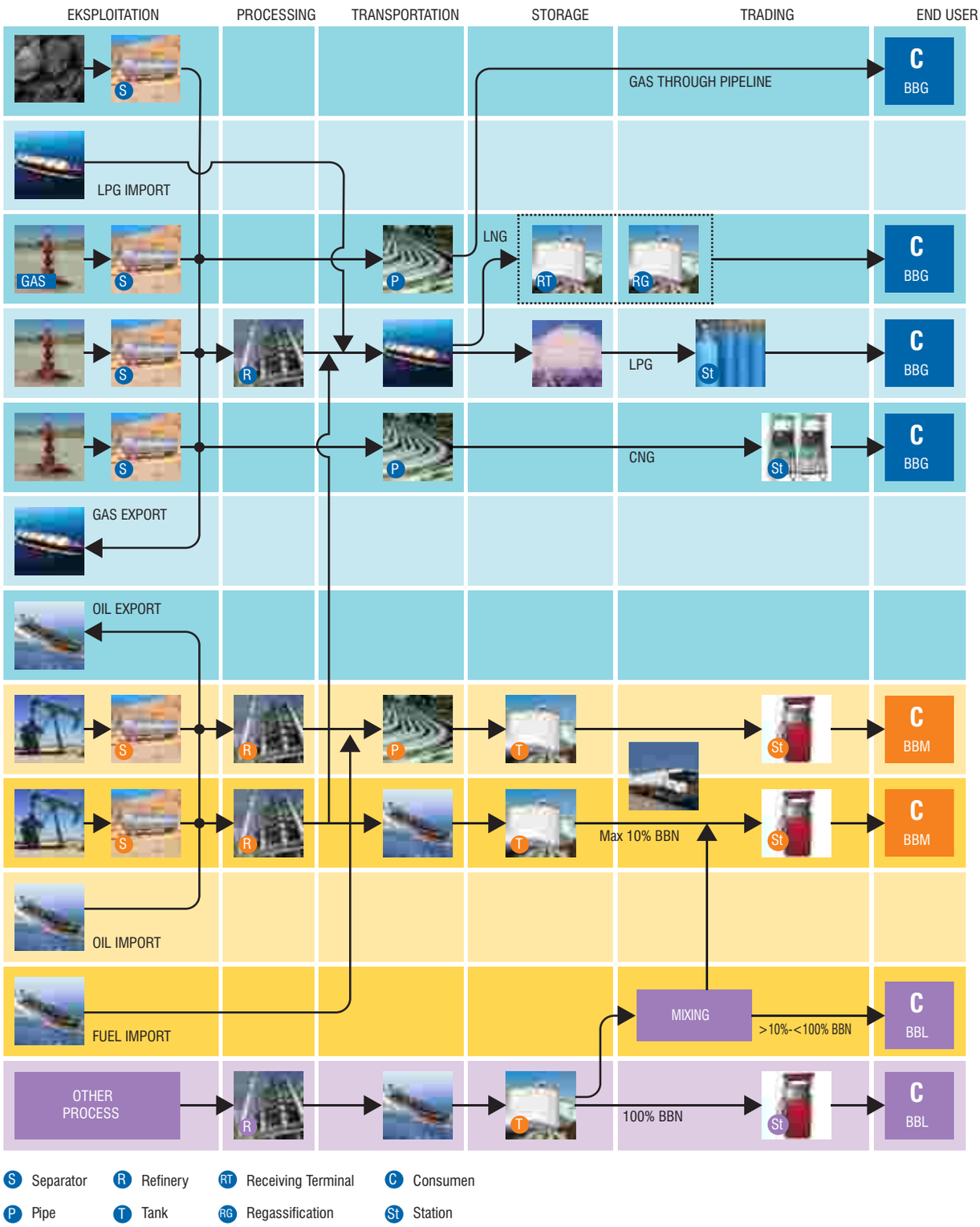


Figure 2.13 National Fuel Supply System

Gas Market Conditions

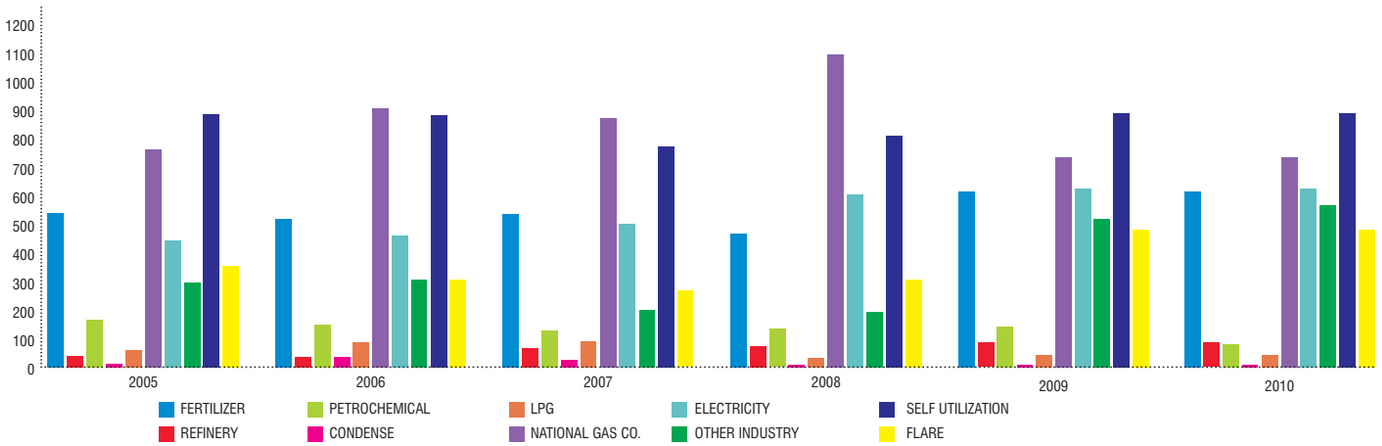


Figure 2.14 Domestic Gas Utilization (2005-2010)

The demand for gas in indonesia, especially on the island of Java, is increasing to meet the needs of industry and power plants. In 2020, it is predicted that the demand for gas will reach 10.7 TCF (low scenario) or 12 TCF (high scenario).

From the supply side, Indonesian gas reserves are estimated to last for the next 46 years, calculated by looking at reserves to production ratios (R/P). Most of Indonesia's gas reserves are located outside Java, namely in Natuna (51.46 TCF), East Kalimantan (18.33 TCF), South Sumatra (17.90 TCF) and Papua (24.32 TCF)

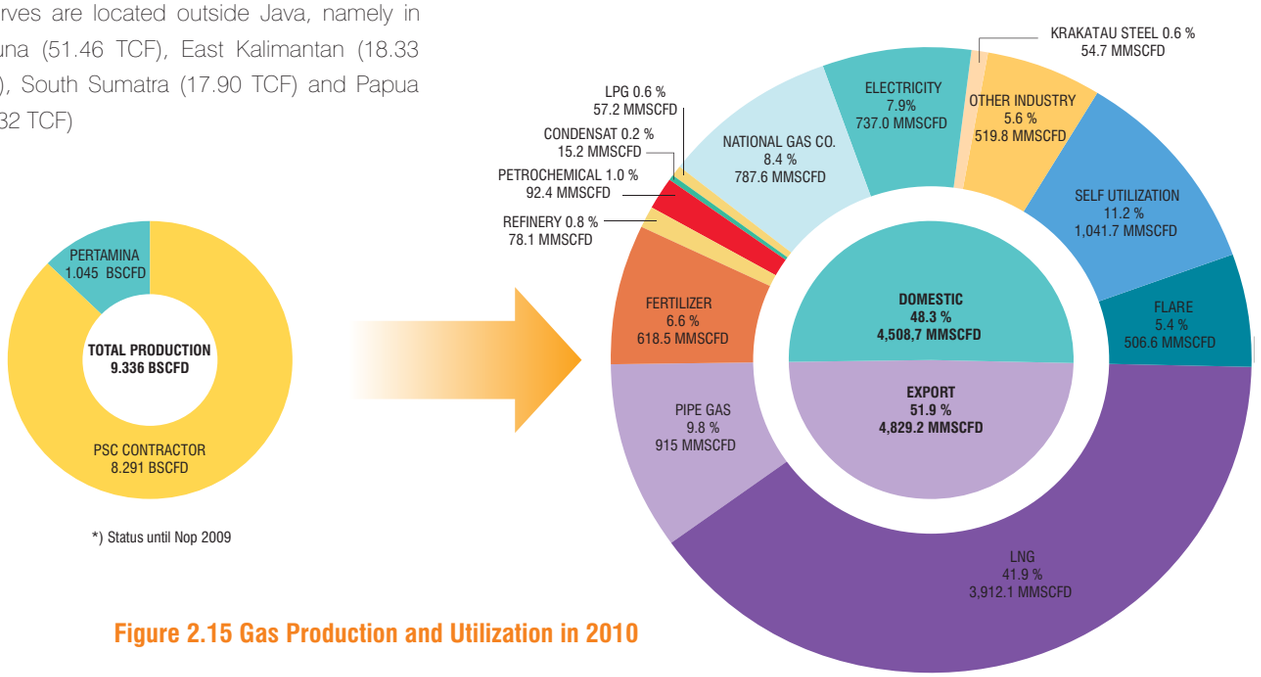


Figure 2.15 Gas Production and Utilization in 2010

Oil and Gas Infrastructure

LEGEND :

- : Province Teritory
- : Transmision Pipe (Plan)
- : Transmision Pipe (Existing)
- : Distribution Pipe (Plan)
- : Distribution Pipe (Existing)
- : Distribution Regional (Plan)
- : Distribution Regional (Existing)
- : Refinery
- : Gas processing
- : LNG processing
- : Storage
- : Depot (inland)
- : Depot(offshore)
- : Oil and Gas Instalation
- : Floating Storage
- : Transit terminal
- : Gas Consumer

Figure 3.18 Indonesia Oil and Gas Infrastructure Map

Domestic requirements for refined oil fuel and natural gas mean that processing facilities must be adequate in terms of their capacity and production. Apart from processing facilities, other facilities such as storage (depots, etc), transportation (trucks, tankers, etc) and sellers (Gas Stations etc.) are also required.

Investment in infrastructure development requires substantial funding; hence, the role of the private sector is required as an infrastructure provider.

Refinery Infrastructure

The need for oil fuel and gas fuel for domestic consumers requires the availability of an appropriate number and adequate capacity of oil refineries and gas facilities. At the present time, Indonesia has several types of oil and gas processing plants such as refineries for oil fuel, LPG, and LNG

Currently, around 67% of domestic oil consumption is supplied from 10 domestic refineries, while the remainder is obtained from import markets. The total capacity of functioning refineries is currently 1.157 million barrels per day, producing around 650 million barrels of refined oil fuel. Some of these refineries belong to Pertamina with an installed capacity of 1,047,300 barrels per day, some to PPT Migas Cepu with an installed capacity of 3,800 barrels per day, those privately owned by PT Tri Wahana Universal (TWU) with a capacity of 6,000 barrels per day and TPPI refinery with a capacity of 100,000 barrels per day.

Figure 2.17 Oil Refineries in Indonesia

Natural Gas Infrastructure

LPG Refineries

In 2010, LPG production was estimated at 2.44 million tons, which represented a significant increase of 15.09 compared to 2009 production of 2.12 million tons. This increase was contributed by LPG production from PT Badak (Bontang), Hess (Pangkah) and PT Media Karya Sentosa (Gresik), which started to produce LPG in 2009. The following are domestic LPG production profiles for the past five years.

LNG Refineries

With the operation of BP Tangguh, current domestic LNG production is fulfilled by 3 refineries namely PT Arun, PT Badak and BP Tangguh. In 2010, LNG production was estimated at 24.10 million tons, representing a small decrease from 20.92 million tons in the previous year. The following is a graph illustrating LNG production over the past five years.

Table 2.3 List of Operating LPG Refineries

BUSINESS ENTITY	LOCATION	TON/DAY	MMTPA
LPG from Refinery			
PT. Pertamina (Persero)	Dumai	185	0.068
PT. Pertamina (Persero)	Musi	360	0.131
PT. Pertamina (Persero)	Cilacap	630	0.230
PT. Pertamina (Persero)	Balikpapan	250	0.091
PT. Pertamina (Persero)	Balongan	1500	0.548
LPG from Gas Processing, Downstream Scheme			
PT. Pertamina (Persero)	Mundu	100	0.037
PT. Sumber Daya Kelola	Tugu Barat	18	0.007
PT. Medco LPG Kaji	Kaji	200	0.073
PT. Titis Sampurna	Prabumulih	200	0.073
PT. Maruta Bumi Prima	Langkat	46.57	0.017
PT. Surya Esa Perkasa	Lembak	125	0.046
PT. Odira Energy Persada	Tambun	150	0.055
PT. Media Karya Sentosa	Gresik	160	0.058
PT. Yudhistira Haka Perkasa	Cilamaya	120	0.044
PT. Wahana Insannugraha	Cemara	102.3	0.037
LPG from Gas Processing, Upstream Scheme			
PT. Pertamina (Persero)	Bontang	2,740	1.000
Chevron	T. Santan	247	0.090
Petrochina	Arar	38	0.014
Petrochina	Jabung	1,315	0.480
Conoco	Belanak	1,151	0.420
Hess	Ujung Pangkah	247	0.090
TOTAL		**9,884**	**3.608**

Table 2.4 List of Operating LNG Refineries

BUSINESS ENTITY	LOCATION	TON/DAY	MMTPA
PT. Arun	NAD	35,197.83	12.85
PT. Badak	Bontang	59,274.78	21.64
BP Tangguh	Tangguh	20,817.39	7.6
TOTAL		**115,290**	**42.09**

Storage, Transportation and Trade

Figure 2.18 Storage, Transportation and Trade Facility

Transportation and Storage

The transportation of oil and gas downstream business currently includes oil fuel transportation and gas transportation (LPG, pipeline gas, and CNG)

The storage business of oil fuel and gas (LPG, LNG) in Indonesia has involved both private and government enterprises in its development to support the supply of oil fuels and gas in each area.

Based on the Directorate General of Oil and Gas Data year 2010, the number of oil storage tanks belonging to Pertamina and other state owned companies is approximately 1,611 tanks with a total capacity of 5,348 million KL. Most of the oil fuel storage (54%) is still concentrated in Java, Bali and Nusa Tenggara.

Trading

The scope of trade in the national oil business includes oil fuel import and the refining of products for export as well as for domestic consumption. This activity can be carried out in the form of trader with owning asset or without asset. Similar activity can also be conducted in the gas industry, In which LNG export and import activities are conducted by traders. Meanwhile, the selling of gas to consumers via pipelines or special containers can be conducted by wholesalers. In the gas industry, companies possessing trade permits can conduct transportation and storage activities to support their businesses as long as no business transactions are carried out.

Investment Opportunity In Oil And Gas

3

central processing plant, offshore java

Indonesia has always been an interesting destination country in oil and gas investment, especially due to its natural resource potential which is attractive for investors. In order to promote investment, the Indonesian government strives to create sound energy policies as well as strategic planning. Various concessions and incentives have been introduced in order to attract local and foreign investors to invest in Indonesia's oil and gas upstream business activities.

The oil and gas industry is capital intensive and involves a range of activities to provide the necessary goods and services. Upstream, business opportunities arise for investors to become contractors in sharing contracts for oil and gas as well as CBM (Coal Bed Methane) in new fields and marginal/mature fields. In addition, they can also contribute to the development of fields that are already in production through the use of artificial lift technology (EOR) or participate in the management of established wells.

Downstream, business opportunities arise at every downstream activity such as refining, transporting, storing and trading. Considering the growing national energy demands, new infrastructure will be required such as the construction of new refineries or the upgrading of old ones, the building of gas pipes, providing transportation and storage facilities, and even by expanding the increasingly popular SPBU (filling stations).

Block Exploration

As mentioned before, Indonesia has 60 potential hydrocarbon sediment basins. Of the 60 sediment basins, 22 have yet to be explored. At 30%, the reserve-finding ratio in Indonesia is more promising than other countries in South-east Asia. The average success ratio of delineation rate can attain 38%, while the success ratio of wildcatting is more than 10%.

Most of the sedimentary basins which have potential for new block development are in Eastern Indonesia and in offshore areas. The basins are located offshore around the island of Sulawesi as well as off the coasts of the following areas: Nusa Tenggara, Halmahera, Maluku, and Papua. Besides the competitive finding-to-exploration ratio, the finding cost is relatively lower when compared to other areas in south east Asia..

Low average finding costs will influence investment risks, in spite of initial development in large-scale capital funding for offshore locations. Under these conditions, Indonesia can be said to be a promising area for oil and gas investment.

In 2010, there were 246 Production Sharing Contract Operators, and in the early 2011, there are new 5 PSC contract has signed. For CBM working area, there were 23 PSC Operators 2010, and in 2011 there were new 9 PSC contracts has signed.

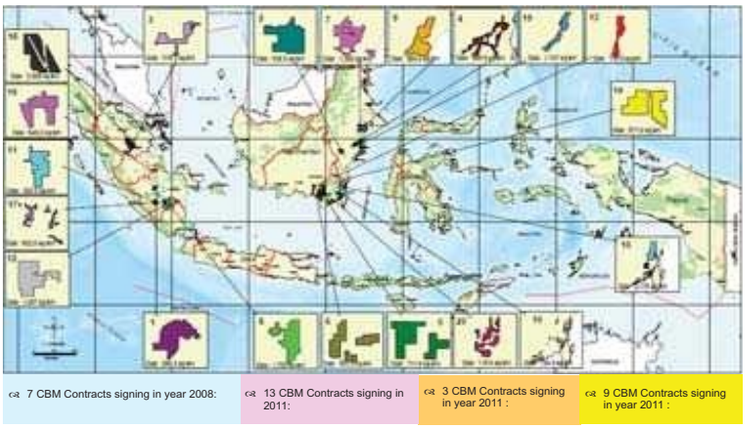


Figure 3.1 Oil and Gas Working Areas map

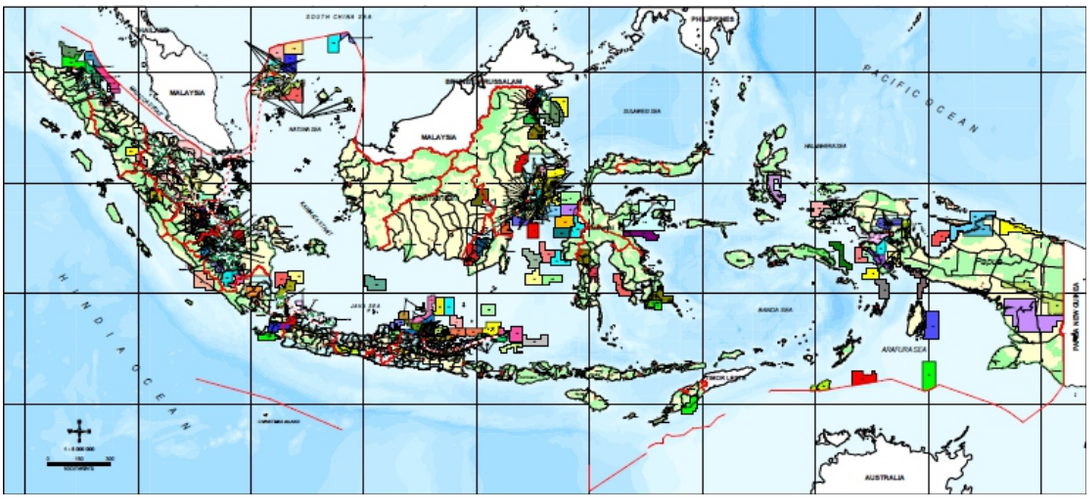


Figure 3.2 Oil and Gas Working Areas Map

Production Fields Development

Production in more than 90% of the existing fields in Indonesia has been decreasing by 12% per year. Stimulation of incremental production of the existing production fields can be achieved through the use of various drilling technologies, such as infill drilling, workover, and Enhance Oil Recovery (EOR). Recently, the government, using all available regulations and policies has been supporting all existing field development activities by offering new production sharing contracts and incentive packages. This condition offers an interesting opportunity for investors to develop the existing fields, one of them is by EOR method.

Marginal Fields

There are currently 52 marginal fields in Indonesia. The government is offering several incentive models such as special profit share and DMO Holiday amongst others, to investors who are interested in managing these marginal fields. Investment opportunities for new marginal fields therefore remain attractive because economically ineffective field development can be avoided by taking advantage of the incentives and taking into consideration the relatively high price for oil.

In order to encourage the development of marginal fields, the government c.q Minister of Energy and Mineral Resources has issued Decree No. 0008/2005 regarding the Incentives for Marginal Oil Field Development. As stipulated in this regulation, the incentives take the form of an additional operational cost return of 20% if the contractors' rate of return is less than 15%.

Brown Field

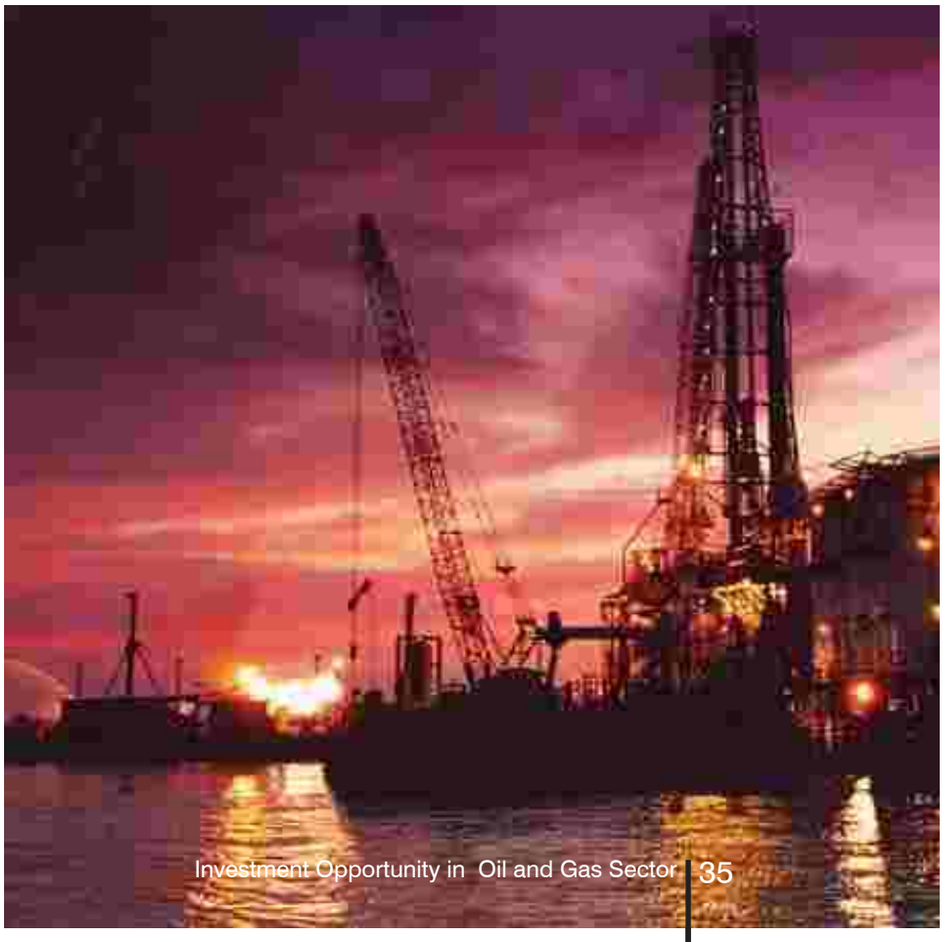
Almost all the fields in Indonesia have achieved maximum primary production levels and are now in decline. Recently, the government has tried to increase oil production from brown fields through recovery improvement. A number of methods which are usually applied for this purpose include the workover method, stimulation and infill drilling by horizontal wells. The number of brown fields in Indonesia is currently estimated at around 255. By providing incentives and new contract schemes by the government, this field development will give investment opportunity in oil and gas upstream sector

Frontier Fields

The current 22 sedimentary basins which are unexplored are mostly located in the deep sea. In addition, some frontier oil fields are also unexplored. Exploration and exploitation in frontier and deep sea areas certainly require advanced technology and a lot of capital.

Regarding the blocks located in East Indonesia, especially the frontier areas, where the sub surface data is not sufficient, the government provides special terms by not requiring the contractors to submit a definite commitment to drilling exploration for the first 3

Drilling operation, Ciasem offshore



Production Fields Development

years but they must carry out seismic surveys with a contract limit of up to 3 years. If the fields do not offer good prospects for drilling and further development they have to terminate the contract.

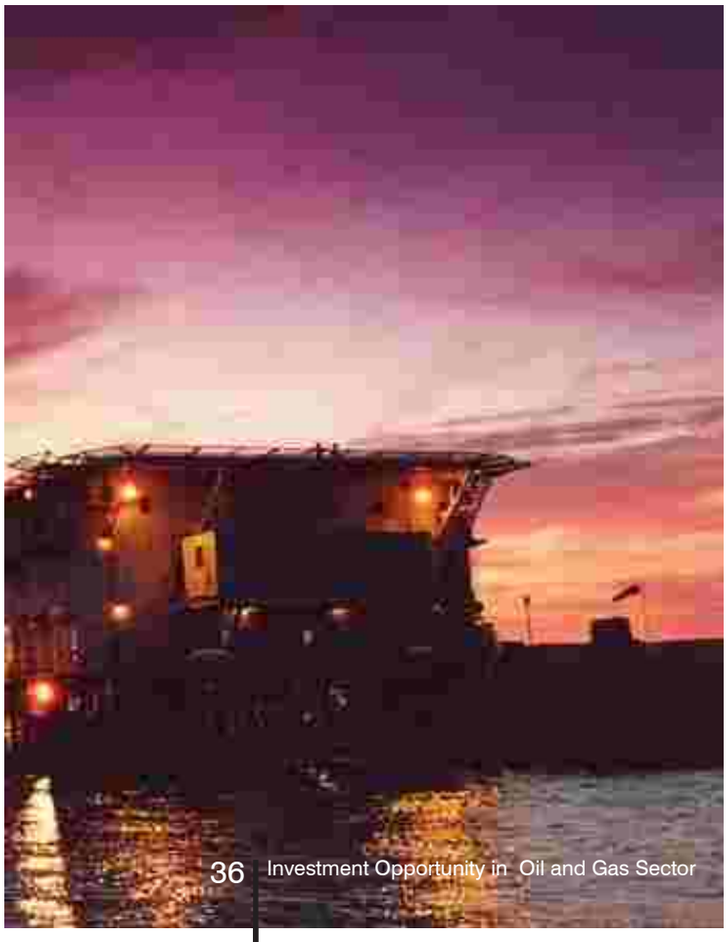
Management of Mature W ells

In addition to investment opportunities in new working areas, there are also opportunities to process and produce oil in mature fields under different terms and conditions from those contained in a conventional profit-sharing contract.

Regarding the processing and production of oil in mature wells, the government c.q the Minister of Energy and Mineral Resources has issued Decree of MEMR No. 01/2008 on Guidelines for Oil Mining in Mature Wells. This decree stipulates that Village Cooperatives, Regionally-Owned Enterprises, Micro Enterprises or Other Cooperatives are given opportunities to process and produce oil from mature wells in cooperation with sharing contract operators by implementing a profit-sharing mechanism.

Farm In - F arm Out

In offering working areas, the term Farm-In – Farm-Out refers to the transfer of interest from the owner of existing working areas to another enterprise or a consortium. Some investors prefer this Farm-In method and buy a participating interest in a working area that is clearly productive because it represents a lower risk of investment and the process is more rapid. In 2010, 33 transfers of interest were approved by the government.



CBM Business

Coal Bed Methane (CBM) working areas are given to business entities or permanent business enterprises under the Mining Law of Indonesia in CBM business. Coal Bed Methane working areas consist of:

1. CBM open areas
2. available working area (no interested contractor or winner in previous tender)
3. oil and gas working areas

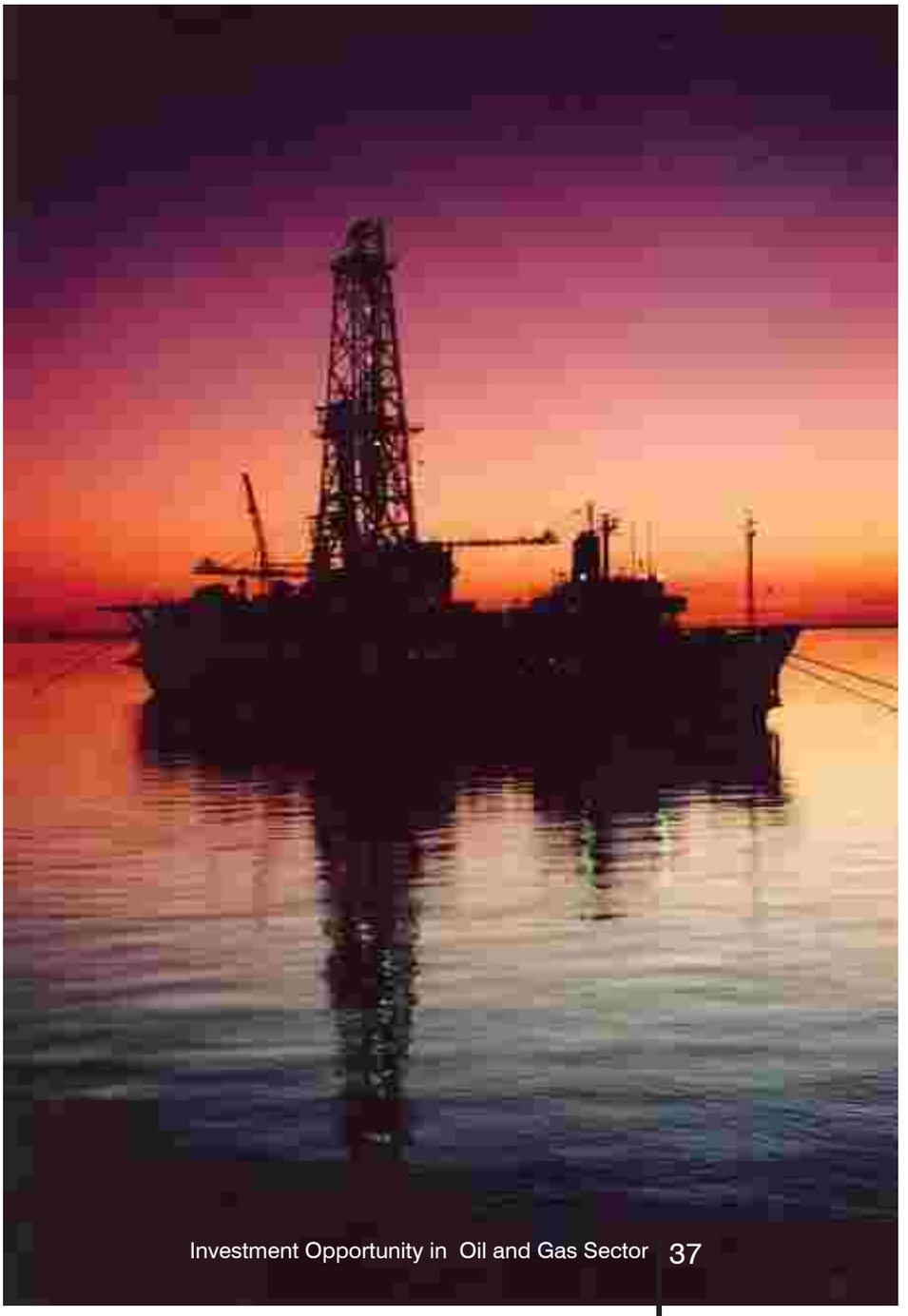
4 coal mining areas (PKP2B/coal KP)

5. overlapping areas of oil and gas mining and coal mining

According to the Ministerial Regulation No. 036/2008, oil and gas contractors which have met fixed commitment of first year exploration period in oil and gas working areas and coal mining areas (PKP2B contractors/coal KP holders) and have conducted coal exploitation for at least 3 years in PKP2B areas or coal KP areas, are given first priority to submit a direct proposal tender by joint evaluation.

In overlapping areas of oil and gas and coal PKP2B/KP working areas, contractors are given the first priority to submit direct proposal tender by joint evaluation. The procedures for all CBM areas, both for joint evaluation and joint study are made through a tender process. Enterprises and Permanent Establishments which have conducted a Joint Evaluation and Joint Study will only have the minimum right to match the highest offer (right to match).

Deepseaice Drill Rig, Bintumi



The Need for Refined Oil Fuel and Construction Plans of New Refineries

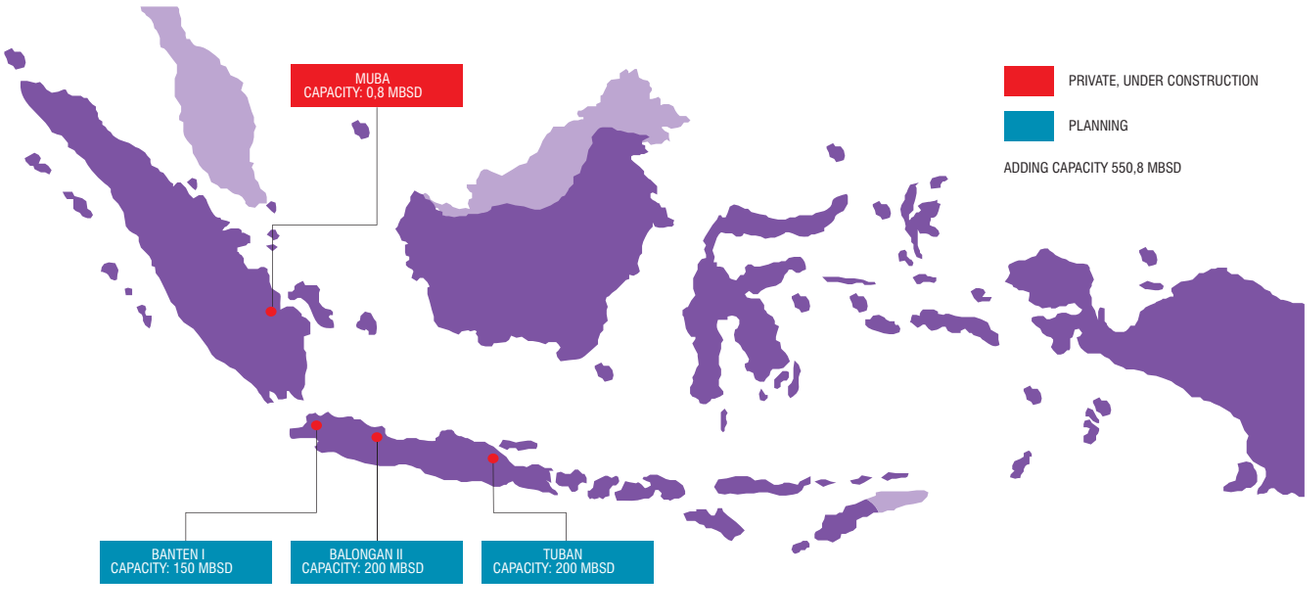


Figure 3.3 New Refineries Plan

Fuel Refinery

37% of domestic requirements for refined oil fuel is currently met via imports. The continuous rise of this domestic need will lead to a growing dependancy on imported fuel in Indonesia. Taking this into consideration, the government is encouraging the construction of new wells in order to increase domestic supply.

Currently, there are plans to build new refineries as well as to revitalize existing ones. The Revitalization Program was launched by Pertamina in 2008 in an effort to quickly increase fuel supply capacity to meet domestic demand.

These construction plans mean that the future needs for refined oil fuel can be projected as shown in Picture 3.4. The role of investors is therefore essential considering that such construction requires advanced technology and is cost intensive.

Table 3.1 New Refineries Project

Project Name	Capacity (MBSD)	Operation (Year)
Banten Refinery (phase I)	150	2014
Balongan Refinery (phase II)	200	2016
Tuban, East Java	200	2015

Table 3.2 Refineries Revitalization

Project Name	Capacity (MBSD)	Operation (Year)
Upgrading of Cilacap refinery	20	2013
Refurbisment of Plaju refinery	14.5	2013
Revamping of Dumai refinery	Up to 200	2014
Upgrading of Balikpapan refinery	40	2015

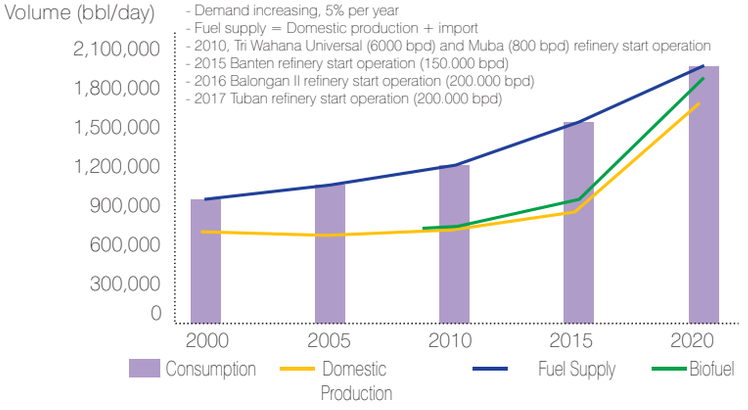


Figure 3.4 Proyeksi Kebutuhan BBM

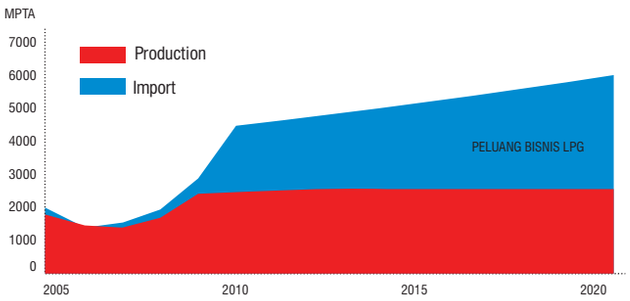


Figure 3.5 LPG Supply - Demand

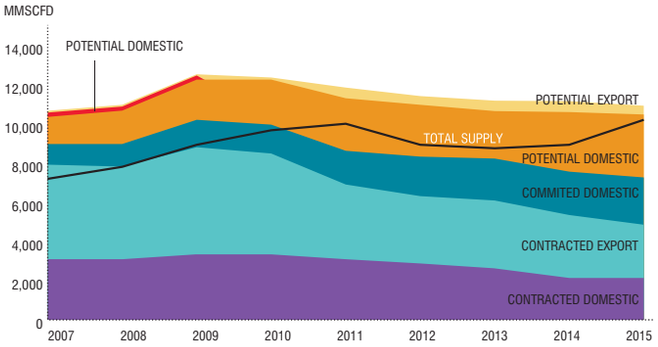


Figure 3.6 Gas Supply - Demand (2007 - 2015)

LPG Refinery

Since the enactment of the Oil and Gas legislation, there are many opportunities for parties other than Pertamina to go into the LPG business. Business makers have responded positively to this opportunity as witnessed by brands other than Pertamina in the market such as Blue Gas and My Gas.

LPG is produced from oil refineries or gas refineries. LPG refineries using natural gas apply either an upstream pattern or a downstream pattern. An Upstream pattern is usually applied by PSC contractors, while a downstream pattern is applied by enterprises that hold government-issued licenses to process gas. The prospect of future LPG trade is increasing considering the recent policy of conversion from kerosene to LPG. By taking this policy into account, it is estimated that the domestic LPG market will increase sharply from around 1.2 million MT/year to 5.6 million MT/year by 2012.

LNG Refinery

LNG Refineries are currently located in Arun, Bontang and Tangguh. In the future, the government plans to build more refineries in Natuna, Donggi- Senoro and Masela due to the ever-increasing needs for LNG and relatively large gas reserve findings, as well as to optimize existing refineries. The investment opportunities, in terms of developing and constructing LNG refineries, are therefore still wide open, especially considering that needs will certainly increase and the government now prioritizes the use of LNG.

Similarly to LPG refineries, LNG refineries apply either upstream or downstream patterns. Those applying an upstream pattern are PT Arun refinery (in NAD, 12.85 MMTPA), PT Badak refinery (in Bontang, East Kalimantan, 21.64 MMTPA) and BP refinery (in Tangguh, 7.6 MMTPA), while PT Senoro Donggi (in Central Sulawesi, 2 MMTPA) applies a downstream pattern. The deficit in gas supply means that there are investment opportunities in LNG Plant, LNG/CNG Receiving Terminal, Pipeline and others.

Transportation, Storage, and Trading

Transportation, Storage, and Trading

Because of a lack of oil fuel supplies to filling stations (SPBU) in Java, which is densely populated, it is important to have safe transportation facilities which are able to distribute oil fuel in large quantities. Storage facilities for oil fuel are also needed because of the geographical considerations in Indonesia.

Considering that existing storage facilities are still concentrated on the island of Java (48%), development of oil fuel storage outside Java is required based on consumption levels for each area and to support the acceleration of oil fuel distribution. This is another opportunity for business entities/organizations to develop oil fuel storage especially on islands outside Java.

Storage facilities for crude oil are also needed. Most of the crude oil comes from middle-eastern countries and is processed at Cilacap refinery.

Oil and Gas Trading

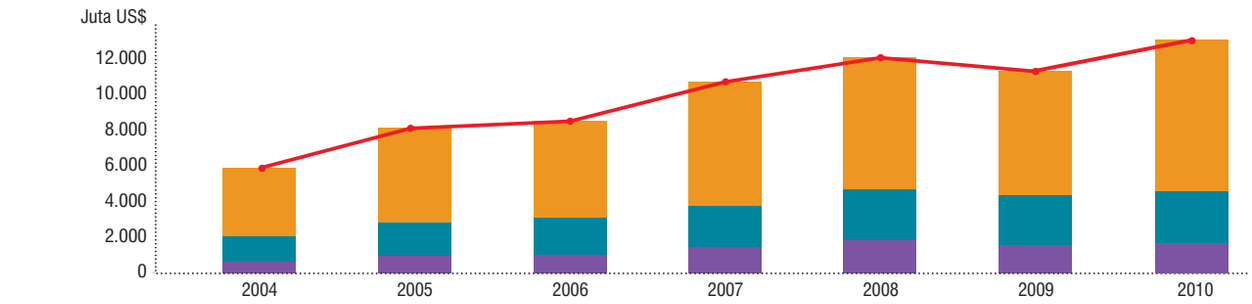
To anticipate the increasing domestic needs for refined oil fuel, adequate supporting facilities are essential. Therefore, several new transit terminals have been built along with the maintenance and construction of other facilities such as Aircraft Fuel Filling Depot (DPPU) and filling stations (SPBU) through privatization. SPBU business in Indonesia currently offers promising prospects as there are now only around 3,547 SPBU: 3,515 of which belong to PT. Pertamina with the remainder belonging to private enterprises. The amount of refined oil fuel consumption for transportation is around 30 million kl/year, which means that in 2010 each SPBU sells on average 21 kl/day.

These numbers are still attractive because the profit margin for Premium fuel and diesel fuel is Rp 180/l while that of Pertamax is Rp 325/l. Considering that the preliminary investment excluding land is approximately Rp 3.5 – 4.5 billion, it is estimated that return of investment can occur in 7 years.

The opportunity for new gas station is also increasing considering that the number of vehicles on the road is increasing and the composition of vehicles is changing (currently dominated by motorcycles).

Transportation and Trading Facilities

Investment Opportunities in Oil and Gas Supporting Business



	2004	2005	2006	2007	2008	2009	2010
Total	5.867,62	8.167,00	8.523,90	10.737,00	12.096,00	11.344,71	12.454,48
Production	3.799,49	5.298,38	5.405,50	6.954,46	7.374,22	6.895,98	7.195,44
Development	1.400,50	1.893,15	2.069,43	2.318,15	2.819,99	2.880,92	2.924,14
Exploration	667,64	975,46	1.048,97	1.464,39	1.901,79	1.567,81	2.334,90

Figure 3.7 Oil and Gas Upstream Investment Value

The increase in the oil and gas business affects its supporting business activites and maximizes national potential. Opportunities exist for supporting activities such as oil and gas reserve findings, upstream production increase and service improvement by developing the types and capacity of distribution facilities in downstream business.

The support includes services such as Construction or Non-Construction Services and Industries such as material, equipment and oil and gas users. Construction Services are mostly needed in building platforms considering that future exploration will tend to be carried out off shore while non-construction services range from seismic surveys to training.

Supporting Industries are also needed to support the effectiveness of exploration and exploitation. Pipes, casing and tubing, wellhead, and chemical substances are examples of products that are chiefly required in upstream activities.

Table 3.3 Oil and Gas Infastructure Project, 2011-2014

NO	Project	Capacity & INVESTMENT (US$ MILLION)	Year				TOTAL
			2011	2012	2013	2014	
1	Oil and Gas Production	MBOPD (Oil)	970	990	1	1.01	4.935
		MMSCFD (Gas)	8.915	8.926	8.646	9.144	44.552
		BUMN	402	0	106	1.427	2.449
		PRIVATE	2.915	3.92	3.97	5.93	19.605
2	Refinery	Unit/Location	-	-	1	1	3
		Barel/hari	-	-	62	150	337
		BUMN	0	0	1.438	0	1.859
		PRIVATE	-	-	-	4.4	4.4
3	Fuel Tank	Unit/Location	-	-	-	-	2 Location
		KL	-	-	-	-	35
		(PRIVATE)	-	-	-	-	10,16
6	LPG Processing	Unit/Location	2 kilang	3 kilang	-	-	4 kilang
		(Ton/day)	650	868	-	-	1.268
		(APBN)		13,44	13,44	13,44	40,32
		(BUMN)	188	-	-	-	188
		(PRIVATE)	95,61	28,72	-	-	187,86
7	Processed refinery	Unit/Location	1				
		(Ton/year)	800				800
		(BPD)					3
		(Ton/day)					54
		(PRIVATE)	148,03				199,67
8	LNG Receiving Terminal	Unit/Location	3 Location	1 Location	1 Location		5
		(MMSCFD)	774	400	500		1.674
		(BUMN)	182		204		387
		(PRIVATE)	348,2	555	698,5		1601,7
9	LNG Processing	Unit				1	1
		(MMSCFD)				335	335
		(BUMN)				2.809	2.809
10	Gas Transmission Network	Segment	2	1	2	2	7
		Km	85	200	516	675	1.476
		Investment	48	135	499	389	1.071
11	Distribution Pipe	Unit/Location	2 Location	1 Location	-	-	9
		Km	60	218,8	-	-	472
		(BUMN)	100	100			300
		(PRIVATE)	160,95	129,78	86,96	65,22	588,26
12	Gas pipefor Household	Unit/Location	4	4	4	4	20
		SR	16	16	16	16	80
		(APBN)	29,6	27,4	29,6	31,7	143,9
13	CNG (Mother Station)	Unit/Location	1 Location	1 Location	1	1	5
		MMSCFD	1	1	1	2	5
		(PRIVATE)	8,69	1,61	1,61	3,18	20,58
14	LPG (Depo dan Filling Plant)	Unit/Location	-	-	-	-	1
		M.Ton/Day	-	-	-	-	5
		(PRIVATE)	-	-	-	-	1,5
15	Gas for Transportation (SPBG/Gas station)	City	1	1	1	-	3
		Unit	7	7	7	-	21
		(APBN)	10,83	12,28	15,81	-	38,92

Master Plan of Transmission/Distribution Pipes

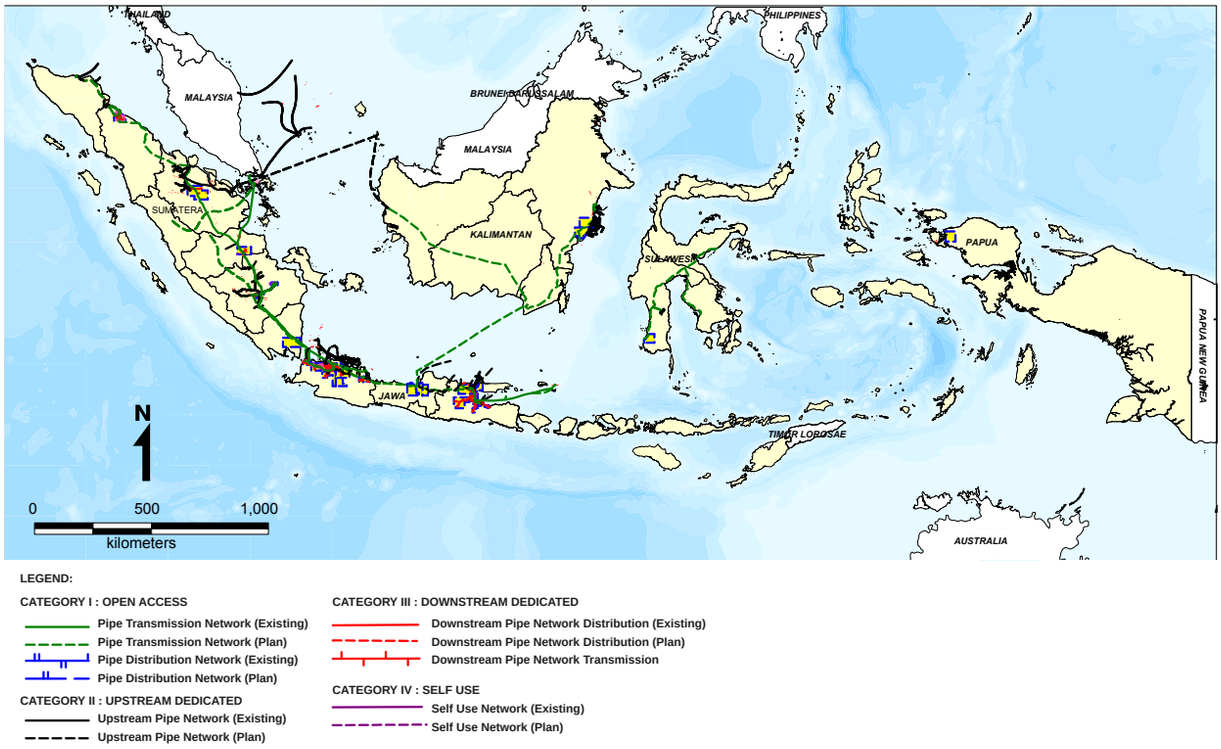


Figure 4.9 Masterplan transmision and Distribution Gas Network

Investment opportunities in the infrastructure of gas supply are another interesting area for investors to consider. Among the most urgent infrastructure requirements are gas pipeline networks. They are needed to support the gas transmission and distribution process. The master plan for gas transmission and distribution national networks can be seen in figure 3.8

Short term government targets in 2009 in the transmission and distribution networks, including city gas networks are to accomplish and update the master plan of transmission network and gas distribution area by referring to the supply available and the needs of the market. Besides the integration of transmission networks and gas distribution in line with the master plan transmission networks and national gas distribution, the government also plans to build city gas networks. In the mid-term period of 2018, the government's target is to realize the establishment of gas transmission and distribution networks (including city gas networks) of 7,558.3 km and 2,733.15 km consecutively, as seen in table 3.4

For the long term target of 2025, it is expected that the transmission and distribution networks development of 15,166.6 km and 5,466.3 km consecutively, can be realized.

Table 3.4 Masterplan of Tansmission and Distribution Network, 2018

No	Island	Pipe Network Category	
		Transmission (Km)	Distribution (Km)
1	Sumatera	1.661,3	843
2	Jawa	1.654	1.244,15
3	Kalimantan	1.975	302
4	Sulawesi	854	100
5	Natuna Timur	1.414	-
6	Maluku & Papua	-	244
Total		7.558,3	2.773,15

Prosedur dan Tata Cara Investasi Migas

4

Ruang Pelayanan Investasi Migas Terpadu

In order to provide easier access to investment services, the Directorate General of Oil and Gas opened an "Investment Center" at Plaza Migas 1st floor, Jl. H.R. Rasuna Said Kav. B-5 South Jakarta. Here, visitors can find licensing services for upstream, downstream and supporting business as well as information on forms and requirements to fulfill.

List of Licensing Services in Investment Centers:

Upstream
- Management of Mature Wells
- Farm-in – Farm-Out
- Joint Study Approval
- General Survey
- Extension of Exploration Period
- POD I Recommendation
- CBM Joint Evaluation/ Joint Study Approval

Downstream
- Refining License
- Transportation License
- Storage License
- Limited Trading License
- Biofuel Trading License

Technical and Environmental Licensing:
- Certification of Registered Oil Number (NPT)
- Ocean Transmission Pipe Installation License
- Operational License (SILO)
- Storage Tank Utilization/Operation License
- AMDAL (Environmental Impact Assessment) Technical Recommendation
- Certificate of Registration (SKT)

Program Development:
- Certificate of Supporting Business Capability (SKUP)
- Verification of Domestic Component Level (TKDN)
- Recommendation on Expatriate Placement Plan (RPTKA)
- Recommendation on Working Permit (IMTA)
- Recommendation on Import Plan and Settlement of Goods Required for Oil and Gas Upstream Operations.

In order to improve services in the oil and gas industry licensing process, the Directorate General of Oil and Gas has created new licensing procedures. The system used is called FIFO (First In First Out), in which a line is created in front of the Oil and Gas Investment Center booth. This booth is open on weekdays from 9am to 3pm Western Indonesia Time .

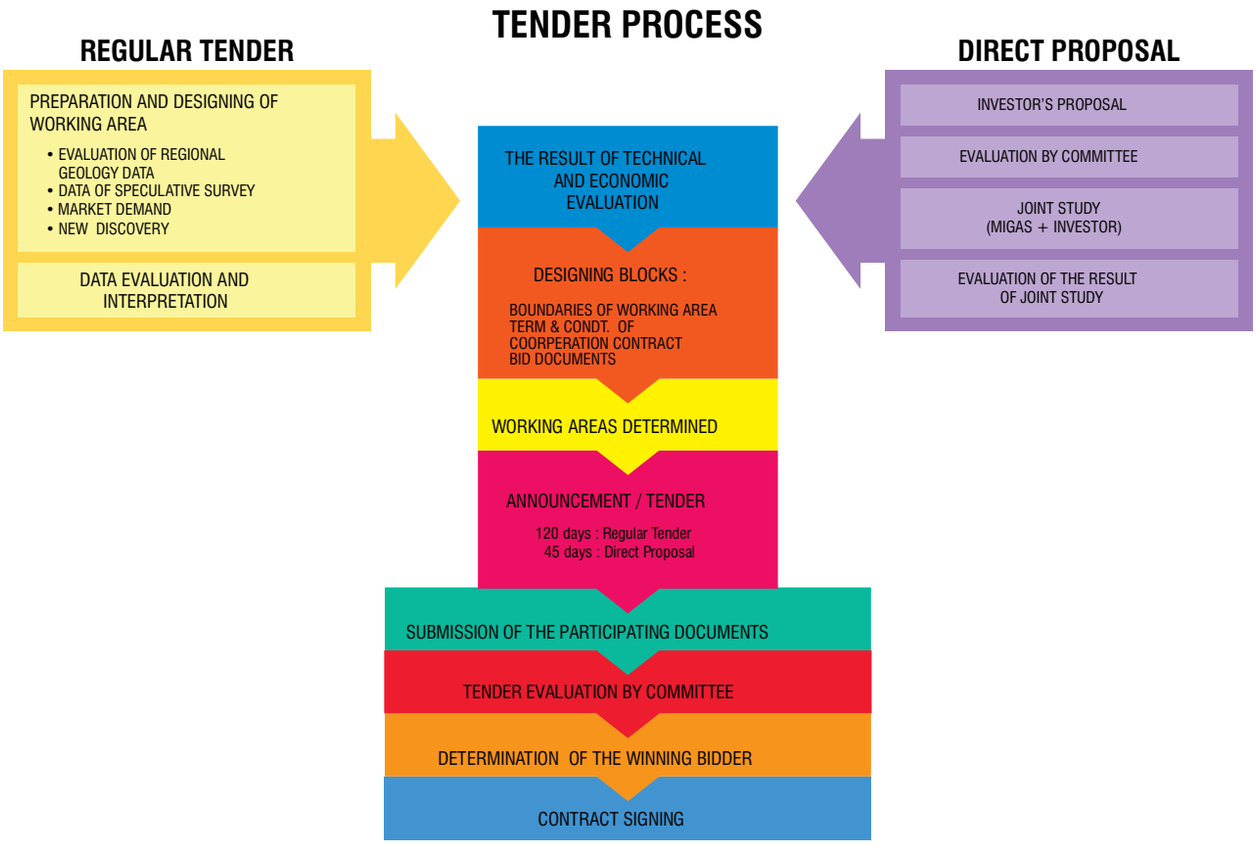


Figure 4.1 Tender Procedure for Working Areas and Coal Bed Methane

Based on the Ministry of Energy and Mineral Resources Regulation No. 035 of 2008, the offers are implemented by means of:

• regular tender

working areas are regularly prepared by the Directorate General Of Oil and Gas, Ministry of Energy and Mineral Resources.

• direct proposal tender

business entities or permanent establishment submits proposal on investment in working areas to the Ministry of Energy and Mineral Resources,which is then followed by a joint study in the open areas. At the same time, a joint evaluation is carried out on site at the working areas and coal mining areas. Business entities or permanent establishments which have submitted proposals on joint study and joint evaluation may receive the right to match which is changed in the proposal, if other business entities or permanent establishments had made a better proposal for the tender being conducted.

The first come first serve principle is a direct offer mechanism. Suggestions on Working Area can come from open areas or available blocks.

In the case that within 14 working days no other BU/BUT is interested in the same working areas or overlapped areas of more than 25%, the proposal will be evaluated by an evaluation team. The working areas will be offered in a tender offer after a feasibility study has been carried out by the evaluation team so that first right of refusal can be given.

Figure 4.2 Downstream License procedures

Based on Article 5, the Ministry Regulation No 0007 of 2005, requirements of proposal for oil and gas downstream business activities consist of :

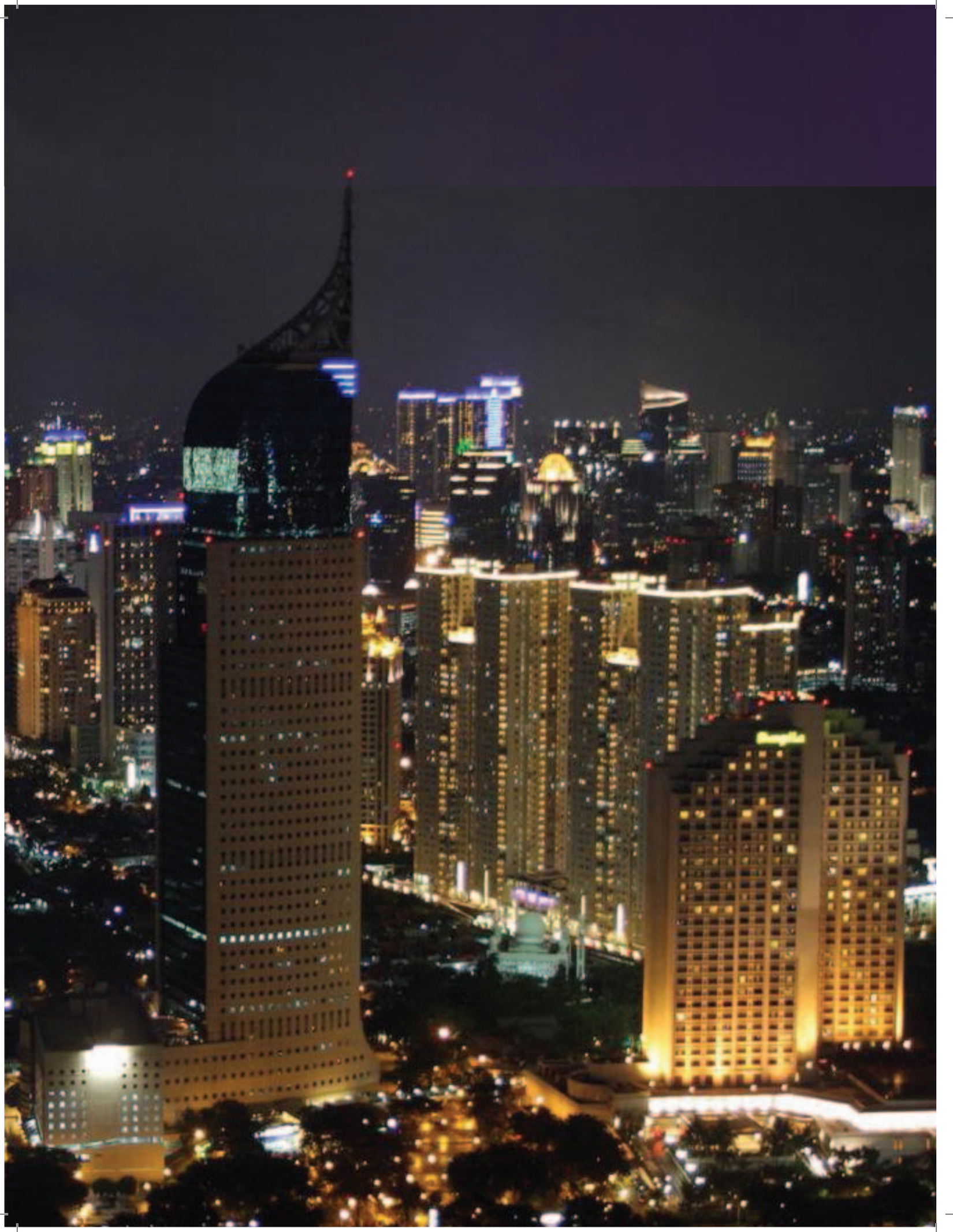
Administration requirements:

1. The deed of company establishment and its amandement be legalized by relevant parties
2. Company profile
3. Tax payer registration number (NPWP)
4. certificate of company registration from regional trade office
5. Statement letter of company domicile
6. Duly stamped written statement concerning the ability to provide operational health and safety, environmental management and local community aspects development
7. Duly stamped written statement concerning the ability to comply with the laws and regulations
8. Written approval from the regional (local)government concerning the development of location for facilities and other infrastructure. This letter can not be used as a permit for limited trading.
9. Legally guaranteed written statement concerning the willingness for site inspection

Technical requirements:

1. Preliminary feasibility
2. Guarantee for financial support or letter of guarantee concerning financial support
3. Plan infrastructure/facilities on waste management
4. Environment study plan

article 10 of the Ministry Regulation No 0007 of 2005, states other technical requirements, which include refining facilities,transportation, storage, and trade infrastructures, can be utilized after KUD (rural/local cooperative unit) and BUMD (regional business companies) have received letter of approval/certification (Directorate General of Oil and Gas), concerning feasibility of installment of equipment (SKPI), Letter of approval/certification (SKPP), relating to feasibility of usage of equipments and commissioning test, by Directorate General of Oil and Gas.



MINISTRY OF ENERGY AND MINERAL RESOURCES
REPUBLIC OF INDONESIA

INVESTMENT OPPORTUNITY IN ELECTRICITY

MINISTRY OF ENERGY AND MINERAL RESOURCES
Jakarta, February 2011

1 INTRODUCTION

1.1. Background

Electric power is one vital need to improve the quality of human life. Electric power supports the activities of communities in the effort of increasing the prosperity of people, promoting economic development and fulfilling the needs of our daily life. Therefore, the government always prioritizes the fulfillment of electric power to support national development.

The government policy for electricity sector development is implemented in various electricity programs and rural electrification programs undertaken by a government agency, such as state own electricity company. The development of electricity infrastructure is conducted by considering various aspects, particularly social and economic aspects. The preparation of development plan should also consider the feasibility of various aspects and impacts of development. Development programs will require considerable resources in the form of funding and other forms of resources.

Basically, the development of power sector in Indonesia is still very dependent on government assistance in funding aspect. Various important policies have been pursued by the government that include policies directly responding to economic crisis. Such funding policy is the next step after resolution for development investment. While on the other hand, the ability of governments to allocate funds power sector development is also limited, hence funding through state budget is not expected. Even the funding currently on going will also experience various obstacles in the implementation. For that, the government should exercise measures to obtain from various sources of development funds either from domestic and foreign loans so as to ensure affordable electricity price for the community.

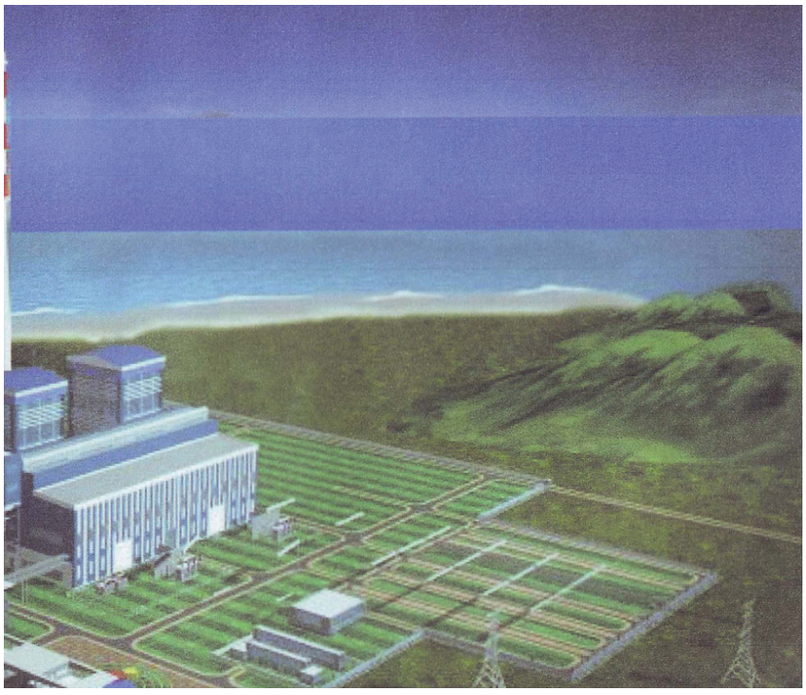
The policy of funding or investment issued by the government generally would provide clear information to all parties that prospective private investors will have the first opportunity to participate and compete fairly with existing competitors. The earlier investment data is completed and disseminated to prospective investors for further distribution to various parties fairly, then the project feasibility or investment offers received from prospective investors will become more attractive.

1.2. Legal Basis

To cope with growing electricity demand, the government opens the opportunity for all parties, including local government and private sector, to participate in power sector development. The policy is based on Law No. 30 of 2009 on Electricity, and supported by Law Number 33 Year 2004 on Regional Government and Act No. 34 of 2004 on Financial Balance between Central and Local Government. Considering the development of electricity is an integral part of national development, the power sector development needs to be harmonious, balanced and simultaneous with national development stage.

In the supply of electricity, both for public interest or for own interests is governed by Law Number 30 of 2009, the actors of Electric Power Supply business for Public Interest (UKU), shall be :

- Government and local governments through State Owned Enterprise (BUMN) and Regional State Owned Enterprise (BUMD) are undertaking Electric Power Supply business for Public Interest (UKU);
- Private enterprises, cooperatives, and community organizations may participate in the Electric Power Supply business for Public Interest (UKU);.
- State Owned Enterprise (BUMN) will have the first priority;



- The Electric Power Supply business for Public Interest (UKU) is based on the Power Supply Business License to be issued by the Government or local government.

While the types of the Electric Power Supply business for Public Interest (UKU) is:

1. Generation of electricity;
2. Transmission of electricity;
3. Distribution of electricity; and / or
4. Sale of electricity.

In addition to the above type of business, there are supporting business that consists of the supporting business itself and the supporting industry.

Supporting business consists of:

1. Consultancy in the field of electricity supply installations;
2. Construction and installation of power supply;
3. Inspection and testing of electric power installations;
4. Operation of electric power installations;
5. Maintenance of electric power installations;
6. Research and development;
7. Education and training;
8. Laboratory testing equipment and utilization of electricity;
9. Certification of equipment and utilization of electricity;
10. Competency certification of electric power engineering; or
11. Other service businesses that are directly related to electricity supply.

While supporting industry consists of:

1. Electric power equipment industry, and / or
2. Utilization of electric power industry.

Government Regulation (PP)

1. Government Regulation of the Republic of Indonesia Number 10 Year 1989 concerning Supply and Utilization of Electric Power as already amended twice, first by Government Regulation Number 3 Year 2005 and the latest by Government

Legal Basis

Regulation of Republic of Indonesia Number 26 Year 2006. Government Regulation of the Republic of Indonesia Number 10 Year 1989 is the implementing regulation of the Law Number 15 Year 1989 concerning Electricity, which regulates the supply and utilization of electric power. This Government Regulation is established based on centralistic system of state management by emphasizing the authority and responsibility of electric power supply and utilization on the Government. By virtue of this Government Regulation, the supply and utilization of electric power is to be carried out on the basis of general plan of national electricity (RUKN).

2 Government Regulation of the Republic of Indonesia Number 3 Year 2005 is the amendment of Government Regulation of the Republic of Indonesia Number 10 Year 1989, which is prepared after the Law Number 20 Year 2002 concerning Electricity is revoked and after the Law number 32 Year 2004 concerning Regional Government is promulgated, which signifies the new era of regional autonomy. Given the system change in the administration of governmental affair, then to realize and implement the policy of regional autonomy in electric power supply and utilization, the authority between Central Government and Regional Government is divided with respect to the licensing, planning and supervision in electricity sector to increase the participation of cooperative, region owned enterprise, private sector or non governmental organization and individual in electric power supply.

The issuance of such Government Regulation Number 3 Year 2005 concerning Supply and Utilization of Electric Supply provides more conducive business climate in the investment of electric power supply business after the revocation of Law Number 20 Year 2002 concerning Electricity by the Constitution Court on December 2004.

3. Government Regulation Number 26 Year 2006 is the second amendment of Government Regulation Number 10 year 1989. Such regulation is issued to encourage the acceleration of energy diversification in electric power generation and to increase private investment in electric power supply business. The substitute use of petroleum fuel to non petroleum fuel, especially coal fuel is directed to reduce the cost of electric power production. Therefore there is facility for the process of electric power purchase which is directed to the program of energy diversification in which its procurement may be carried out through mechanism of direct selection. Aside from the aforementioned, to encourage more investment in electric power supply business, then the purchase of electric power derived from expansion capacity of power generator in the existing electric power generator that is already in operation in the same location, may be carried out through the mechanism of direct appointment.

Regulation of the Minister (PERMEN)

1. Regulation of Energy and Mineral Resources Ministry Number 0010 Year 2005 concerning Licensing Procedure In Electricity Business for Inter-Province Or Linked To National Transmission Grid. This ministerial regulation regulates on licensing which is under the authority of Minister of Energy and Mineral Resources i.e. electricity business for public interest which is inter province and not linked to National Transmission Grid, or electricity business linked to national transmission grid. This Ministerial Regulation regulates that among License Holders of Electric Power Business for Public Interest which have business area or between License Holder of Electric Power Business for Public Interest and the Authority Holder of Electricity Business may cooperate on sale purchase of electric power directly to fulfill the need of electric power in each respective business area or in the frame of improving business efficiency.

2. Regulation of Energy and Mineral Resources Ministry Number 01 Year 2006 concerning The Procedure on Electricity Power Purchase And/Or Lease of Grid In Electricity Supply Business For Public Interest is issued to improve the Regulation of Energy and Mineral Resources Ministry Number 09 Year 2005, in an effort to accelerate the

cooperation process of sale purchase of electric power and/or lease of electric power grid between PT. PLN (Persero) with private investor.

3. Regulation of Energy and Mineral Resources Ministry Number 002 Year 2006 concerning Business of Renewable Energy Electric Power Generator on Medium Scale. This Ministerial Regulation is issued to increase the participation of cooperative and other business entity in the business of electric power supply derived from renewable energy with generator capacity or excess power starting from 1 MW to 10 MW and to exercise the provision of Article 19 of Regulation of Energy and Mineral Resources Ministry Number 01 Year 2006.

4. Regulation of Energy and Mineral Resources Ministry Number 04 Year 2007 Concerning Amendment upon Ministerial Regulation of Energy and Mineral Resources Number 001 Year 2006. This Ministerial Regulation is issued to implement Article 11 sub article (6a) Government Regulation Number 26 Year 2006, i.e. procedure of electric power purchase through direct appointment.

5. Regulation of Energy and Mineral Resources Ministry Number: 05 Year 2009 Concerning Guidelines on The Electricity Purchase Price By PT. PLN (Persero) from Cooperative or Other Business Entity. This Ministerial Regulation is improving the provision of electric power purchase price that is already stipulated in several Ministerial Regulation of Energy and Mineral Resources, as it is no longer suitable with the current development of economy and industry. Several provisions which are declared no longer valid are the following :
   - Provision of Article 14 Decree of Energy and Mineral Resources Ministry Number 1122K/20/MEM/2002 dated June 12th 2002 concerning Business Guidance on Scattered Small Scale Electric Power Generator;
   - Provision of Article 3 Regulation of Energy and Mineral Resources Ministry Number 002 Year 2002 dated January 18th 2006 concerning Business of Renewable Energy Electric Power Generator on Medium Scale;
   - Regulation of Energy and Mineral Resources Ministry Number 044 of 2006 dated July 18th 2006 Concerning Electric Power Purchase in the frame of Accelerating Energy Diversification of Electric Power Plant of Using Coal Energy Through Direct Selection;
   - Regulation of Energy and Mineral Resources Ministry Number 14 Year 2008 dated May 9th 2008 Concerning Benchmark Sale Price of Electric Power from Geothermal Electric Power Generator; and
   - Regulation of Energy and Mineral Resources Ministry Number 269-12/26/600.3/2008 dated June 9th 2008 concerning Basic Cost of Electric Power Supply (Biaya Pokok Penyediaan/BPP) Year 2008 Provided By Limited Liability Company (Persero) PT Perusahaan Listrik Negara.

6. Regulation of Energy and Mineral Resources Ministry Number 31 Year 2009 concerning The Purchase Price of Electricity by PT PLN (Persero) from Power Generator Using Small and Medium Scale Renewable Energy or Excess Power of Electricity.

7. Regulation of Energy and Mineral Resources Ministry No.02/2010 jo Permen ESDM No.15/2010 on List Projects Electric Power Development Acceleration Using Renewable Energy, Coal and Gas

8. Regulation of Energy and Mineral Resources Ministry Number 32 Year 2009 concerning The Standard Purchase Price of Electricity by PT PLN (Persero) from Geothermal Power Generator.

9. Regulation of Energy and Mineral Resources Ministry No.7/2010 on Tariff of Electricity Supplied by the Company (Persero) PT Perusahaan Listrik Negara

1.3. Policy Support

A. Policy for the Establishment of Electric Power Supply Business

The development of electricity sector today is still dependent on government effort through PT. PLN (Persero) as the State Owned Enterprise which is specifically designated to carry out the business of electric power supply to society. Given the increasing need scale of national electric power, and limited capacity of government and PT. PLN (Persero) in allocating development fund for the development of electricity infrastructure, the role of private investor and other business entities are very needed to fulfill the need of national electric power.

B. Policy on the Use of Primary Energy

Policy on the use of primary energy for electric power generator is aimed at securing the supply of primary energy. To ensure the security of supply, policy of Domestic Market Obligation (DMO), the utilization of local primary energy source, and utilization of new and renewable source is introduced. The policy of security of primary energy source supply for electric power generation is carried out on two sides, i.e. the side of business entity acting as the supplier of primary energy source and the business entities acting as electric power generator.

The policy on business entity acting as supplier of primary energy source, among others are that business entities which supply primary energy especially coal and gas are given wide opportunity to supply primary energy need for electric power generator at the price commensurate with economical value. The policy on the use of local primary energy for electric power generator may consist of either fossil energy (lignite coal, marginal gas) or non-fossil energy (water, geothermal, biomasses, and etc.). Such use of local primary energy prioritizes the utilization of renewable energy while still paying attention to technical, economical, and environmental safety aspects.

While the policy on the business entity acting as electric power generator is, among others, the policy of energy diversification not to depend on one source, especially fossil energy and energy conservation. To ensure good operation of electric power generator, business entities in power generation need to prepare sufficient energy source while taking into consideration any constraint of supply possibly occurring.

C. Policy on Basic Tariff of Electricity

The government policy concerning basic tariff of electricity is that electricity tariff is gradually adjusted to reach the level of economical value, so that the electricity tariff average may cover the production cost of electric power supply. Although the tariff stipulation is later carried out to reach the level of economical value, the Government will still apply subsidy for basic tariff of electricity, still considering the affordability of low income consumer.

The policy of non-uniform tariff may be introduced in the future, since there are different stages of electricity development from one region to another region and different level of affordability.

D. Policy on Environment Protection

The development in electricity sector is carried out to support sustainable development and environmental orientation. Therefore, any ecosystem damage and degradation in the development of electricity infrastructure has to be reduced by limiting negative impact either at local, regional or global scope which is related to electric power production.

With respect to this matter, business entity which conducts electricity activity that may potentially have major and important impact has to conduct AMDAL (ANDAL, RKL, and RPL), while business entity which conducts electricity activity that has no major and important impact has to prepare an Effort on Environmental Management (Upaya Pengelolaan Lingkungan/UKL) and Effort on Environmental Monitoring (Upaya Pemantauan Lingkungan/UPL) in accordance with the provision of Law Number 23 Year 1997 concerning Environment Management and Government Regulation Number 27 year 1999 concerning Analysis on Environment Impact (Analisis Mengenai dampak Lingkungan/AMDAL), also other related law products.

E. Policy on Standardization, Security and Safety, and Supervision

Considering that aside from benefit for society life, electric power may also be hazardous for human being if not managed well, Government in the frame of maintaining electricity safety stipulates standardization, security of installation tools and electric power use. The purpose of electricity safety among others is to protect society from hazard caused by electric power, to increase the reliability of electricity system, to increase efficiency in operation and utilization of electric power.

Policy on such standardization includes standard of electric power tools (i.e. tool or facility at the installation of generation, distribution, and utilization of electric power), standard of electric power use (i.e. any products or tool which in its utilization are using electric power to function such product or tool). Whilst, policy on installation safety, among others, includes operation feasibility of electric power installation, safety of tool and electric power use, and technical manpower competencies. Feasible installation of electric power is declared by Certificate of Feasible Operation. Equipment and electric power use which

has fulfilled the criteria of Indonesia National Standard is declared by Product Certificate to be able to add SNI Sign (SNI) on the electric power tools and the issuance of Safety Sign Certificate S on use electric power and competent technical manpower declared by Certificate of Competence.

F. Fiscal Policy on Importation of Capital Goods

In the frame of supporting the development of electric power supply business continuously, the Government provides incentive on importation of capital goods intended for the development of electric power generator for public interest by the issuance of Regulation of Finance Ministry Number 154/PMK.011/2008 concerning Exemption of Import Duty upon Capital Goods Importation in the Frame of Development and Construction of Electric Power Generator Industries for Public Interest as amended through Regulation of Finance Ministry Number 128/ PMK.011/2009.

The policy on such fiscal incentive mentioned in PMK number 154/PMK.011/2008 is only granted to IUKU Holder of generation business that has contract with PT. PLN (Persero), however in view of the current practice, such incentive is extended to PT. PLN (Persero) and Holder of Integrated IUKU that have sale purchase contract either with PT. PLN (Persero) or with Holder of Integrated IUKU which has business area.

The Regulation of Finance Ministry provides the authority to Directorate General of Electricity and Energy Utilization to give approval and sign of validation upon Import Plan on Capital Goods as one of requirements to obtain exemption facility of import duty from the Department of Finance.

With respect to such delegation of authority, the Regulation of Directorate General of Electricity and Energy Utilization Number 57-12/20/600.3/2009 concerning Request Procedure for Approval and Sign of Validation of Import Plan on Capital Goods for the Development and Construction of Electric Power Generator Industries For Public Interest.

G. Government guarantees for PPP Projects / Public Private Partnership (PPP)

In order to accelerate the implementation of the provision of electricity infrastructure, the Government of the Republic of Indonesia has issued Presidential Regulation No. 13 of 2010 Concerning the Amendment to Presidential Decree Number 67 Year 2005 Concerning Government Cooperation With Business Entities in the Provision of Infrastructure, where cooperation projects between the Government and Private include power generators, among others the development of electric power from geothermal energy, transmission, or distribution of electric power;

H. Policy on Purchase Price of Electric Power

Aside from the above, to facilitate the transaction cooperation between PT. PLN (Persero) with private electricity developer (IPP) either for electricity generator using new energy, renewable energy and non-renewable energy, there is a policy of guidance for electric power purchase price by PLN from private electricity which considers the latest development on economic and industry as listed through Regulation of Energy and Mineral Resource Ministry Number 05 Year 2009 concerning Guidance of Purchase Price of Electric Power by PT. PLN (persero) from Cooperative or Other Business Entities, which mainly contains electric power purchase by PT. PLN (Persero) carried out through public auction, direct appointment, or direct selection on the basis of Business Plan of Electric Power Supply (Usaha Penyediaan Tenaga Listrik/RUPTL) of PT PLN (Persero) which has been validated by Minister of Energy and Mineral Resource.

In connection with the Supply of Electricity Infrastructure by the Government organized or conducted by State Owned Enterprises / Regional-Owned Enterprises, the State-Owned Enterprises / Regional-Owned Enterprises shall act as the responsible party of Cooperation Project. The proposed Power Generator Project in the PPP Book, where PT. PLN (Persero) or Integrated IUKU Holder serves as electricity purchaser from power generator, the proposed projects in Book PPP shall have to be included / have certainty to be included in RUPTL of PT. PLN (Persero) or Integrated IUKU holder.

Proposed projects with off grid nature and planned for the supply of electricity in certain areas can be done by complying electricity sector regulations regarding the stipulation of regional electricity business. In addition to these regulations, other supporting regulations are also published, i.e the Regulation of the President of the Republic of Indonesia Number 78 Year 2010 concerning Infrastructure Projects Guarantee in Public Private Cooperation Projects through the Business Entities on Infrastructure Guarantee and Minister of Finance Regulation No. 260/PMK.011/2010 on Guidelines of Infrastructure Guarantee Implementation In Cooperation Project between Government and Business Entities.

I. Negative list of Investment

In accordance with Presidential Decree No. 36 of 2010, Indonesia has the following negative list of investment in the electricity sector:

Policy Support

Table 1.1
Energy and Mineral Resoursches Sector

No	Line of Business	KBLI	Condition										Detail of Conditions		Remark
			a	b	c	d	e	f	g	h	i	j	c	d	e	
1	Power Plant (<1 MW)	35101		-	-	-	-	-	-	-	-	-	-	-		a. Reserved for micro, small, medium enterprises and cooperatives. b. Partnership c. Foreign capital ownership d. Certain Location e. Special license and foreign capital f. 100% local capital g. Foreign capital and location ownership h. Special license and foreign capital i. 100% local capital and special license j. Foreign capital and ownership requirement an/or location for capital investment from ASEAN countries Recommendation from BATAN
	Small scale Power Plant (1-10 MW)	35101	-	✔	-	-	-	-	-	-	-	-	-	-	-	
3	Operation and Maintenance Service of Geothermal Facility	06202	-	-	✔	-	-	-	-	-	-	-	-	Maximum 90%	-	
4	Geothermal Drilling Service	06202	-	-	✔	-	-	-	-	-	-	-	-	Maximum 95%	-	
5	Geothermal Power Plant	06202	-	-	✔	-	-	-	-	-	-	-	-	Maximum 95%	-	
6	Oil and Gas Drilling Service Offshore Outside of Eastern Indonesia Territory	09100	-	-	✔	-	-	-	-	-	-	-	-	Maximum 95%	-	
7	Oil and Gas Drilling Service on Land	09100	-	-	✔	-	-	-	-	-	-	-	-	Maximum 95%	-	
8	Operating and Maintenance Service of Oil and Gas Facility	09100	-	-	✔	-	-	-	-	-	-	-	-	Maximum 95%	-	
9	Power Plant Maintenance and Operation Installation Service	35104	-	-	✔	-	-	-	-	-	-	-	-	Maximum 95%	-	
10	Power Plant (> 10 MW)	35101	-	-	✔	-	-	-	-	-	-	-	-	Maximum 95%	-	
11	Nuclear Power Plant	35101	-	-	✔	-	-	-	-	-	-	-	-	Maximum 95%	-	
12	Power Plant Transmition	35102	-	-	✔	-	-	-	-	-	-	-	-	Maximum 95%	-	
13	Electricity Distribution	35103	-	-	✔	-	-	-	-	-	-	-	-	Maximum 95%	-	
14	Contructing and Installing Electricity Service	43211	-	-	✔	-	-	-	-	-	-	-	-	Maximum 95%	-	
15	Engineering Procurement Construction (EPC) Service	71100	-	-	✔	-	-	-	-	-	-	-	-	Maximum 95%	-	
16	Electricity Consultation Service	71100	-	-	✔	-	-	-	-	-	-	-	-	Maximum 95%	-	
17	Technology Development of Electricity Supplied Equipment	72102	-	-	✔	-	-	-	-	-	-	-	-	Maximum 95%	-	
18	Radio Active Mineral Minning	07210	-	-	-	-	✔	-	-	-	-	-	-	-	Recommendation From BATAN	

Note:

1. ✔ = Following the column requirement
2. In the event that Indonesiaan Standard Classification of Business Fields (KBLI) includes more than one business field, then provisions as referred to in appendix II is only applicable to the business fields stated in the column of business fields.
3. what it meant by micro, small, medium, enterprise and cooperative (UMKMK) in this presidential regulation is individual or business entities that fulfill the criteria as meant in law number 20 of 2008 on micro, small, medium enterprises and cooperatives and law number 25 of 1992 on cooperative.
4. In the event that business field covered in Indonesia`s commitment to "ASEAN Economic Community" is not stated in appendix II column j of this presidential regulation but stated in other columns, then the capital originating from ASEAN may be invested based on the requirements are referred to in the columns.

2

OVERVIEW ON CONDITION OF NATIONAL POWER

The modern society nowadays depends heavily on the availability of energy resources. Electric power as one form of energy resources has many qualitative advantages compared with other primary energy resources. With the availability of electric power, all daily activities can be done easily and quickly. According to final energy consumption data by type, in the year 2009 the level of electricity consumption in Indonesia reached 12.8% of the total final energy consumption. This percentage puts the needs of electric power as the number three after fuel oil (47.1%), gas (21.0%), and coal (12,9%).

As one form of energy that is ready for use by consumers (final energy), the electric power is also one of the determining factors to achieve the goals of national development and the mover of country's economy. Therefore, the construction of electricity infrastructure remains high priority for the Government and become an integral part of national development.

Until recently the construction of electricity infrastructure is still dependent on the Government's efforts through PT PLN (Persero) as the State-Owned Enterprises, doing business operation on electricity supply to the public from Sabang to Merauke.

2.1. Availability of Energy Resources

A. Coal

In accordance draft RUKN 2010-2029, that the potential of the national coal reaches approximately 104,756.84 Million Tons and the implementation of the Program Acceleration of 10,000 stage and II which is planned to be built coal fired power plant with the total at 13,000 MW, it is predicted for the next ten years will be more use of coal increases. The increasing use of coal will require infrastructure support and readiness to "coal handling" among others for ground transportation / water from the mine to the port offender, sender coal terminal availability (shipping), navy (barging) and the availability of coal receiving terminal (receiving).

coal reserves (Milion Ton)

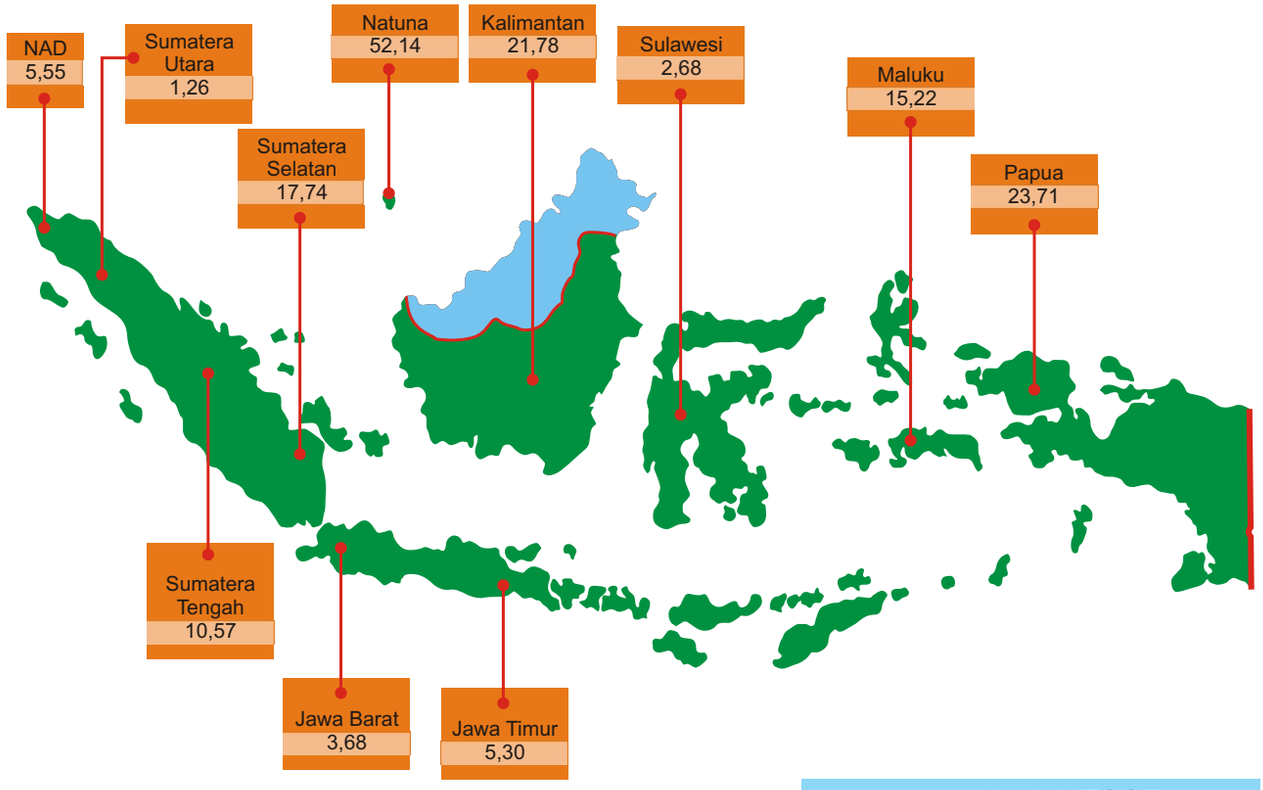
Total: 104.756,84 Milion Ton

Source: Statistik dan Direktori Badan Geologi Tahun 2010

Figure 2.1. Coal Reserves

B. Natural Gas

According the data of Directorate General of Oil and Gas in 2009, Potential natural gas owned amounted to 159.63 TSCF. The use of natural gas for power generation is absolutely necessary in order to meet the needs of the system during peak load. Therefore, the allocation of natural gas for power needs to be done for system reliability can be maintained. The existence of problems in network infrastructure and the availability of gas supply pipeline has given the projected use of natural gas will decline for a period of ten years into the future. To enhance security of gas supply, building plans receiving LNG terminal needs to be realized.



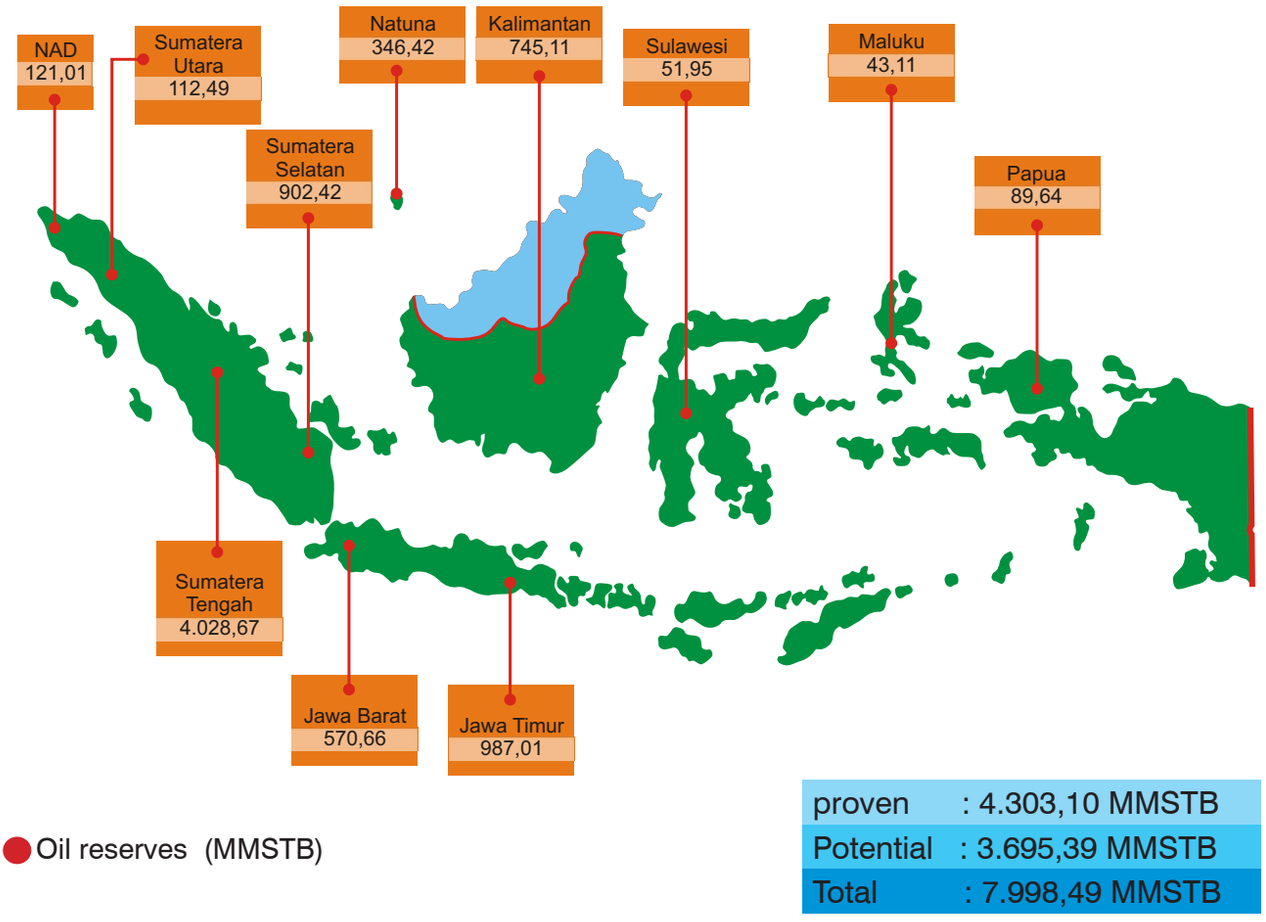
Source: Ditjen Migas 2010

Figure 2.2. Natural Gas Reserves

Availability of Energy Resources

C. Oil Fuel

According the data of Directorate General of Oil and Gas, petroleum resources are at approximately 7998.49 MMSTB consisting of proven reserves amounted to 4303.10 MMSTB and potential reserves amounting to 3695.39 MMSTB. Noting the increasingly limited availability and the price is increased, then the use of fuel for power generation could decrease for the next ten years. Its use will only be limited to plants as peak load bearers, to overcome the crisis regions of short-term electricity supply or areas that have no other natural resources. Utilization of fuel for power generation strived to better prioritize the use of Marine Fuel Oil (MFO) of the High Speed Diesel (HSD) that cost more than twice the MFO.



Source: Ditjen Migas 2010

Figure 2.3. Oil Reserves

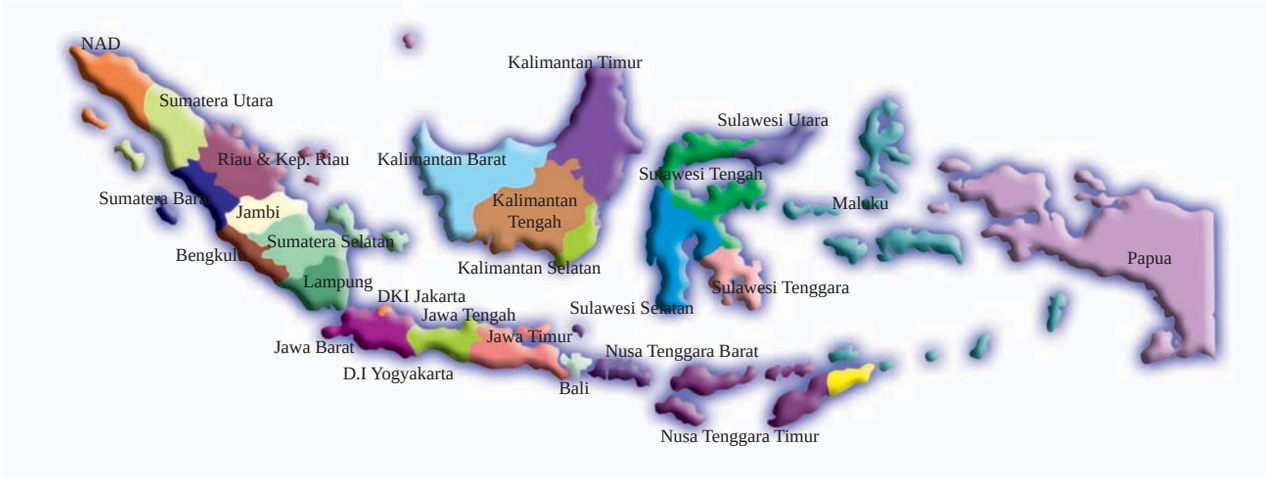
D. Hydro Power

The potential water that can be converted into electric power reaches approximately 22 GW. However, the use of water for power generation, particularly large scale and type of reservoir / dam will further decline for the past 10 (ten) years in the future due to environmental and social problems in the development of new hydroelectric reservoirs and a decrease in debit / dam effect occurred erosion in the estuary of the river upstream to the existing hydropower. For the utilization of water for hydropower is more directed at the utilization of river water flow velocity (run of river) and the development of hydroelectric power mini-hydro, micro hydro or piko hydro in particular to remote areas that have potential. Pumped Storage technology development needs to be realized in order to meet demand and improve power system reliability, especially during peak load.

Availability of Energy Resources

E. Geothermal

Seeing the potential of geothermal energy in excess of approximately 28 GW, the potential of this renewable energy should be utilized as much as possible in power generation. The existence of 10,000 MW Acceleration Program Phase II project will develop as many as 43 geothermal power plants at approximately 3967 MW by the year 2014, and has set the benchmark price for power generation using renewable energy small and medium scale or excess of power based on the Regulation of the Minister of Energy and Resources Mineral Resources No. 31 of 2009 and the highest reference price by 9.7 cents USD / kWh for the purchase of electricity from geothermal power plants in the high voltage in accordance with the Regulation of the Minister of Energy and Mineral Resources No. 32 of 2009, it will provide opportunities for use of geothermal energy for power generation within 10 (ten)years into the future. This condition will be more conducive, if the main obstacle faced by geothermal development was the location of a protected forest area conservation can be resolved.



1. Nangroe Aceh Darussalam	17 lks	10. Banten	5 lks	19. Sulawesi Utara	5 lks
2. Sumatera Utara	16 lks	11. Jawa Barat	40 lks	20. Gorontalo	2 lks
3. Sumatera Barat	16 lks	12. Jawa Tengah	14 lks	21. Sulawesi Tengah	16 lks
4. Riau & Kep. Riau	1 lks	13. D.I Yogyakarta	1 lks	22. Sulawesi Tenggara	12 lks
5. Bangka Belitung	3 lks	14. Jawa Timur	11 lks	23. Sulawesi Selatan	14 lks
6. Jambi	8 lks	15. Bali	5 lks	24. Sulawesi Barat	3 lks
7. Bengkulu	4 lks	16. NTB	3 lks	25. Maluku	9 lks
8. Sumatera Selatan	6 lks	17. NTT	19 lks	26. Maluku Utara	9 lks
9. Lampung	13 lks	18. Kalimantan Barat	3 lks	27. Papua	2 lks

Source: Statistik dan Direktori Badan Geologi Tahun 2010

Total: 257 Lokasi

Figure 2.4.
Location of Geothermal Potential

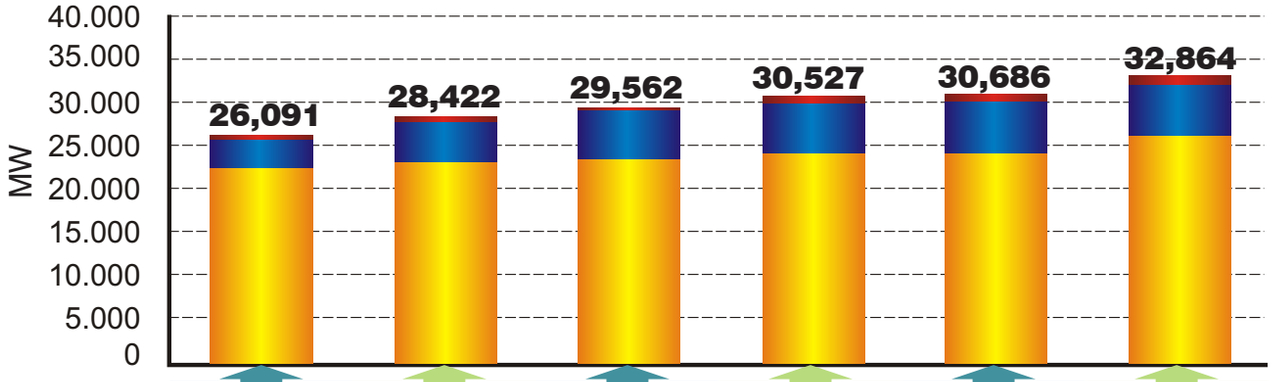
2.2. Current Condition of Electricity Infrastructure

A. Power Generation Plants

To meet the national needs of electric power, the construction of power plants in Indonesia is not merely conducted by PT PLN (Persero), but also conducted by other parties that are private business entity, cooperatives, and community organisation. This is in accordance with Article 4 parafigures (2) of Act No. 30 of 2009 on Electricity that "private business entities, cooperatives, and community organisation to participate in the supply of electricity."

Electricity supply business that has been conducted by private business entity, cooperative or such regional state owned enterprise (BUMD) are among others to build and operate their own power generation and sell the electric power to PT PLN (Persero) or better known as private generators or the Independent Power Producer (IPP) or to build and operate own generation, transmission and distribution of electricity in an integrated manner in which electric power is sold directly to consumers in a particular business area known as integrated power generation plant or Private Power Utility (PPU).

Until the end of 2010, the total installed capacity of national power generation is 32,864 MW consisting of power generator owned by PT PLN (Persero) amounting to 26,168 MW (80%), Independent Power Producer amounting to 5,839 MW (17%) and Private Power Utility amounting to 857 MW (3 %). The installed generating capacity is experiencing an addition of 6,773 MW since 2005, an increase of 25.96% over a period of 5 years.



	2005	2006	2007	2008	2009	2010
PPU	373	376	343	766	781	857
IPP	3,372	4,692	5,554	5,729	5,839	5,839
PLN	22,346	23,355	23,664	24,031	24,066	26,168

PPU: Private Power Utility
IPP: Independent Power Producer

Figure 2.5
Installed Capacity Development of National Electric Power Generator

Current Condition of Electricity Infrastructure

While the distribution of installed capacity of power to the main islands are as shown in Table I.1.

Table 2.1
Installed Capacity of Power Plant

No.	Island	Installed Capacity (MW)
1.	Sumatera	5.867
2.	Jawa-Madura-Bali	23.309
3.	Kalimantan	1.348
4.	Sulawesi	1.525
5.	Nusa Tenggara	354
6.	Maluku	231
7.	Papua	231
	Indonesia	32.864

B. Power Grid

Electric power systems available in the Indonesian archipelago have not been fully integrated into the electricity transmission grid. Currently the electric system that has integrated well only in Java-Madura-Bali, where the electric power system of Java-Madura-Bali has 2 interconnection systems, namely Extra High Voltage Transmission Lines (SUTET) 500 kV as the main backbone (Back Bone) network and the High Voltage Transmission Lines (SUTT) 150 kV as supporting network. On the island of Sumatra, Northern Sumatra electric power system (Sumbagut) that links the Province of Nanggroe Aceh Darussalam (NAD) and North Sumatra has been interconnected to the SUTET 275 KV.

The system of West Sumatra and Riau (Sumatra-Riau) has been well integrated. In November 2004, the electricity system in South Sumatra province has integrated the province of South Sumatra, Jambi, Bengkulu and Lampung, into the System of Sumbagsel, and subsequently in August 2006, the northern of Sumatera - the southern of sumatera electric power system has been integrated with SUTT 150 kV.

With respect to the island of Kalimantan, a small part of electric power system of the Central Kalimantan province is already connected via SUTT 150 KV with South Kalimantan province. While on the island of Sulawesi, the electric power system which includes the provinces of South Sulawesi, Central Sulawesi, Southeast Sulawesi, North Sulawesi and Gorontalo are still supplied by various scattered system, but some areas have been connected with SUTT 150 KV. The electric power system of Nusa Tenggara, Maluku and Papua have not had SUTET and SUTT because in general the existing electric power system is still isolated and scattered, and the capacity of power generating available is still relatively small.

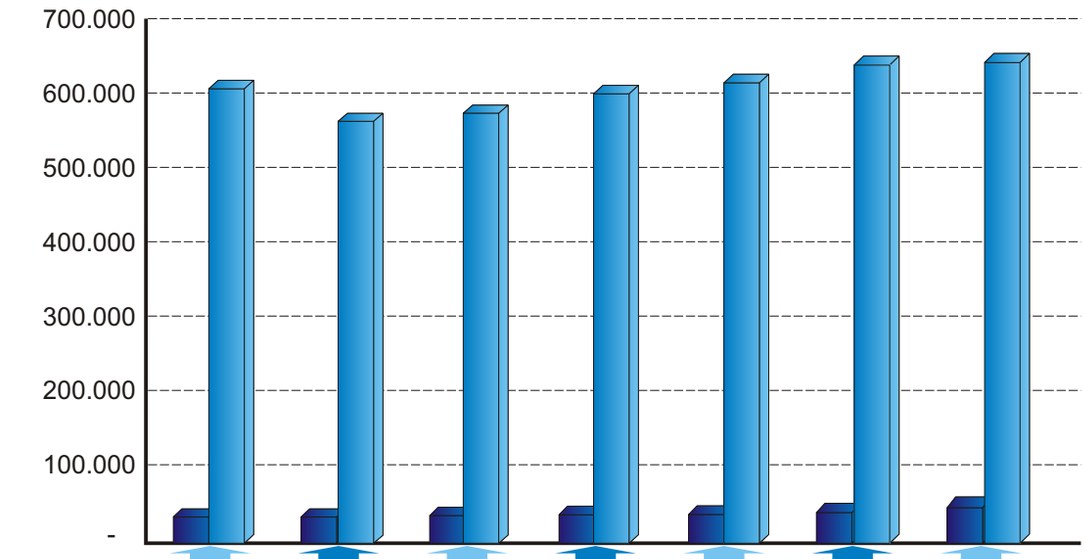
Until the end of 2010, the total length of power transmission network which is been built by PT PLN (Persero) is 38,825 kms consisting of 500 kV EHV transmission lines along 5,099 Kms, 275 kV EHV transmission lines along 1,027 Kms, SUTT 150 kV along the 27,810 Kms, and SUTT 70 kV over 4,888 Kms. Total length of electric power transmission networks are experiencing an addition of 7,879 Kms since 2005 or an increase of 25.46% over the period of 5 years. While the results achieved in the construction of power transmission to the main islands are as shown in Table 2.2.

Table 2.2
Length of Electric Power Distribution

No.	island	SUTET (kms)	SUTT (kms)	Total (kms)
1.	Sumatera	-	10.881	10.881
2.	Jawa-Madura-Bali	5.099	17.262	22.361
3.	Kalimantan	-	1.947	1.947
4.	Sulawesi	-	3.552	3.552
5.	Nusa Tenggara	-	83	83
6.	Maluku	-	-	-
7.	Papua	-	-	-
	Indonesia	**6.126**	**32.698**	**38.825**

C. Electric Power Distribution

Until the end of 2010, the total length of electric power distribution network which has been built by PT PLN (Persero) is the 642,211 Kms consisting of Medium Voltage Networks (JTM) along 270,214 Kms and Low Voltage Networks (JTR) along 372,709 Kms. Total length of electric power distribution networks are experiencing an addition of 35,168 Kms since 2005 or an increase of 5.78% over the period of 5 years.



	2004	2005	2006	2007	2008	2009	2010
Transmisi	30.534	30.665	32.905	33.151	34.172	34.937	38.825
Distribusi	607.775	563.838	573.049	598.498	615.230	639.517	642.923

Figure 2.6
Development
Network Electric Power Transmission and Distribution

Current Condition of Electricity Infrastructure

The results achieved in the development of power distribution to the main islands are as shown in Table 2.3.

Table 2.3
Length of Electric Power Distribution

No.	Island	JTM (kms)	JTR (kms)	Total (kms)
1.	Sumatera	73.700	92.262	165.962
2.	Jawa-Madura-Bali	133.670	219.083	352.753
3.	Kalimantan	24.148	22.537	46.685
4.	Sulawesi	24.361	25.404	49.765
5.	Nusa Tenggara	7.676	7.501	15.177
6.	Maluku	4.585	2.364	6.949
7.	Papua	2.074	3.558	5.632
	Indonesia	**270.214**	**372.709**	**642.923**

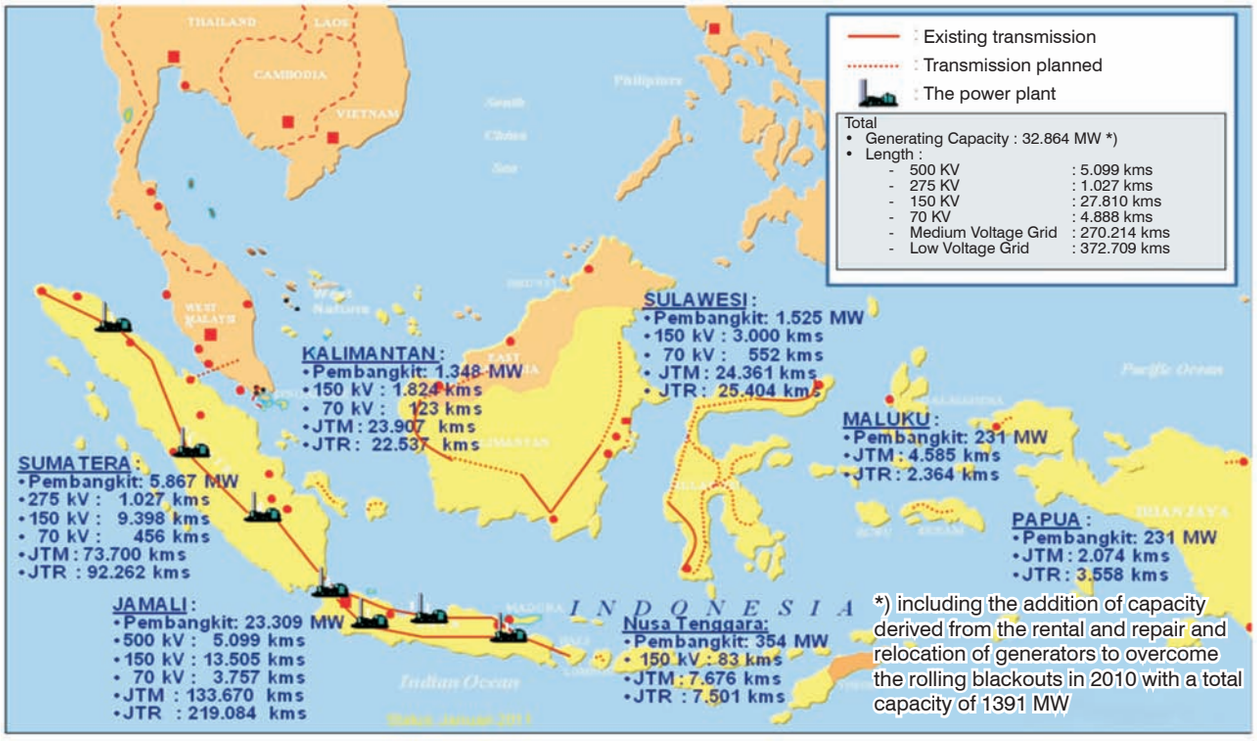


Figure 2.7
National Development of Electric Power Supply Year 2010

2.3. Electrification Ratio

Electrification ratio is defined as the number of households that are electrified divided by the number of existing households. The national electrification ratio from year to year has been increasing, from 53.5% in 2004 to 67.15% in 2010.

Electrification ratio for the main islands is as shown in Table 2.4.

Table 2.4
Electrification Ratio

No.	Island	Percent (%)
1.	Sumatera	68,71
2.	Jawa-Madura-Bali	70,48
3.	Kalimantan	63,35
4.	Sulawesi	60,65
5.	Nusa Tenggara	30,23
6.	Maluku	68,94
7.	Papua	34,32
	Indonesia	**67,15**

3 INVESTMENT OPPORTUNITY IN ELECTRICITY

3.1. Condition of Demand and Supply of Electric Power

Demand for electric power from year to year continues to increase with the growth average around 8.5% per year. Meanwhile, development of infrastructure, especially the increase of electricity generation capacity during the last five years (2005-2010) only grows by an average of 4.7% per year. The imbalance between demand and supply of electricity, the electricity supply shortages in some areas, especially outside of the electricity system Java-Madura-Bali can not be avoided. Growth conditions of low electric power supply is also a result of the economic crisis that hit Indonesia in the period 1998/1999, at which time the growth of installed capacity only grew by 1.4%

Indonesia's current economic growth requires the support of reliable supply of energy including electric power. Electric power demand will increase in line with economic development and population growth. The growth of economy in the region resulted in increase in electricity consumption as well. This condition should be anticipated as early as possible so that the supply of electric power could be available in sufficient quantities and at reasonable prices. By considering the assumption of national economic growth on average to grow by 6.9% per year and growing population nationally to grow by 1.4% per year, forecast growth in national electric power demand according to the National Electricity National 2010-2029 is expected to reach an average of 9.5% per year.

Table 3.1
Electricity Investment Realization 2004-2010

Million USD

Description	2004	2005	2006	2007	2008	2009	2010
Generation	1,862.94	1,565.13	2,661.59	1,465.22	2,837.70	4,253.63	3,417.08
Transmission	336.81	580.42	473.12	1,334.42	1,204.20	973.39	1,434.74
Distribution	354.00	492.00	118.28	520.41	671.7	533.12	116.28
EBT (Off grid & non PLTP)				43.36	46.3	67.91	
Jumlah	**2,553.75**	**2,637.55**	**3,252.99**	**3,363.41**	**4,759.90**	**5,828.05**	**4,968.10**

The high estimate of growth in average national electric power demand of 9.5% is also concerned with the number of potential customers waiting list of PT PLN (Persero) that the amount of capacity has reached more than about 6,000 MW due to the implementation of restrictions on sales of electric power (suppressed demand) in previous years

3.2. Electricity Infrastructure Development Priorities Ahead

A. Power Plant

Development of electric power supply capacity is directed at realistic growth and prioritized at solving electric power supply crisis that is occurred in some areas, to increase reserves and to fulfill the reserve margin (System for Java-Madura-Bali 30% and Foreign Systems of Java-Madura, Bali, 40%) which prioritizes the utilization of local energy sources or renewable energy and cancels fuel power development plan. Development of fuel power generator will be exempted to solve electric power supply crisis in the short-term (only one to two years ahead) while awaiting the completion of construction of non-fuel power plant already under planning, by conducting lease of generators using MFO fuel. If the non-fuel power plant already under planning is already in operation, then the fuel power plant would be no longer in operation.

By considering high growth of electric power, providing electricity access to the whole community and encouraging the use of renewable energy, then the acceleration program of 10,000 MW phase II development which has varied range of primary energy (not only coal) will be offered to be developed by PT PLN (Persero) and private sectors with facilities as have been implemented in the acceleration program of the 10,000 MW phase I construction

Development of small-scale Steam Power Plant coal can be considered as an alternative to replace power plants that use fuel oil on a small scale system to reduce the cost of electricity system operation. In addition, the development of small-scale Steam Power Plant coal can also be used to replace existing Diesel Power Plant partial role in the electricity system in Outside Java-Madura-Bali in which its dominance is still quite high. By considering the difficulty of obtaining land to build large-scale electric power plants in Java and considering the increasing peak load from year to year, then the development of Steam Power Plant coal with a capacity of 1,000 MW Supercritical boiler technology to gain efficiency and better emission levels, can be conducted by PT PLN (Persero) and private sector

B. Development of Electric Power Grid

The basic principle for the development of electric power transmission system is aimed at system growth, increase of system reliability and reduction of constraints on distribution system and the construction of new plants. Given the Government is currently carrying out the acceleration program of 10,000 MW of Phase I construction and future plan development is to implement the acceleration program of 10,000 MW phase II, the construction of electric power transmission system will be prioritized to deliver electric power from the new electric power plants.

At present, the large system already well integrated is the system of Java-Madura-Bali and the system of Sumatra. While the electricity system on the other islands such as Sulawesi have better systems in the northern and southern regions. The electricity system on other islands such as Kalimantan, Nusa Tenggara, Maluku and Papua have to get more attention for the development of its distribution system, especially in the effort to increase reliability

In the medium term, the System of Sumatra is expected to have been fully integrated using the network of extra high voltage 275 kV, which is currently the system already interconnected with the network of high voltage 150 kV. The entry of several large-scale power generator, in the long-term in Kalimantan and Sulawesi, is expected also to be connected properly.

The development of delivery system is directed at the development of voltage system of 500 kV and 150 kV for the System of Java-Madura-Bali and 275 kV, 150 kV and 70 kV for the system outside Java-Madura-Bali. Efforts to develop distribution system to be interconnected between the Java-Madura-Bali, Sumatra System can be done after an in depth study by taking into account several aspects, inter alia technical, economical and social aspects. While development plan of 500 kV cross-link from Java to Bali Island is one option that can be done in anticipation of load growth in Bali.

In developing substation, the selected voltage system is directed at the suitability of transmission system development. The expansion of transformer is prioritized when transformer load in the installed GI has reached 70% of its capacity. While the construction of new GI can be considered to be done if the supply in a region is not able to be met from the existing GI surrounding which is indicated by the GI transformer load has exceeded 70% and its capacity already has reached optimum capacity.

C. Development of Electric Power Distribution

Development of electric power distribution facilities can be directed to anticipate the growth of electric power, to maintain the desired level of reliability and efficiency and improve service quality.

When the fulfillment of an integrated electric power with other electricity systems is considered less / not efficient, then isolated network may be applied. The meaning of isolated network is electric power distribution network that stands alone and does not connect directly with JTN with limited service areas.

3.3. Potential Projects in the Electricity Sector

A. Electricity System for Java-Madura-Bali

In the period of 2010-2019, additional electric power generating capacity is needed in the Electricity System of Java-Madura-Bali amounted to 36,222 MW, or an additional average annual generating capacity around 3,622 MW. From this capacity, PT PLN (Persero) will only build plant with a total capacity of 23,095 MW or 64% of the total additional electric power generating capacity. While the additional capacity of 13,127 MW of new power plants or 36% of the total additional electric power generating capacity which is needed, will be offered to private sector.

Observed from the type of plant to be built, the Steam Power Plant coal will be dominating with generating capacity to be developed reaching 21,625 MW or 60%, while PLTG and PLTGU ranks the second with a capacity of 8,201 MW or 23%. The kinds of renewable energy that will be mostly used is geothermal amounted to 3,255 MW, or 9% of total capacity, followed by Hydro Power Plant amounted to 3141 MW or 9%.

Several strategic projects that will be developed in the Electricity System of Java-Madura-Bali are:

- PLTGU Muara Tawar Add-on (1,200 MW). This project is very strategic because the plant is located very close to load centers and to improve voltage quality. However due to limited gas supply, then the first phase development is only for block 2 (500 MW when completed supplementary firing) is intended to operate in 2012-2013, where as in later phases will be developed blocks 3-4 (700MW with supplementary firing) which intended to operate in 2016 when the available supply enough gas.

- IPP power plant in Central Java (2x1.000 MW). This project is very strategic because it takes the system in 2014 and 2015, and is the first electricity projects using Public Private Partnership (PPP) with the Presidential Decree No. 67/2005 as amended by Presidential Decree No. 13/2010.

- PLTU Indramayu (2x1.000 MW). This project is very strategic because it takes the system in 2015, and located relatively close to the load center industry in the East Jakarta.

- Hydroelectric Pump Upper Cisokan (1,000 MW). This project is very strategic because it can minimize the cost of system operation and provides many benefits in power system operations, including functioning as a peak load generator, frequency regulator, as aspinning reserve (reserve play), improve the utility factor of base load generation and improve system load factor .

- Mulut Tambang power plant in South Sumatra and 500kV HVDC transmission Sumatra - Java with a capacity of 3,000 MW. This project is very strategic because it is an economical solution to meet the electricity needs in Java by using low rank coal reserves in South Sumatra. The project was only implemented after the electricity needs of Sumatra fully fulfilled with considerable reserve.Project choice is also driven by the increasing difficulty of findingsites to build large-scale coal power plant in Java.

- Power plant Banten / West Java. In line with the rising prices of primary energy lately, the price of LNG has risen very high, is above U.S. $ 10/ mmbtu. At these prices, fuel LNG Combined Cycle Power Plant will be difficult to compete against coal power plant that operated to fill the intermediate load.

Table 3.2
Additional Need of Electric Power Generation Capacity Electricity System for Java-Madura-Bali

Year	2010	2011	2012	2013	2014
PLN					
PLTU	3.205	2.625	-	700	1.660
PLTN					
PLTP	-	-	-	-	-
PLTGU	194	734	393	350	-
PLTG	-	-	-	-	-
PLTA	-	-	-	-	1.000
Total	**3.399**	**3.359**	**393**	**1.050**	**2.660**
IPP					
PLTU	-	660	2.265	450	1.400
PLTN					
PLTP	-	-	175	425	1.380
PLTGU	230	50	-	-	-
PLTG					
PLTA	-	-	-	-	157
Total	**230**	**710**	**2.440**	**875**	**2.937**
PLTU	3.205	3.285	2.265	1.150	3.060
PLTN	-	-	-	-	-
PLTP	-	-	175	425	1.380
PLTGU	424	784	393	350	-
PLTG	-	-	-	-	-
PLTA	-	-	-	-	1.157

D. Electricity System Outside Java-Madura-Bali

Additional needs new generating capacity to the electrical system out side Java-Madura-Bali in the period 2010-2019 needed additional generating capacity of 12,365 MW in western Indonesia, and 6896 MW in East Indonesia, including the committed and ongoing projects. Development of power until 2019 in western Indonesia, conducted by PLN is as much as 5157 GW (42%). The rest will be built as an IPP project as much as 7208 GW (58%), greater than the power plant built by PLN. power development until 2019 in eastern Indonesia conducted by PLN is as much as 3706GW (54%). The rest will be built as an IPP project as much as 3190GW (46%), smaller than the power plant built by PLN.

Observed from the type of plant which is planned to be built, then some of the Diesel Power Plant is still planned to be built in remote areas especially in eastern Indonesia in which its load is not yet high to be supplied by small-scale Steam Power Plant coal. PLTP is projected to be developed by 2,735 MW and 2,409 MW of Hydro Power Plant.

Several strategically planned electricity projects to be developed in the electricity system outside Java-Madura-Bali include:

- Acceleration of Presidential power project completion 71 considering the number of regions in crisis due to lack of supply of electrical power.
- Acceleration of completion of IPP power plant projects that have the status of PPA and construction.
- Accelerating procurement and construction projects geothermal in Sumatra and North Sulawesi is a main stay of local electricity supply.

Potential Projects in the Electricity Sector

- Settlement of 275 kV transmission system to interconnect Southern Sumatra and North Sumatra,
- Hydroelectric Asahan 3 amounting to 174 MW units intended to operate in 2012, very strategically to improve the fuel mix in North Sumatra,
- Mulut tambang coal power plant in South Sumatra, a large-scale electricity will also be distributed to the interconnection system is transferred to Java, Sumatra, as well as through 500 kV HVDC transmission,
- Interconnection of electric Power systems from Sarawak to West Kalimantan related to the Bakun hydroelectric development of Sarawak, is expected PLN will conduct energy exchange began in 2013.
- Completion of interconnection plan Batam - Bintan with 150 kV submarine cables associated with the construction of power plant in Batam, Tanjung Kasam is delayed until an unspecified time.

Table 3.3
Additional Need of Electric Power Generation Capacity
Electricity System for West Indonesia

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
PLN											
PLTU	37	964	634	320	306		200	200			2.663
PLTP		55	55	110	110						330
PLTGU		86									86
PLTG	105					30	160	320	300	400	1.315
PLTD		4	2	4	9	5	8	7	8	4	52
PLTM	2	1		1							4
PLTA				260				175	273		708
Total	**144**	**1.110**	**691**	**695**	**427**	**35**	**368**	**702**	**581**	**404**	**5.157**
IPP											-
PLTU	12	231	8	630	472	950	450	525	630	690	4.598
PLTP				392	990		110	62	185	275	2.014
PLTGU			30								30
PLTG											-
PLTD		22									22
PLTM	21	16	81	23							140
PLTA	180					74	120	30			404
Total	**213**	**269**	**119**	**1.044**	**1.462**	**1.024**	**680**	**617**	**815**	**965**	**7.208**
PLTU	49	1.195	642	950	780	950	650	725	630	690	7.261
PLTP	-	55	55	502	1.100	-	110	62	185	275	2.344
PLTGU	-	86	30	-	-	-	-	-	-	-	116
PLTG	105	-	-	-	-	30	160	320	300	400	1.315
PLTD	-	26	2	4	9	5	8	7	8	4	74

Table 3.4
Additional Need of Electric Power Generation Capacity Electricity System for East Indonesia

Year	2010	2011	2012	2013	2014
PLN					
PLTU	49	501	200	459	235
PLTP	10		23	33	93
PLTGU					240
PLTG			225	50	
PLTD	11	10	9	44	35
PLTM	12	5	6	13	8
PLTA			10	40	
Total	**82**	**516**	**474**	**639**	**611**
IPP					
PLTU	14		376	623	340
PLTP		3	3	40	80
PLTGU	60	60			120
PLTG	10	10	80		
PLTD					
PLTM	4	15	11	19	6
PLTA		195			
Total	**88**	**283**	**470**	**682**	**546**
PLTU	63	501	576	1.082	575
PLTP	10	3	26	73	173
PLTGU	60	60	-	-	360
PLTG	10	10	305	50	-
PLTD	11	10	9	44	35
PLTM	16	21	17	32	13
PLTA	-	195	10	40	-
Total	**170**	**800**	**943**	**1.321**	**1.156**

Table 3.5
Electricity Sector Investment Needs 2010-2019 (Million U.S.)

Item		2010	2011	2012	2013	2014
Transmission	Fc	3.694,0	4.438,3	6.433,7	6.829,9	5.668,0
	Lc	1.659,3	2.167,5	2.796,3	2.857,7	2.386,9
	Total	**5.353,3**	**6.605,8**	**9.230,0**	**9.687,6**	**8.054,9**
Distribution	Fc	1.384,4	1.498,9	1.136,0	1.112,5	1.351,1
	Lc	603,3	547,0	441,0	397,1	485,0
	Total	**1.987,7**	**2.045,9**	**1.577,0**	**1.509,7**	**1.836,1**
Distribution	Fc	-	-	-	-	-
	Lc	781,2	1.087,4	1.014,0	956,0	999,9
	Total	**781,2**	**1.087,4**	**1.014,0**	**956,0**	**999,9**
Total	Fc	5.078,4	5.937,2	7.569,7	7.942,4	7.019,1
	Lc	3.043,8	3.801,9	4.251,3	4.210,8	3.871,7
	Total	**8.122,2**	**9.739,0**	**11.821,1**	**12.153,3**	**10.890,8**

4

PROCEDURE AND METHOD OF INVESTMENT

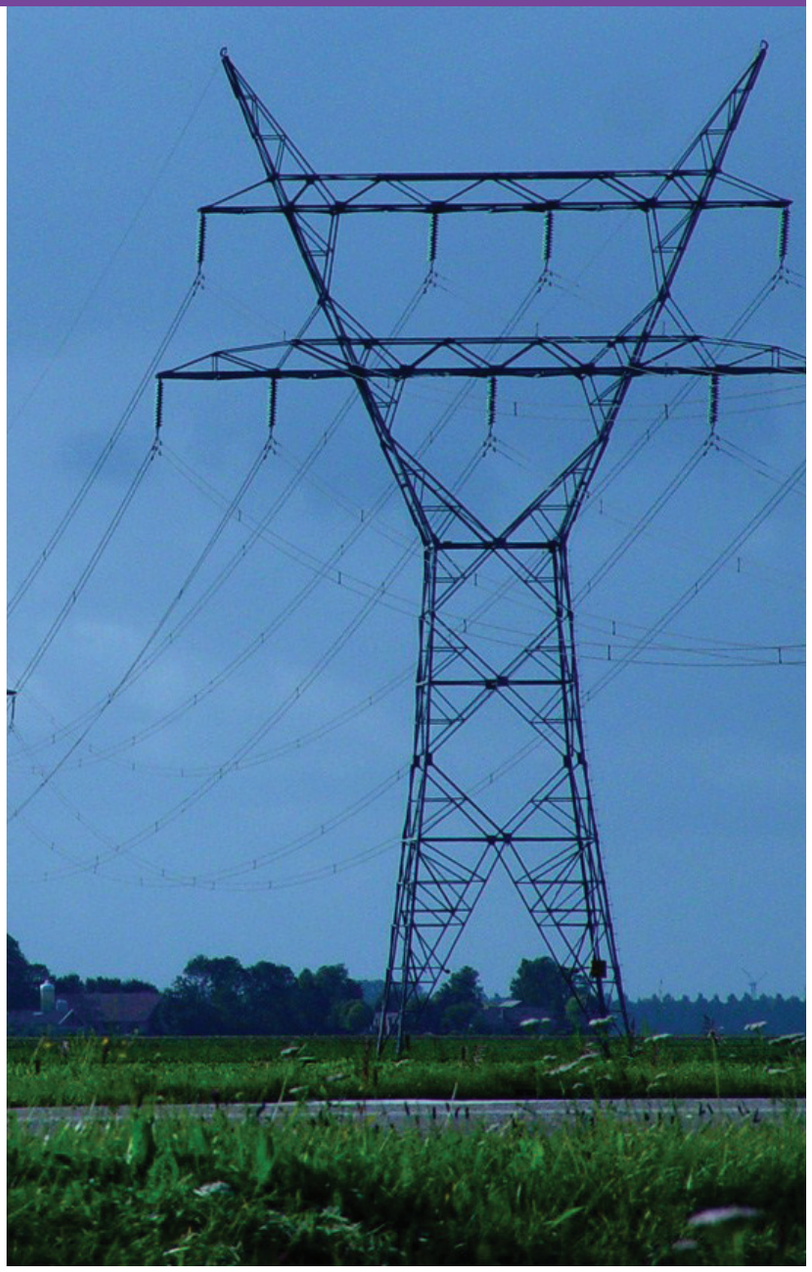
4.1. Investment Scheme And Mechanism Of Procurement

A. Investment Scheme

In accordance with Law Number 15 Year 1985 concerning Electricity that the business of electric power supply carried out by PT PLN (Persero) as the Authority Holder of Electricity Business has the obligation to provide electric power at the national scope. In an effort to provide electric power supply, PT PLN (Persero) obtains source of funding from the Government (State Budget-APBN) and from the PLN own budget. Nevertheless, in reality this budget can not fulfill the need of investment required to provide electric power supply all over Indonesia. Hence, alternative to other source of funding is needed. Therefore, PT PLN (Persero) conducts the activities of cooperation with private investors, either as Independent Power Producer (IPP) or as contractor (EPC Contractor).

In carrying out business cooperation of electric power supply, PT PLN (Persero) may cooperate with private sector through various mechanisms in accordance with Government Regulation Number 10 Year 1989 concerning Supply and Utilization of Electric Power Jo Government Regulation Number 3 Year 2005 and Government Regulation Number 26 Year 2006, i.e. through public auction, the direct appointment or the direct selection.

Moreover, PT PLN (Persero) also conducts own construction of electric power generator with the financing derived from private entity as contractor (Engineering Procurement Construction/EPC Contractor). In the event that the procurement of electric power generator is carried out by PT PLN (Persero) itself in which the source of financing is derived from the state finance, then the process should be carried out through public auction as regulated by the President Decree Number 80 year 2003 concerning Guidance for Procurement of Goods/Service.



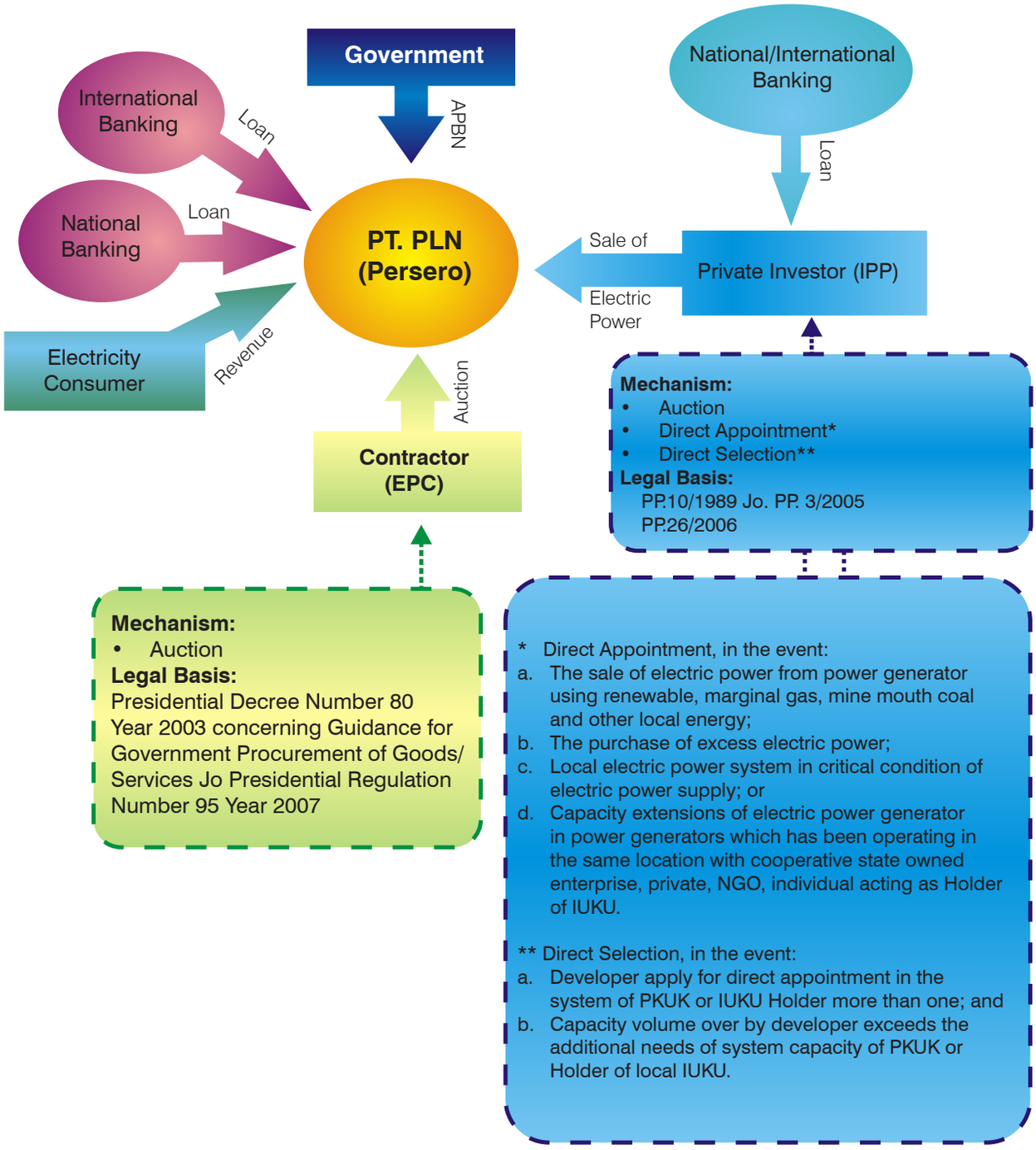


Figure 4.1
INVESTMENT SCHEME
DEVELOPMENT OF ELECTRICITY INFRASTRUCTURE

Investment Scheme And Mechanism Of Procurement

Mechanism of Private Government Cooperation Project

Electrification projects that have signed the General Plan for the Provision of Electricity (RUPTL) but have not received the assurance of funding can be submitted as a PPP project. Government Support to the PPP project is the issuance of Presidential Regulation No. 78/2010 as a complement to regulation 13/2010. Published also Permenkeu 260/PMK.011/2010 on Infrastructure Assurance Implementation Guidelines on Public Private Partnership Projects Business.

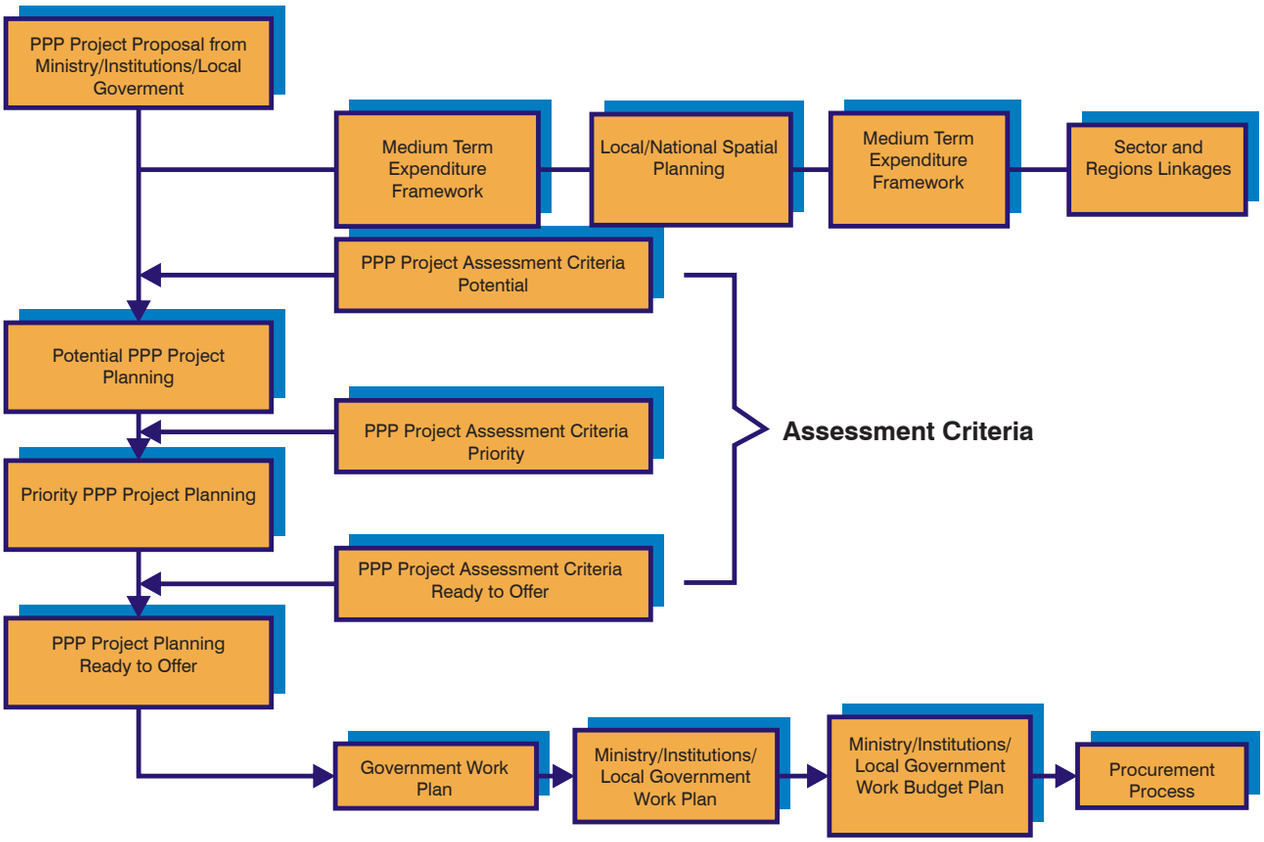


Figure 4.2
Mechanism of Private Government Cooperation Project

B. Procurement Mechanism

Based on Article 11 sub article (5) of the Government Regulation Number 10 year 1989 concerning Supply and Utilization of Electric Power Jo Government Regulation Number 3 year 2005 and Government Regulation Number 26 year 2006, the purchase of electric power by PKUK from other party basically is carried out through public auction. Nevertheless, in certain condition electric power purchase from a third party may be carried out through direct selection or direct appointment. Provisions and criteria concerning such three procurement mechanisms, are regulated in Regulation of Energy and Mineral Resources Ministry Number 09 Year 2005 concerning Procedure of Electric Power Purchase and/or Lease of Grid in Electric Power Supply Business for Public Interest Jo. the Regulation of Energy and Mineral Resources Ministry Number 01 year 2006 and Regulation of Energy and Mineral Resources Ministry Number 04 year 2007. The process of public auction, direct appointment or direct selection by PKUK should be carried out openly, without discrimination, transparently, and accountably.

Public Auction

As mentioned previously, the mechanism of electric power purchase by PKUK from a third party is basically carried out through public auction. The process of public auction starts with auction announcement by PKUK. Then, prequalification process is carried out which is followed by auction process for participants who pass prequalification stage, until the winner of auction is stipulated. After being stipulated as the winner of auction, a prospective developer may file a request for the issuance of Temporary Business License of Electricity for Public Interest (Izin Usaha Ketenagalistrikan Untuk Kepentingan Umum - IUKU) to the Minister of Energy and Mineral Resources.

In this stage, PLN and the auction winner conduct the process of PPA negotiations. After PKUK and the auction winner reach an agreement, there is a submission for corporate approval to the State Minister of State Owned Enterprise (Meneg BUMN). Further, the negotiation result of electric power selling price is submitted to the Minister of Energy and Mineral Resource for approval. After the obtaining of temporary IUKU, corporate approval from State Minister of State Own Enterprise (Meneg BUMN) and selling price approval from MESDM (Minister of Energy and Mineral Resource), then PT PLN (Persero) and the developer may sign Power Purchase Agreement (PPA).

Time period to implement the whole process of public auction must be completed within:

- 196 days until contract signing (for capacity ≤ 15 MW);
- 321 days until contract signing (for capacity > 15 MW);

After signing a Power Purchase Agreement with PT PLN (Persero), a developer may file a request for IUKU issuance to the Minister Energy and Mineral Resources attached with documents required.

The public auction chart for electric power sale purchase (as regulated in Regulation of Energy and Mineral Resources Ministry Number 01 year 2006 Jo. Regulation of Energy and Mineral Resources Ministry Number 04 year 2007), is mentioned in the following figure:

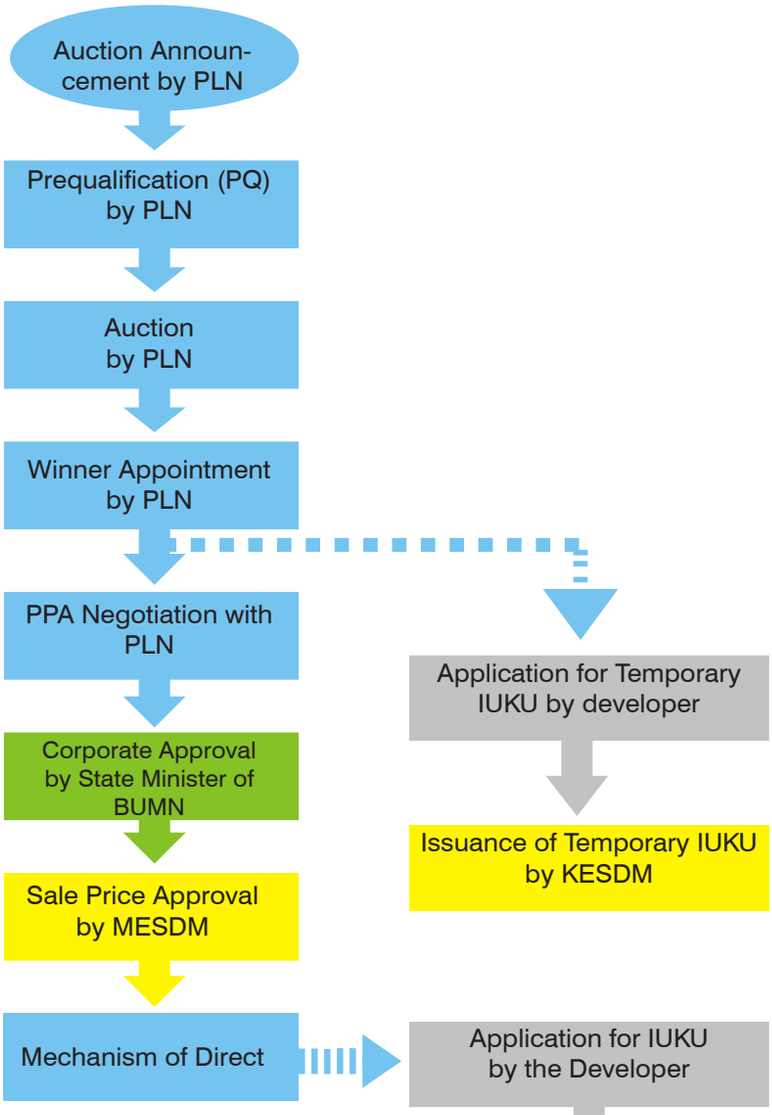


Figure 4.3. Mechanism of Auction of Private Electricity
(In accordance with Ministerial Regulation of ESDM Number 01/2006 jo Ministerial Regulation of ESDM Number 04/2007)

Investment Scheme And Mechanism Of Procurement

Direct Appointment

The purchase of electric power from private party which may be carried out by direct appointment, on the basis of Government Regulation Number 10 year 1989 concerning Supply and Utilization of Electric Power Jo. Government Regulation Number 3 year 2005 and Government Regulation Number 26 year 2006, has to comply with the following criteria:

a. The purchase of electric power from electric power generator using renewable energy, marginal gas, mine mouth coal and other local energy;
b. The purchase of excess electric power;
c. Local electric power system is in critical condition of electric power supply; or
d. Capacity extension of electric power generator on main electric power generator already operating at the same location.

A Region which suffers critical condition of electric power supply is stipulated by the Government in accordance with the proposal of PT PLN (Persero). The government has issued Ministerial Regulation of Energy and Mineral Resources concerning Stipulation of Electric Power Condition several times for regions having critical condition of electric power supply, as stipulated according to the progress of electricity condition at various areas, the latest is stipulated by Regulation of Energy and Mineral Resources Ministry Number 236-12/23/600.2/2009 dated May 20 2009. For a region which is already stipulated as the region having critical condition of electric power supply in such Ministerial Regulation, then the purchase of electric power from private party may be carried out by PT PLN (Persero) through mechanism of direct appointment.

Based on Regulation of Energy and Mineral Resources Ministry Number 01 Year 2006 Jo. Regulation of Energy and Mineral Resources Ministry Number 04 year 2007, the implementation process of direct appointment is started from the submission of proposal on electric power sale through direct appointment to PT PLN (Persero) by cooperative and other business entity. After the proposal submitted by cooperative or other business entity is reviewed, and preliminary agreement is reached between both parties, PT PLN (Persero) file a proposal on electric power purchase which will be carried out through direct appointment along with the reason to the Minister through Director General of Electricity and Energy Utilization to obtain approval.

After obtaining approval from Minister of Energy and Mineral Resources, PT PLN (Persero) carries out direct appointment and negotiates PPA with the prospective developer. In this phase, the prospective developer may apply for the issuance of temporary Business License of Electricity for Public Interest (IUKU) to Minister of Energy and Mineral Resources. After PPA is agreed between PT PLN (Persero) and developer, corporate approval is proposed to State Minister of BUMN. The negotiation result of electric power sale price is proposed to Minister of Energy and Mineral Resources to obtain approval. After the obtaining of temporary IUKU, sale price approval from MESDM, and corporate approval from State Minister of BUMN, PT PLN (Persero) and the developer may sign Power Purchase Agreement (PPA). The whole process of direct appointment until contract signing has to be completed in 110 days.

After signing Power Purchase Agreement with PT PLN (Persero), the developer may apply for IUKU issuance to Minister of Energy and Mineral Resources together with required documents.

The chart of direct appointment of electric power sale purchase (as regulated in Regulation of Energy and Mineral Resources Ministry Number 01 year 2006 Jo. Regulation of Energy and Mineral Resources Ministry Number 04 year 2007), may be seen in the following figure:

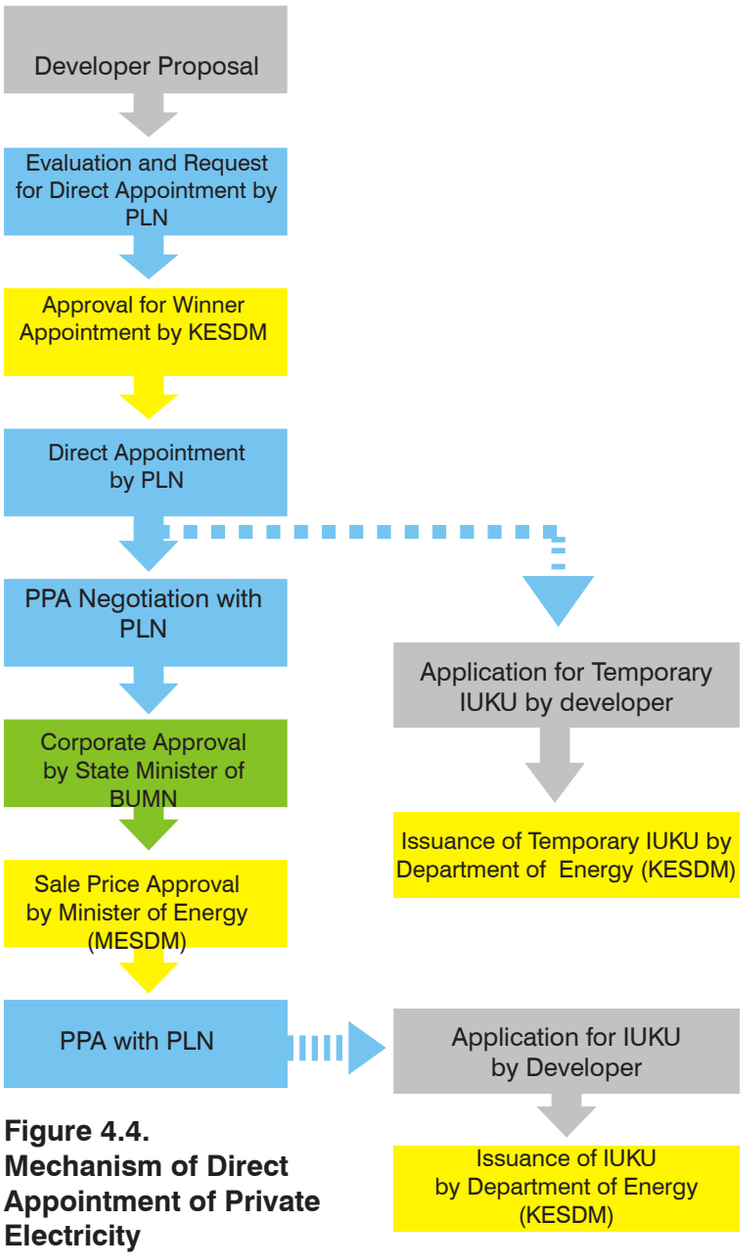


Figure 4.4.
Mechanism of Direct Appointment of Private Electricity
(In accordance with Ministerial Regulation of ESDM Number 01/2006 jo Ministerial Regulation of ESDM Number 04/2007)
PPA with PLN

Direct Selection

The purchase of electric power which may be carried out through direct selection mechanism on the basis of Article 11 sub article (6a) of Government Regulation Number 10 year 1989 concerning Supply and Utilization of Electric Power Jo. Government Regulation Number 3 Year 2005 and Government Regulation Number 26 Year 2006, are electric power purchase in the frame of energy diversification of electric power generator into non-petroleum fuel. In addition, based on Regulation of Energy and Mineral Resources Ministry Number 01 Year 2006 Jo. Regulation of Energy and Mineral Resources Ministry Number 04 Year 2007, the direct selection may also be carried out in the event:

- Developer which applies for direct appointment at PT PLN (Persero) is more than 1 (one); and
- The volume of capacity offered by the developer exceeds the need of additional system capacity of PT PLN (Persero).

The implementation process of direct selection is started by filing proposal of electric power purchase which will be carried out through the direct selection by PT PLN (Persero) along with the reason to Minister of Energy and Mineral Resources through the Director General of Electricity and Energy Utilization to obtain approval. After obtaining the approval from the Director General on behalf Minister, PT PLN (Persero) carries out the direct selection process. Further, PLN carries out PPA negotiation with the winner of such direct selection. During such negotiations process, the selected developer may apply for temporary IUKU to Department of Energy (DESDM).

After PPA is agreed between PT PLN (Persero) and the developer, PT PLN (Persero) reports the negotiations results and files proposal of electric power sale price to the Minister to obtain approval and submits corporate approval to the State Minister of BUMN. After the obtaining of Temporary

Investment Scheme And Mechanism Of Procurement

IUKU, sale price approval from Minister of Energy and Mineral Resource (MESDM), and corporate approval from State Minister of BUMN, PT PLN (Persero) and the developer may sign Power Purchase Agreement (PPA).

The whole implementation process of direct selection to until contract signing has to be completed within 170 days.

After the signing of Power Purchase Agreement with PT PLN (Persero), the developer may apply for IUKU issuance to the Minister of Energy and Mineral Resources along with the documents required.

The process of direct selection as regulated in Regulation of Energy and Mineral Resources Ministry Number 01 year 2006 Jo. Regulation of Energy and Mineral Resources Ministry Number 04 year 2007 may be seen in the following chart:

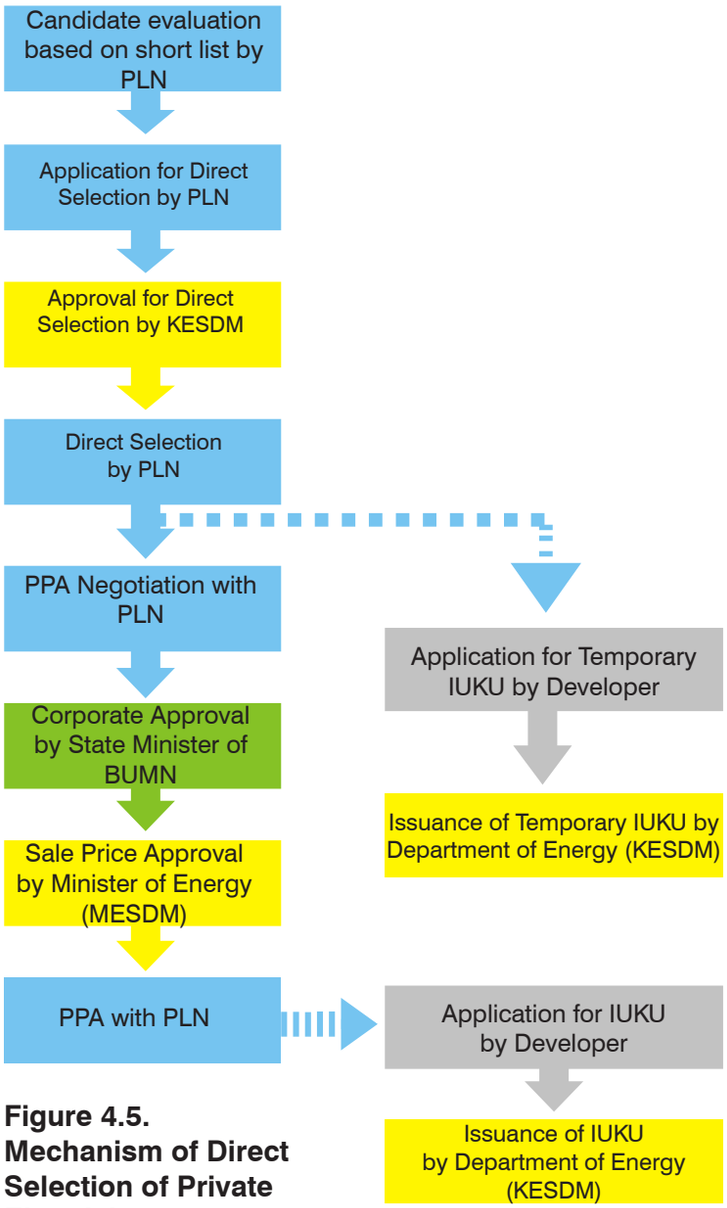


Figure 4.5.
Mechanism of Direct Selection of Private Electricity
(In accordance with Regulation of ESDM Number 01/2006 jo Regulation of ESDM Number 04/2007)

4.2. Authority and Electricity Business License

As already stipulated in Law Number 15 Year 1985, concerning Electricity, private party is given broad opportunity to conduct the business of electric power supply either for public interests as well as for own interests on the basis of Electricity Business License. Based on the above, in accordance with the policy of regional autonomy there is a stipulation on the division of authority with respect to the issuance of electricity business license between the Central Government and Local Government in this case the Minister, Governor and Regency/Mayor. The division of authority with respect to the issuance of Electricity Business License for Public Interest as stipulated in Government Regulation Number 3 Year 2005 concerning the amendment to Government Regulation Number 10 Year 1989 concerning Supply and Utilization of Electric Power, is as follows:

a. a. The Head of Regency/Head of municipality, for the business of electric power supply in which either its facility or electric power within their recpective regions, which is not connected to the National Transmission Grid.
b. Governor, for the business of electric power supply across regency or municipality in which either its facility or electric power is not connected to the National Transmission Grid.
c. Minister, for the business of electric power supply across province in which either its facility or electric power is not connected to the National Transmission Grid or for the business of electric power supply is connected to the National Transmission Grid.

4.3. License Mechanisms

In general the application for Electric Power Business License for Public Interest (IUKU) and Electricity Business License for Own Interest (IUKS) requires the fulfillment of administrative and technical requirements. Administrative requirements are the following:

1. Applicant identity;
2. Deed of incorporation of company;
3. Company profile;
4. Tax Registration Code Number (NPWP); and
5. Financing capacity.

Technical requirements are the following:

1. Pre-feasibility study;
2. Installation site including layout (situational map);
3. Single line diagram;
4. Business type and capacity;
5. Information/figure of business area and Plan of Business Supply of Electric Power (RUPTL);
6. Schedule of construction;
7. Schedule of operation; and
8. License and other requirements in accordance with the prevailing laws and regulations.

In accordance with Government Regulation Article 6 sub article (14), the provisions concerning licensing procedures is stipulated by the Minister, the Governor or Head of Regency/Head of Municipality in accordance with respective authority. Licensing procedures and requirements in the field of electric power supply business which is under the authority of the Minister, is regulated in the Regulation of the Minister of Energy and Mineral Resources Number 0010/2005 concerning Licensing Procedures for the Electric Power Business Across Province or National Transmission Grid. In the Ministerial Regulation, the issuance process in the field of electric power supply business is carried out through two stages, i.e. issuance of temporary IUKU and issuance of IUKU.

A. Temporary IUKU

From the mechanism of electric power purchase as explained previously, after PT PLN (Persero) stipulates a prospective developer from the result of auction process, direct appointment or direct selection, the prospective developer can apply for the issuance of temporary IUKU to the Minister Energy and Mineral Resources. The application letter for IUKU issuance has to be attached with required documents in the form of administrative requirements and technical requirements. The administrative requirements are the following:

1. Applicant identity;
2. Deed of incorporation of company;
3. Company profile;
4. Tax Registration Code Number (NPWP).

Technical requirements are the following:

1. Prefeasibility study;
2. Generation type and capacity;
3. Schedule of construction;
4. letter of winning bid or direct appointment/selection from Authority Holder in Electric Power Business (PKUK) or Holder of Electric Power Business License for Public Interest (PIUKU).

B. IUKU (Electric Power Business License for Public Interest)

The process of IUKU issuance can only be carried out to a developer, if the developer has signed a Power Purchase Agreement and has obtained financing assurance (financial closing) to carry out the construction of electricity facility. If these requirements have been fulfilled, then the developer may apply for the issuance of IUKU to the Minister of Energy and Mineral Resources attached with the required documents in the form of administrative requirements and technical requirements. Administrative requirements are the following:

1. Applicant identity;
2. Deed of incorporation of company;
3. Company profile;
4. Tax Registration Code Number (NPWP); and
5. Financing capacity.

Technical requirements are the following:

1. Prefeasibility study;
2. Installation location, including lay-out (situational map);
3. Single line diagram;
4. Business type and capacity;
5. Information/figure of business area and Plan of Business Supply of Electric Power (RUPTL);
6. Schedule of construction and plan of operation;
7. Approval on sale price of electric power or price of grid lease; and
8. Other Licenses and requirements which include: Environmental Impact Assessment (AMDAL) or Environmental Management Efforts Report (UKL) and Environmental Monitoring Efforts Report (UPL), Building Construction License, and Investment License

SAMPLE FORM OF
APPLICATION FOR TEMPORARY IUKU

Number : 2007
Attachment : .....
Re : Application for Temporary Business License of Electricity for Public Interest **(Temporary IUKU)**

Your Excellency,
Minister of Energy and Mineral Resources
c.q. Directorate General of Electricity and Energy Utilization
JL. H. R. Rasuna Said Blok X-2 Kav. 7-8 Kuningan
Jakarta

Pursuant to Ministerial Regulation of Energy and Mineral Resources Number 0010 Year 2005 concerning Licensing Procedure In Electricity Business For Inter-provincial Link Or Linked To National Transmission Grid, hereby we submit the application for Temporary Business License of Electricity for Public Interest **(Temporary IUKU)** Generation business/ Transmission business to fulfill the needs of electric power for sale to PT PLN (Persero)/PT . . . . /public community/certain subscriber . . . .*) with required documents as follows:

a. deed of incorporation of company;
b. company profile;
c. Tax Registration Code Number (NPWP);
d. pre-feasibility study;
e. Type and capability generator/transmission*);
f. schedule of constructions; and
g. Letter of winning bid or direct appointment from PKUK or Holder of IUKU which is integrated, acting as prospective purchaser of electric power or grid lessee

We thank you for the attention of the Minister.

applicant
stamp IDR 6 000

(signed and stamped)

Full Name
Position

Cc
- Minister of Energy and Mineral Resources

*) delete where unnecessary

Figure 4.6.

SAMPLE FORM OF
APPLICATION FOR IUKU

Number : 2007
Attachment : .....
Re : Application for Business License of Electricity for Public Interest (IUKU)

Your Excellency,
Minister of Energy and Mineral Resources
c.q. Directorate General of Electricity and Energy Utilization
JL. H. R. Rasuna Said Blok X-2 Kav. 7-8 Kuningan
Jakarta

Pursuant to Ministerial Regulation of Energy and Mineral Resources Number 0010 Year 2005 concerning Licensing Procedure In Electricity Business For Inter-provincial Link Or Linked To National Transmission Grid, hereby we submit the application for Business License of Electricity for Public Interest **(IUKU)** which is Integrated/Generation business/Transmission business/Distribution business to fulfill the needs of electric power for sale to PT PLN (Persero)/PT . . . . . ./public community/certain subscriber . . . .*) with the required documents as follows:

a. deed of incorporation of company;
b. company profile;
c. Tax Registration Code Number (NPWP);
d. financing capacity;
e. feasibility study;
f. installation site, including layout (situational map);
g. single line diagram;
h. business type and capacity;
i. information/figure of business area and Business Plan of Electric Power Supply (RUPTL);
j. schedule of construction and plan of operation;
k. approval on sale price of electric power and price of grid lease; and
l. License and other requirements include inter alia approval on Environmental Impact Assessment (AMDAL) or Environmental Management Efforts Report (UKL) and Environmental Monitoring Efforts Report (UPL), Building Construction License, and Investment License which are issued by competent authorities.

We thank you for the attention of the Minister

Applicant
stamp IDR 6 000

(Signed and stamped)

Full Name
Position

Cc
- Minister of Energy and Mineral Resources
*) delete where unnecessary

Figure 4.7.

ATTACHMENT

Recapitulation of Infrastructure and Investment Needs

Recapitulation of Infrastructure and Investment Needs
NAD Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	221	188.0	26	118.7	94	95.4	63	124.2	0	219.5
2.	Power Transmission (kms)	1,010	29.6	328	7.2	4	8.9	280	23.6	0	42.2
3.	Substation (MVA)	240	12.3	120	6.1	20	7.1	110	20.9	90	42.6
4.	Distribution System										
	- Distribution Substation (MVA)	22	2.5	23	2.6	24	2.7	25	2.9	27	3.2
	- Medium Voltage Grid (kms)	453	10.9	471	11.3	496	11.9	530	12.8	568	13.7
	- Low Voltage Grid (kms)	494	4.3	512	4.4	547	4.7	583	5.0	634	5.5
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	266 12,150	1.8	95 8,000	1.4	114 7,650	1.8	108 6,500	1.9		
	- Medium Voltage Grid (kms)	411	7.1	150	4.5	164	5.5	162	6.2		
	- Low Voltage Grid (kms)	670	6.5	191	3.3	209	4.0	221	4.6		
			262,9		159,6		142,1		202,2		326,7

Recapitulation of Infrastructure and Investment Needs
North Sumatera Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	640	598,8	24	695,7	638	732,6	475	343,3	45	154,5
2.	Power Transmission (kms)	786	56,6	220	52,2	552	16,2	46	2,5	30	2,8
3.	Substation (MVA)	2.130	52,0	700	41,9	1.210	14,5	90	6,1	150	8,8
4.	Distribution System										
	- Distribution Substation (MVA)	373	4,5	602	6,6	583	6,4	579	6,4	554	6,1
	- Medium Voltage Grid (kms)	1.017	373	1.304	38,9	1.403	41,5	1.534	44,2	1.668	46,6
	- Low Voltage Grid (kms)	933	8,3	860	7,7	778	6,9	682	5,9	538	4,5
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	157 4.675	0,9	170 5.000	1,4	204 6.600	2,0	190 6.000	2,0		
	- Medium Voltage Grid (kms)	350	7,3	460	10,7	440	11,3	422	11,9		
	- Low Voltage Grid (kms)	201	2,0	216	2,3	216	2,4	210	2,8		
			1.103,6		857,5		833,8		425,0		223,4

Recapitulation of Infrastructure and Investment Needs

Recapitulation of Infrastructure and Investment Needs
West Sumatera Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	1	200,3	286	334,4	0	301,7	220	248,8	200	75,6
2.	Power Transmission (kms)	232	114,4	902	32,2	0	0,4	14	0,4	0	1,4
3.	Substation (MVA)	170	27,6	530	11,4	60	4,6	60	5,9	90	8,4
4.	Distribution System										
	- Distribution Substation (MVA)	28	2,0	35	2,6	38	2,7	41	3,0	45	3,3
	- Medium Voltage Grid (kms)	226	6,0	270	7,1	280	7,4	297	7,8	315	8,3
	- Low Voltage Grid (kms)	334	4,0	344	4,1	359	4,3	382	4,5	407	4,8
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	166 7.225	1,1	112 6.150	1,7	80 7.450	1,5	80 7.450	1,8		
	- Medium Voltage Grid (kms)	305	6,42	316	9,4	301	10,1	301	10,6		
	- Low Voltage Grid (kms)	223	2,8	307	3,5	307	4,2	307	4,5		
			364,6		406,4		336,9		287,4		101,8

Recapitulation of Infrastructure and Investment Needs
RIAU Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	34	154,5	116	133,5	128	71,9	7	90,5	5	244,4
2.	Power Transmission (kms)	414	58,8	704	23,7	150	45,3	130	113,9	670	49,5
3.	Substation (MVA)	50	30,6	730	15,4	120	30,9	90	63,2	1.130	25,6
4.	Distribution System										
	- Distribution Substation (MVA)	52	4,9	56	5,4	62	6,0	73	7,0	83	7,9
	- Medium Voltage Grid (kms)	408	9,2	447	10,1	494	11,1	580	13,1	657	14,8
	- Low Voltage Grid (kms)	493	4,8	539	5,2	596	5,8	699	6,8	792	7,6
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	380 28.000	3,9	100 7.900	1,9	97 7.650	2,0	100 7.900	2,2		
	- Medium Voltage Grid (kms)	310	6,5	175	5,0	170	5,2	170	5,6		
	- Low Voltage Grid (kms)	389	4,4	200	2,6	190	2,6	180	2,7		
			277,6		202,8		180,8		304,9		349,9

Recapitulation of Infrastructure and Investment Needs
Riau Islands Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	17	59,8	28	81,7	34	63,2	52	40,3	0	-
2.	Power Transmission (kms)	0	-	0	3,6	0	21,6	158	33,8	112	10,5
3.	Substation (MVA)	0	-	0	1,4	0	4,0	90	2,3	0	1,0
4.	Distribution System										
	- Distribution Substation (MVA)	12	1,1	13	1,2	14	1,4	17	1,6	19	1,8
	- Medium Voltage Grid (kms)	95	2,1	103	2,3	114	2,6	134	3,0	152	3,4
	- Low Voltage Grid (kms)	113	1,1	123	1,2	136	1,3	160	1,5	181	1,7
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)										
	- Medium Voltage Grid (kms)										
	- Low Voltage Grid (kms)										
			64,2		91,4		94,1		82,6		18,5

*Riau Islands Rural Electrification Including in Riau Province Rural Electrification Program

Recapitulation of Infrastructure and Investment Needs
BENGKULU Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	28	57,7	6	78,6	55	89,3	89	45,2	0	-
2.	Power Transmission (kms)	48	6,8	0	13,7	333	4,4	0	0,6	24	0,2
3.	Substation (MVA)	30	2,6	0	5,8	85	2,5	30	0,3	0	0,5
4.	Distribution System										
	- Distribution Substation (MVA)	7	0,5	7	0,6	8	0,6	9	0,7	10	
	- Medium Voltage Grid (kms)	67	1,2	73	1,3	80	1,4	88	1,6	97	
	- Low Voltage Grid (kms)	70	0,7	76	0,8	83	0,8	91	0,9	101	
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	149 11.300	1,5	176 8.800	2,6	180 9.050	2,8	184 9.200	3,0		0,8
	- Medium Voltage Grid (kms)	450	11,1	752	19,1	769	20,5	776	21,7		1,7
	- Low Voltage Grid (kms)	344	3,7	654	6,4	668	6,9	674	7,3		1,0
			85,9		128,8		129,3		81,3		4,2

Recapitulation of Infrastructure and Investment Needs

Recapitulation of Infrastructure and Investment Needs
JAMBI Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	0	49,8	28	95,7	55	62,9	55	78,9	0	131,3
2.	Power Transmission (kms)	0	8,1	185	14,0	130	46,4	170	84,3	420	29,5
3.	Substation (MVA)	0	30,2	560	20,8	60	26,9	780	15,2	90	12,0
4.	Distribution System										
	- Distribution Substation (MVA)	14	1,1	15	1,2	16	1,3	17	1,4	19	1,5
	- Medium Voltage Grid (kms)	149	2,7	163	2,9	177	3,2	189	3,4	203	3,6
	- Low Voltage Grid (kms)	144	1,5	156	1,6	170	1,7	182	1,9	196	2,0
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	360 23.500	3,1	390 26.000	6,1	379 25.950	6,6	360 25.000	6,1		
	- Medium Voltage Grid (kms)	366	8,0	444	10,5	471	11,9	436	10,5		
	- Low Voltage Grid (kms)	319	2,5	564	5,0	535	5,3	57.149	5,0		
			106,8		157,7		166,3		206,6		179,9

Recapitulation of Infrastructure and Investment Needs
South Sumatera Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	328	439,6	30	673,8	555	984,7	630	827,7	750	476,7
2.	Power Transmission (kms)	227	60,5	501	80,8	293	120,6	890	98,0	167	148,5
3.	Substation (MVA)	270	48,4	1.520	44,2	60	66,7	1.215	106,2	90	232,8
4.	Distribution System										
	- Distribution Substation (MVA)	35	2,8	37		42		45		51	
	- Medium Voltage Grid (kms)	436	7,8	474		519		569		629	
	- Low Voltage Grid (kms)	367	3,8	395		433		475		527	
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	459 29.450	3,5	235 11.750	2,8	240 12.000	3,1	225 11.250	3,2		
	- Medium Voltage Grid (kms)	480	9,4	800	14,1	738	14,5	750	16,1		
	- Low Voltage Grid (kms)	323	3,7	575	6,9	611	8,1	553	8,1		
			579,5		822,6		1.197,7		1.059,2		858,0

Recapitulation of Infrastructure and Investment Needs
Bangka Belitung Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	105	61,2	14	67,4	14	56,1	60	28,5	0	-
2.	Power Transmission (kms)	50	10,5	140	14,1	400	3,8	0	-	0	-
3.	Substation (MVA)	190	5,2	0	5,3	90	2,3	0	2,3	60	2,1
4.	Distribution System										
	- Distribution Substation (MVA)	18	0,7	17	0,8	14	0,8	16	1,0	19	1,1
	- Medium Voltage Grid (kms)	283	3,4	190	2,3	187	2,2	226	2,7	232	2,8
	- Low Voltage Grid (kms)	322	2,6	295	2,4	250	2,1	285	2,3	326	2,7
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	96 7.100	0,6	115 11.650	1,8	105 9.050	1,6	130 11.600	2,2		
	- Medium Voltage Grid (kms)	292	6,6	336	8,1	365	9,3	345	9,7		
	- Low Voltage Grid (kms)	147	1,4	240	2,7	230	2,8	215	2,8		
			92,2		104,8		81,1		51,5		8,6

Recapitulation of Infrastructure and Investment Needs
LAMPUNG Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	255	176,1	55	277,9	24	324,5	275	184,8	0	-
2.	Power Transmission (kms)	161	12,8	280	9,2	80	11,7	190	49,8	150	121,4
3.	Substation (MVA)	80	8,7	120	11,6	210	13,1	240	9,3	180	6,0
4.	Distribution System										
	- Distribution Substation (MVA)	38	2,6	36	2,7	39	2,8	43	3,0	47	3,1
	- Medium Voltage Grid (kms)	181	2,3	141	2,1	134	2,0	130	1,9	125	1,8
	- Low Voltage Grid (kms)	327	4,7	296	5,1	308	5,5	325	6,1	345	6,7
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	230 16.500	2,6	102 8.250	2,7	76 6.350	2,4	52 4.100	1,9		
	- Medium Voltage Grid (kms)	370	8,1	420	13,4	227	8,7	205	9,5		
	- Low Voltage Grid (kms)	633	6,2	531	6,9	310	4,8	280	5,2		
			224,3		331,6		375,6		271,5		139,1

Recapitulation of Infrastructure and Investment Needs

Recapitulation of Infrastructure and Investment Needs
West Kalimantan Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	0	159,7	196	264,4	88	163,1	158	81,4	30	50,9
2.	Power Transmission (kms)	112	49,8	1.080	22,5	280	5,4	6	19,0	180	31,8
3.	Substation (MVA)	60	20,3	400	11,4	90	5,3	90	6,7	60	9,4
4.	Distribution System										
	- Distribution Substation (MVA)	39	2,8	39	2,8	38	2,7	36	2,6	39	2,8
	- Medium Voltage Grid (kms)	475	12,6	514	13,6	545	14,4	578	15,3	612	16,2
	- Low Voltage Grid (kms)	586	6,9	633	7,5	671	8,0	712	8,4	754	9,0
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	197 10.075	1,4	48 2.425	0,7	47 2.300	0,8	47 2.400	1,0		
	- Medium Voltage Grid (kms)	348	8,9	553	16,1	511	17,4	468	17,1		
	- Low Voltage Grid (kms)	221	5,4	625	9,1	590	10,0	645	11,8		
			267,8		348,1		227,1		163,3		120,0

Recapitulation of Infrastructure and Investment Needs
Central Kalimantan Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	16	145,8	34	141,3	170	158,8	120	236,6	100	141,4
2.	Power Transmission (kms)	346	31,5	606	20,1	304	7,5	2	7,6	240	2,3
3.	Substation (MVA)	60	5,6	60	4,5	30	4,6	60	3,9	60	1,0
4.	Distribution System										
	- Distribution Substation (MVA)	14	2,8	13	2,7	11	2,2	12	2,4	12	2,6
	- Medium Voltage Grid (kms)	290	7,6	277	7,3	225	5,9	241	6,3	258	6,8
	- Low Voltage Grid (kms)	247	2,9	236	2,8	193	2,3	207	2,5	221	2,6
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	131 7.300	1,2	158 8.850	2,8	139 7.650	2,6	137 7.850	2,8		
	- Medium Voltage Grid (kms)	271	7,9	678	25,1	508	21,6	417	17,1		
	- Low Voltage Grid (kms)	110	2,8	91	2,4	68	2,0	46	1,5		
	- Diesel Power Plants (Unit/kW)										
			208,3		208,9		207,5		280,8		156,7

Recapitulation of Infrastructure and Investment Needs
South Kalimantan Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	130	115,4	14	138,8	104	122,5	100	67,1	65	19,5
2.	Power Transmission (kms)	248	16,4	298	8,0	0	9,3	213	2,8	0	1,9
3.	Substation (MVA)	60	4,0	0	2,2	30	1,8	0	3,9	90	4,5
4.	Distribution System										
	- Distribution Substation (MVA)	35	7,2	33	6,8	28	5,7	30	6,1	32	6,5
	- Medium Voltage Grid (kms)	725	19,1	693	18,3	562	14,8	602	15,9	645	17,0
	- Low Voltage Grid (kms)	725	7,5	602	7,1	492	5,8	527	6,3	564	6,7
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	131 7.300	1,3	140 7.000	2,0	140 7.250	2,1	150 8.250	2,5		
	- Medium Voltage Grid (kms)	186	5,2	275	8,0	260	8,1	250	8,3		
	- Low Voltage Grid (kms)	143	2,1	100	3,0	109	4,1	105	4,3		
			178,1		194,2		174,2		117,1		56,2

Recapitulation of Infrastructure and Investment Needs
East Kalimantan Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	0	335,7	393	434,1	335	214,0	107	46,3	0	72,9
2.	Power Transmission (kms)	180	34,2	487	30,3	544	10,4	0	7,2	220	2,2
3.	Substation (MVA)	150	10,9	120	10,1	180	4,9	60	4,6	60	4,8
4.	Distribution System										
	- Distribution Substation (MVA)	78	5,6	115	8,3	128	9,3	80	5,8	88	6,4
	- Medium Voltage Grid (kms)	482	8,2	663	11,3	787	13,4	764	13,0	872	14,9
	- Low Voltage Grid (kms)	373	3,9	516	5,4	596	6,3	542	5,7	603	6,4
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	92 9.200	1,1	49 7.840	1,2	54 8.640	1,3	50 17.600	2,7		
	- Medium Voltage Grid (kms)	195	6,0	190	7,6	196	7,7	228	9,6		
	- Low Voltage Grid (kms)	88	1,2	33	0,5	52	0,8	40	0,6		
			406,9		508,8		268,1		95,6		107,5

Recapitulation of Infrastructure and Investment Needs

Recapitulation of Infrastructure and Investment Needs
North Sulawesi Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	50	117,9	59	152,6	92	118,2	80	50,4	16	12,6
2.	Power Transmission (kms)	152	2,1	4	1,8	40	1,4	32	0,3	0	-
3.	Substation (MVA)	190	5,7	70	4,4	0	4,4	90	4,6	40	3,4
4.	Distribution System										
	- Distribution Substation (MVA)	26	1,9	28	2,1	31	2,3	34	2,5	37	2,7
	- Medium Voltage Grid (kms)	144	2,5	139	2,4	147	2,5	160	2,7	175	3,0
	- Low Voltage Grid (kms)	232	2,5	247	2,6	271	2,9	296	3,1	306	3,2
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	70 5.500	0,7	112 6.050	1,9	115 5.775	2,1	111 5.625	2,2		
	- Medium Voltage Grid (kms)	150	5,2	194	8,4	193	9,2	182	9,5		
	- Low Voltage Grid (kms)	160	2,1	248	5,3	248	5,8	255	6,5		
			140,6		181,4		148,7		81,9		24,9

Recapitulation of Infrastructure and Investment Needs
GORONTALO Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	50	49,8	20	95,7	12	14,6	0	-	0	-
2.	Power Transmission (kms)	500	5,3	16	3,1	0	7,0	210	3,1	20	1,1
3.	Substation (MVA)	80	1,9	0	-	0	0,6	0	1,3	30	0,4
4.	Distribution System										
	- Distribution Substation (MVA)	6	0,5	7	0,5	8	0,5	8	0,6	9	0,7
	- Medium Voltage Grid (kms)	32	0,5	31	0,5	33	0,6	36	0,6	39	0,7
	- Low Voltage Grid (kms)	56	0,6	60	0,6	66	0,7	72	0,8	74	0,8
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	610 48.500	5,7	79 9.500	2,3	83 10.000	2,5	79 9.500	2,7		
	- Medium Voltage Grid (kms)	183	5,0	460	15,3	500	16,5	550	17,5		
	- Low Voltage Grid (kms)	180	1,8	450	11,2	500	12,1	520	12,8		
			71,1		129,4		55,0		39,2		3,6

Recapitulation of Infrastructure and Investment Needs
Central Sulawesi Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Pembangkit Tenaga Listrik (MW)	198	144,2	68	143,9	46	140,7	271	200,4	12	10,6
2.	Transmisi Tenaga Listrik (kms)	632	35,9	0	45,4	360	19,7	0	15,3	480	11,1
3.	Gardu Induk (MVA)	80	2,4	0	1,6	0	7,0	90	8,4	110	4,2
4.	Sistem Distribusi										
	- Gardu Distribusi (MVA)	16	1,2	18	1,3	19	1,4	21	1,5	23	1,7
	- JTM (kms)	76	1,3	73	1,2	77	1,3	84	1,4	92	1,6
	- JTR (kms)	145	1,5	154	1,6	169	1,8	184	1,9	191	2,0
5.	Listrik Perdesaan (2011-2014)										
	- Gardu Distribusi (Unit/kVA)	190 9.625	2,1	190 9.650	2,5	197 9.850	2,5	199 9.950	2,7		
	- JTM (kms)	300	8,3	556	15,3	569	16,5	575	17,5		
	- JTR (kms)	490	6,4	579	11,2	592	12,1	597	12,8		
			203,2		224,2		203,0		261,9		31,2

Recapitulation of Infrastructure and Investment Needs
South Sulawesi Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	234	268,4	204	234,3	150	264,2	208	246,9	200	218,1
2.	Power Transmission (kms)	370	25,4	313	6,6	70	0,8	2	0,6	2	8,4
3.	Substation (MVA)	460	13,3	150	10,4	180	8,0	180	8,6	150	10,5
4.	Distribution System										
	- Distribution Substation (MVA)	97	7,1	108	7,8	109	7,9	101	7,3	112	8,1
	- Medium Voltage Grid (kms)	934	15,9	968	16,5	895	15,3	806	13,7	889	15,1
	- Low Voltage Grid (kms)	1.103	11,6	1.189	12,5	1.137	12,0	1.058	11,2	1.167	12,3
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	331 21.700	3.3	170 10.400	2,6	187 10.500	3,0	242 14.100	4,3		
	- Medium Voltage Grid (kms)	438	8,6	204	5,1	212	5,7	235	8,6		
	- Low Voltage Grid (kms)	511	5,8	268	3,6	266	3,7	313	4,8		
	- Diesel Power Plants (Unit/kW)										
			359.4		299,4		320,6		306,1		272,6

Recapitulation of Infrastructure and Investment Needs

Recapitulation of Infrastructure and Investment Needs
West Sulawesi Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	8	9,6	0	-	0	12,3	14	17,1	0	-
2.	Power Transmission (kms)	0	-	0	1,3	0	2,9	90	0,9	0	-
3.	Substation (MVA)	60	0,5	0	0,3	0	0,8	30	0,3	0	-
4.	Distribution System										
	- Distribution Substation (MVA)	5	0,4	6	0,4	6	0,4	5	0,4	6	0,4
	- Medium Voltage Grid (kms)	37	0,6	39	0,7	36	0,6	32	0,5	36	0,6
	- Low Voltage Grid (kms)	57	0,6	62	0,6	59	0,6	55	0,6	60	0,6
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)										
	- Medium Voltage Grid (kms)										
	- Low Voltage Grid (kms)										
			11,7		3,3		17,7		19,7		1,7

*Rural Electricity western Sulawesi, including in south Sulawesi Rural Electricity

Recapitulation of Infrastructure and Investment Needs
South East Sulawesi Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	21	83,7	32	96,0	70	82,5	20	58,9	33	88,9
2.	Power Transmission (kms)	0	14,4	20	31,3	980	9,4	0	-	0	-
3.	Substation (MVA)	40	7,1	60	11,7	183	5,5	90	1,3	0	1,7
4.	Distribution System										
	- Distribution Substation (MVA)	14	1,0	15	1,1	15	1,1	14	1,0	16	1,1
	- Medium Voltage Grid (kms)	113	1,9	117	2,0	108	1,8	98	1,7	108	1,8
	- Low Voltage Grid (kms)	154	1,6	166	1,8	159	1,7	148	1,6	163	1,7
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	86 3.450	0,7	24 1.505	0,4	23 1.175	0,4	25 800	0,3		
	- Medium Voltage Grid (kms)	254	6,8	162	4,9	149	4,8	140	4,9		
	- Low Voltage Grid (kms)	187	2,1	23	0,3	37	0,5	54	0,7		
	- Diesel Power Plants (Unit/kW)										
			119,4		149,5		107,8		70,3		95,3

Recapitulation of Infrastructure and Investment Needs
West Nusa Tenggara Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	96	172,5	63	185,3	125	123,1	60	61,5	55	57,4
2.	Power Transmission (kms)	113	5,8	108	5,1	121	2,5	61	4,4	0	9,0
3.	Substation (MVA)	70	9,0	110	4,9	20	3,3	60	4,4	70	4,5
4.	Distribution System										
	- Distribution Substation (MVA)	36	4,8	30	4,1	16	2,1	17	2,3	18	2,4
	- Medium Voltage Grid (kms)	536	12,9	454	10,9	235	5,6	251	6,0	268	6,4
	- Low Voltage Grid (kms)	536	7,5	454	6,3	235	3,3	251	3,5	268	3,7
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	117 9.075	1,1	305 24.745	5,4	324 26.545	6,3	345 28.095	7,4		
	- Medium Voltage Grid (kms)	316	8,6	296	10,7	364	14,5	339	14,9		
	- JTR (kms)	140	2,9	430	10,0	343	8,9	345	9,8		
			225,1		242,8		169,7		114,1		83,5

Recapitulation of Infrastructure and Investment Needs
East Nusa Tenggara

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	95	99,0	32	46,8	27	42,2	45	56,1	11	34,1
2.	Power Transmission (kms)	294	2,4	0	4,5	0	10,2	326	3,1	0	-
3.	Substation (MVA)	170	3,2	0	2,0	30	3,6	60	1,3	0	1,1
4.	Distribution System										
	- Distribution Substation (MVA)	17	1,4	18	1,6	20	1,7	22	1,9	24	2,1
	- Medium Voltage Grid (kms)	237	5,8	243	6,0	248	6,1	252	6,2	254	6,2
	- Low Voltage Grid (kms)	273	2,9	282	3,0	292	3,1	300	3,2	307	3,3
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	241 14.550	2,0	309 15.450	3,4	360 18.000	4,2	365 18.250	4,5		
	- Medium Voltage Grid (kms)	583	15,0	495	14,8	542	17,1	546	18,3		
	- Low Voltage Grid (kms)	469	5,4	358	5,3	413	6,5	429	7,1		
			137,3		87,3		94,7		101,7		46,8

Recapitulation of Infrastructure and Investment Needs

Recapitulation of Infrastructure and Investment Needs
MALUKU Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	0	43,7	20	66,4	63	58,1	19	24,1	19	30,9
2.	Power Transmission (kms)	0	3,5	60	2,6	40	0,5	0	-	0	19,9
3.	Substation (MVA)	0	3,4	50	1,9	30	0,3	0	0,4	0	4,0
4.	Distribution System										
	- Distribution Substation (MVA)	11	0,9	10	0,8	11	0,9	11	1,0	12	1,1
	- Medium Voltage Grid (kms)	39	1,0	29	0,7	37	0,9	41	1,0	44	1,1
	- Low Voltage Grid (kms)	95	1,0	86	1,0	92	1,0	100	1,1	108	1,2
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	75 4.000	0,6	150 7.500	2,2	154 7.700	2,4	156 7.800	2,5		
	- Medium Voltage Grid (kms)	211	6,3	400	14,2	409	15,3	413	16,2		
	- Low Voltage Grid (kms)	50	1,0	449	9,7	459	10,4	463	11,0		
			61,5		99,6		89,8		57,2		58,1

Recapitulation of Infrastructure and Investment Needs
North Maluku Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	16	30,6	11	33,7	11	43,0	37	36,9	6	5,4
2.	Power Transmission (kms)	0	-	0	2,0	0	4,5	128	1,4	0	-
3.	Substation (MVA)	0	-	0	-	0	-	0	-	0	0,5
4.	Distribution System										
	- Distribution Substation (MVA)	6	0,5	5	0,4	6	0,5	6	0,5	7	0,6
	- Medium Voltage Grid (kms)	23	0,6	17	0,4	22	0,5	24	0,6	26	0,6
	- Low Voltage Grid (kms)	50	0,5	46	0,5	49	0,5	53	0,6	57	0,6
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	106 7.300	0,9	261 13.050	3,3	267 13.350	3,6	269 13.450	3,8		
	- Medium Voltage Grid (kms)	235	5,7	627	16,6	641	17,8	648	18,9		
	- Low Voltage Grid (kms)	166	1,9	504	9,4	516	10,1	520	10,6		
			40,6		66,4		80,5		73,3		7,8

Recapitulation of Infrastructure and Investment Needs
PAPUA Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	26	66,7	21	91,1	99	100,1	22	36,3	6	32,9
2.	Power Transmission (kms)	0	10,8	340	3,3	0	-	0	-	0	-
3.	Substation (MVA)	0	5,0	110	1,6	0	0,3	0	1,0	30	1,3
4.	Distribution System										
	- Distribution Substation (MVA)	16	1,4	19	1,6	21	1,8	24	2,0	22	1,9
	- Medium Voltage Grid (kms)	177	4,4	217	5,3	228	5,6	245	6,0	224	5,5
	- Low Voltage Grid (kms)	224	2,4	257	2,7	289	3,1	324	3,5	300	3,2
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	111 5.900	1,1	202 10.275	3,8	270 13.500	5,3	280 14.000	5,7		
	- Medium Voltage Grid (kms)	355	12,0	520	16,4	700	22,1	750	23,7		
	- Low Voltage Grid (kms)	162	1,8	496	4,7	740	7,0	820	7,8		
			105,6		130,5		145,3		86,0		44,7

Recapitulation of Infrastructure and Investment Needs
West Papua Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	23	25,1	7	42,7	28	37,9	18	17,6	1	17,5
2.	Power Transmission (kms)	0	2,9	90	1,7	0	1,9	60	0,6	0	-
3.	Substation (MVA)	0	1,0	0	2,6	40	0,3	0	0,2	0	0,8
4.	Distribution System										
	- Distribution Substation (MVA)	9	0,8	11	0,9	12	1,0	13	1,2	12	1,1
	- Medium Voltage Grid (kms)	101	2,5	124	3,0	129	3,2	139	3,4	127	3,1
	- Low Voltage Grid (kms)	128	1,4	147	1,6	165	1,8	185	2,0	172	1,8
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)										
	- Medium Voltage Grid (kms)										
	- Low Voltage Grid (kms)										
			33,7		52,5		46,0		24,9		24,3

**West Papua's rural electricity Electricity Included in rural Papua

Recapitulation of Infrastructure and Investment Needs

Recapitulation of Infrastructure and Investment Needs
BALI Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	0	242,5	130	172,8	460	95,0	0	37,6	0	92,4
2.	Power Transmission (kms)	158	51,9	207	15,1	10	37,7	10	80,9	440	24,1
3.	Substation (MVA)	150	7,0	60	15,5	210	33,4	330	46,4	1.120	16,0
4.	Distribution System										
	- Distribution Substation (MVA)	39	1,7	50	2,2	63	2,8	78	3,5	88	3,9
	- Medium Voltage Grid (kms)	184	4,2	237	5,3	294	6,6	355	8,0	388	8,7
	- Low Voltage Grid (kms)	120	0,8	188	1,2	259	1,6	334	2,1	372	2,3
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	155 15.780	1,3	65 6.750	1,2	52 8.350	1,8	141 21.450	3,4		
	- Medium Voltage Grid (kms)	84	2,4	153	3,3	104	3,9	60	2,5		
	- Low Voltage Grid (kms)	168	3,0	94	2,1	101	2,4	82	2,3		
	- Diesel Power Plants (Unit/kW)										
			314,8		218,8		185,2		186,7		147,4

Recapitulation of Infrastructure and Investment Needs
BANTEN Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	1.570	306,2	0	55,8	0	259,7	0	397,0	110	592,8
2.	Power Transmission (kms)	529	30,3	28	25,1	179	12,6	58	120,2	16	263,6
3.	Substation (MVA)	2.046	81,6	980	67,8	720	57,5	1.240	33,3	120	47,2
4.	Distribution System										
	- Distribution Substation (MVA)	177	16,6	166	14,3	167	14,9	172	14,8	209	18,1
	- Medium Voltage Grid (kms)	1.064	73,2	879	56,2	628	33,8	655	35,9	982	64,6
	- Low Voltage Grid (kms)	1.267	8,4	1.386	8,7	1.374	8,7	1.460	9,3	1.659	10,1
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	169 9.700	1,2	0 8.850	2,2	0 4.250	1,1	0 5.650	1,6		
	- Medium Voltage Grid (kms)	159	3,7	658	7,6	682	7,7	597	8,9		
	- Low Voltage Grid (kms)	276	3,0	421	7,5	475	9,8	392	9,4		
			524,2		245,1		405,9		630,3		996,4

Recapitulation of Infrastructure and Investment Needs
West Java Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	3.214	1.669,0	325	1.690,0	655	1.736,1	2.762	1.348,8	30	663,9
2.	Power Transmission (kms)	729	115,7	632	108,6	418	136,7	726	63,0	262	40,9
3.	Gardu Induk (kVA)	5.396	252,1	3.600	185,2	2.040	140,3	2.020	301,7	440	581,6
4.	Distribution System										
	- Distribution Substation (MVA)	362	56,3	244	37,9	283	44,0	247	38,3	315	48,9
	- Medium Voltage Grid (kms)	2.014	66,2	2.087	68,9	2.175	67,1	2.294	71,4	2.446	76,3
	- Low Voltage Grid (kms)	3.742	42,3	3.952	45,0	4.175	47,8	4.410	50,9	4.659	54,1
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	240 14.500	2,1	0 15.100	2,8	0 16.500	3,1	0 18.400	3,4		
	- Medium Voltage Grid (kms)	242	6,3	658	8,3	682	9,0	597	9,6		
	- Low Voltage Grid (kms)	480	6,4	421	4,4	475	4,8	392	5,0		
	- Diesel Power Plants (Unit/kW)										
			2.216,5		2.151,2		2.189,0		1.892,1		1.465,7

Recapitulation of Infrastructure and Investment Needs
Central Java Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	630	1.112,2	1.320	1.381,0	55	1.317,5	1.715	1.131,0	1.305	857,4
2.	Power Transmission (kms)	505	75,8	421	76,2	137	112,8	666	36,7	34	9,5
3.	Substation (MVA)	2.512	87,0	2.260	75,8	540	99,5	1.950	58,4	1.040	44,9
4.	Distribution System										
	- Distribution Substation (MVA)	302	12,0	209	8,3	235	9,3	255	10,1	278	11,0
	- Medium Voltage Grid (kms)	1.860	53,0	1.258	35,8	1.396	39,8	1.426	40,6	1.694	48,3
	- Low Voltage Grid (kms)	3.075	15,7	2.126	10,9	2.388	12,2	2.598	13,3	2.827	14,4
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	400 20.000	1,3	155 23.350	1,8	165 22.900	1,9	161 22.500	2,1		
	- Medium Voltage Grid (kms)	291	4,2	370	5,1	400	5,5	415	5,8		
	- Low Voltage Grid (kms)	368	3,9	350	6,2	380	6,8	504	7,2		
			1.365,1		1.601,1		1.605,4		1.305,3		985,6

Recapitulation of Infrastructure and Investment Needs

Recapitulation of Infrastructure and Investment Needs
Jogjakarta Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	0	-	0	-	0	-	0	-	0	-
2.	Power Transmission (kms)	10	0,2	0	-	0	0,4	0	0,9	10	0,3
3.	Substation (MVA)	120	1,9	0	2,5	120	20,5	0	43,9	800	20,8
4.	Distribution System										
	- Distribution Substation (MVA)	43	1,7	30	1,2	34	1,3	37	1,4	40	1,6
	- Medium Voltage Grid (kms)	232	6,6	157	4,5	174	5,0	178	5,1	211	6,0
	- Low Voltage Grid (kms)	440	2,2	304	1,6	342	1,7	372	1,9	405	2,1
5.	Rural Electrification (2011-2014)*										
	- Distribution Substation (Unit/ kVA)										
	- Medium Voltage Grid (kms)										
	- Low Voltage Grid (kms)										
	- Diesel Power Plants (Unit/kW)										
			12,7		9,7		28,9		53,2		30,7

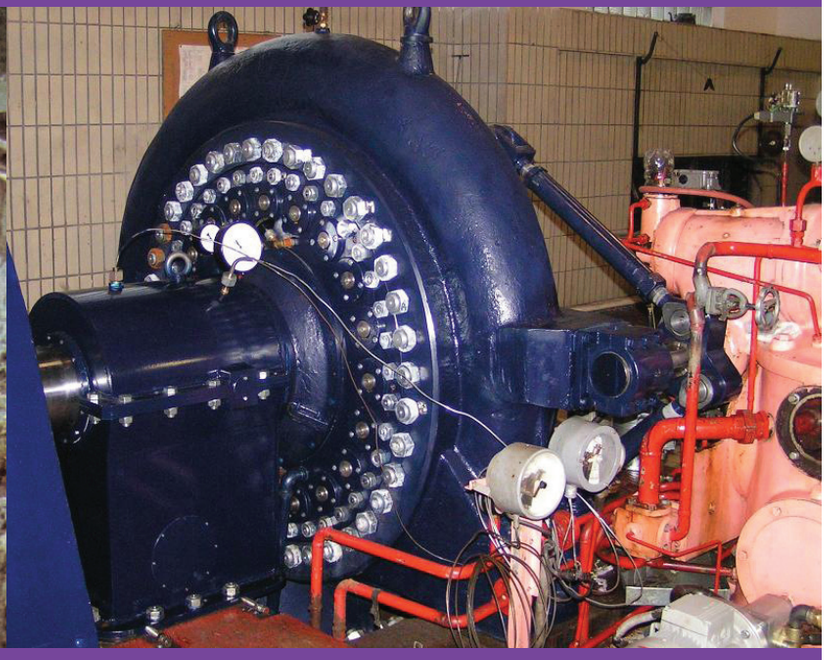
*Jogjakarta Rural Electrification Including In Central Java Rural Electrification Program

Recapitulation of Infrastructure and Investment Needs
East Java Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	1.290	954,8	815	789,9	755	614,0	675	452,0	0	354,7
2.	Power Transmission (kms)	93	84,8	643	36,8	136	20,5	160	21,1	155	9,6
3.	Substation (MVA)	1.902	170,6	3.410	127,0	1.940	107,3	1.510	91,4	1.390	64,9
4.	Distribution System										
	- Distribution Substation (MVA)	580	17,9	619	19,1	660	20,3	703	21,7	749	23,1
	- Medium Voltage Grid (kms)	1.624	34,5	1.732	33,6	1.847	35,8	1.968	38,3	2.097	40,9
	- Low Voltage Grid (kms)	1.990	18,9	2.123	20,1	2.263	21,5	2.412	22,9	2.569	24,4
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)	125 10.650	0,9	179 13.200	2,7	183 13.300	2,9	191 13.900	3,1		
	- Medium Voltage Grid (kms)	175	3,5	224	5,7	224	6,0	226	6,3		
	- Low Voltage Grid (kms)	256	3,6	315	5,3	335	5,9	337	6,2		
			1.289,4		1.040,1		834,1		663,0		517,5

Recapitulation of Infrastructure and Investment Needs
DKI JAKARTA Province

No	Description	2011		2012		2013		2014		2015	
		Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)	Volume	Investment (Mil USD)
1.	Power Plants (MW)	694	291,8	243	79,7	0	-	0	-	0	-
2.	Power Transmission (kms)	190	48,2	51	15,8	6	33,2	56	57,2	102	57,1
3.	Substation (MVA)	2.758	174,1	1.340	177,6	1.360	138,1	1.420	136,3	1.020	182,9
4.	Distribution System										
	- Distribution Substation (MVA)	371	25,1	391	26,4	377	25,4	408	27,6	488	32,9
	- Medium Voltage Grid (kms)	1.657	156,2	1.123	109,4	407	50,8	407	54,0	1.190	127,4
	- Low Voltage Grid (kms)	2.160	6,6	2.427	6,4	2.293	5,2	2.448	5,6	2.934	6,6
5.	Rural Electrification (2011-2014)										
	- Distribution Substation (Unit/ kVA)										
	- Medium Voltage Grid (kms)										
	- Low Voltage Grid (kms)										
	- Diesel Power Plants (Unit/kW)										
			702,0		415,3		252,8		280,7		406,9



MINISTRY OF ENERGY AND MINERAL RESOURCES
THE REPUBLIC OF INDONESIA

INVESTMENT OPPORTUNITY IN MINERALS AND COAL MINING

Ministry of Energy and Mineral Resources
Jakarta, February 2011

1 INTRODUCTION

1.1. Background Information

Most mineral and coal resources spread out and limited in availability are non renewable. These resources are vital raw materials supply of development of domestic basic and heavy industries, primary and secondary industries. The functions of these resources are prime mover development of a country as foreign exchange earning, work opportunity, local community development, investment and so forth.

In line with demand for investment guidelines in national mineral and coal mining, it is important that the country to publish a book on investment opportunity in mineral and coal mining, taking care of correlation between national demand for mineralks and coal in a short and long run, as well as national defence and security including overall devopment program which is sustainable.

In addition to increase added value, investors are expected to process any metal minerals into metal products in Indonesia, by establishing owned smelters or using others'. In five years since 2009, it is prohibited for companies or investors to export raw materials of mining commodities. There are now a number of smelters such as PT. Smelting Gresik that refine copper concentrate of Freeport Indonesia and Newmont Nusa Tenggara, INCO and Aneka Tambang which refine nickel ores to nickel matte and ferronickel. Other smelters such as of PT Timah and Kobatin and other small scale smelters refine tin ores. The only producer of aluminium in Indonesia, Asahan Aluminium (Inalum) which is now in the process of contract extention with the government. Mandatory processing of mining commodities in Indonesia results in new investors interested in setting up smelters such as Nusantara Smelting Corp., National Aluminium Co., Jogja Magasa Mining Iron and Konsorsium Mangan which is planning to Stablish a smelter in Nusa Tenggara Timur. Government owned mining enterprise (BUMN), PT Aneka Tambang plans to develop five smelters and mineral refining plant, Feronickel (FeNi) in Halmahera, in cooperation with Jinchuan Group Ltd. & Hanson Grup, Chemical Grade Alumina (CGA) Tayan, Smelter Grade Alumina (SGA) Mempawah, steel factory in Kalimantan Selatan, in cooperation Krakatau Steel and Nickel Pig Iron (NPI) plant in Mandiodo (North Sulawesi). PT Timah, after being successful in tin solder plant in Riau, is finalising tin chemical plant in Cilegon, Banten. The total new investment projects has achieved around USD 10 billion.

Whereas coal as national energy resources has played the role, both for domestic demand and for export, for foreign exchange earnings. In 1998, Indonesia coal production achieved 61,3 million tons, while in 2009 has come to 254 million tons per year, or a four-time increase. In 2009 Indonesia coal production has become around 270 million tons. About 70% of the production is for export to foreign countries and 30% for domestic market. In the future domestic demand of coal continues to rise, which should be anticipated by the government.

The projection of energy until the year of 2025, in line with Presidential Instruction No. 5 for 2025, on National Energy Policy, the role of coal in energy mix continues to rise to 33%, including coal liquefaction of 2%. At the present time, contribution of coal in national enery mix remains at around 18%.

It is to be noted that coal belongs to non renewable natural resources. Indonesia coal resources currently avails at 104.75 billion tons and reserve of 20.98 billion tons or equivalent to 80 billion barrels oil BOE), of only 2% compared to world coal reserves.

In the future the role of coal continues to be more important that its uses, from upstream to downstream segments, should be taken care of. The Law of Mineral and Coal, stipulates that upstream and downstream business in coal should be integrated in order to intensify investment, government earnings, man power and other benefits for the country.

1.2. Legal Basis

To publish a Book on Investment Opportunity in Mineral and Coal Mining includes government policy and regulations of general mining and authorization of related agencies for development of minerals and coal, also government laws and regulations concerning environment, investment, space arrangement and forestry.

1.2.1 Legislation

a. Law No 4 of 2009 on Mineral and Coal Mining (UU Minerba)

Minerba Law is replacement of Law No 11 of 1967 concerning Main Stipulations of Mining. The Minerba Law exterminates contract schemes but make use of available contracts. Minerba Law provides more legal enforcement to mining operators and creates conducive climate in investment.

A number of aspects included in Minerba Law results in basic changes in mining practices in Indonesia, such as:

- Minerba Law brings about optimalization of Government Income Work areas (WP) which consist of Business Mining Areas (WUP), People Mining Areas (WPR) and Government Conservation Areas (WPN).
- Licencing schemes based on Minerba Law, consisting of Business Mining (IUP), Exploration and Production, Licence for People Mining (IPR),
- Special Licence (IUPK) for former government conservation areas, IUP and IUPK are available for domestic and by offering tender for foreign investors.
- IUP is offerd by tender. IUPK may be given at former WPN (WUPK)
- Clarification of authority of Central Government, Provincial and Regents/Cities scope areas.
- Mandatory in processing and refining should be done in Indonesia, as added value.
- Community development should be emphasized on wellfare of the peiople.
- For the sake of national, the government defines domestic market obligation (DMO) for mineral and coal.
- Mining companies with IUPK scheme should share net benefit after production of 4% to Central government and 6% to Local government.
- Sanctions are given for any violation.
- Change of contract (KK/PKP2B) might be possibly made.

b. Legislation for other sectors

- Law No 41 of 1999 o9n Forestry.
- Law No 25 of 2007 on Investment
- Law No 26 of 2007 on Space Arrangement
- Law No 27 of 2007 on Coastal Areas Management and small islands.
- Law No 32 of 2009 on Environment .
- Law No 23 on Railways
- Government Regulations No 56 of 2009 on Railways Implementation
- Government Rgeulations No 72 of 2009 on Traffic and Railways Transportation
- Law No 3 of 1965 on Traffic and Road Transportation
- Law No 17 of 2008 on Voyage
- Government Ragulations No 20 of 2010 on Transportation on Waters.
- Law No 36 of 2008 on the Fourth Changes of Law No 7 of 1983 on Income Tax.
- Law No 25 of 2007 on Investment

1.2.2 Regulation

1.2.2.1 Business Regulation

The government set up regulations for the implementation of business in Mineral and coal industry.

i. EMR (ESDM) Ministry Regulation No 28 of 2009 on Service Business

- The application of Parafigure 127 of Law No 4, 2009 on Mineral and Coal Mining, results in setting up EMR Regulations on the implementation of Service Business in Mining.
- Mining Service refers to supporting service related to Mining business activities.
- Mining Service Business related to stages of mining business.
- Non-core Mining Service Business related to service business other than services that support mining operations.
- Mining Business related to Mineral and Coal operations that include stages in general survey, exploration, feasibility study, construction, transportation, rocess and refining, distribution and sale as well as post mining.

ii. EMR (ESDM) Regulation No 34 of 2009 on the Emphasys of Supply of Mineral and Coal for Domestic demand

- To avoid shortage of Mineral and Coal and secure domestic supply of Mineral and Coal it is important to enforce EMR Regulations.
- Domestic users of Mineral and Coal include enterprises and individuals in Indonesia making business in Mineral and Coal as raw materials.
- Users of Mineral and Coal as raw materials include business in metal smelting, refining, non metal mineral and coal processing and rock processing.
- Users of Mineral and coal refers to the refining industries construction sector.
- Prices of Mineral and Coal refers to international index or market prices of Mineral and Coal produced by Mineral and Coal mining enterprises.

iii. EMR (ESDM) Regulation No: 0186 k/30/ MEM/2011 on authority of EMR Minister to the Director General of Mineral and Coal to give mining licence and letter of registration.

- IMining licence in transportation and sale is given if carried out inter provinces and countries;
- Mining licence in process and refining of commodities originated from other provinces;
- Letter of Registration for carrying out non core mining services over the country.

1.2.3 Institutional

To efficiently develop Mineral and Coal in Indonesia, it is important to classify duties of each related institutions

a. Ministry of Energy and Mineral Resources and Coal

- To set up policy and regulations for development of mineral and coal in Indonesia upstream and downstream.
- In cooperation with other institutions in the development of Mineral and coal.
- To support implementation of technology, manpower and infrastructures for development of mineral and coal in Indonesia

b. Forestry Ministry

Authority of development forestry to cooperate in subsector of mineral and coal mining, upstream segment, such as cases in overlap areas.

c. Ministry of Environment

Authority of environment to cooperate in development of mineral and coal for sustainable environment in local areas

d. Ministry of Finance

Authority to encourage government income, tax and non-tax in mining sector

e. Ministry of Industry

Authority to encourage added value of mining products, especially secondary industries.

f. Ministry of Trade

Authority to encourage trade, both domestic and foreign, in mining sector

g. Ministry of Transportation

Sauthority to encourage development of infrastructures in mining sector.

h. Coordinating Board of Investment

To cooperate in mining sector for the opportunity and development of investment, upstream and downstream

i. Local Government

- In cooperation with central government to implement policy in local mining including supervision and monitoring of mining practices.
- To support development of infrastructures, manpower, technology, research and development.

j. Business Operators

- To make mining business in good corporate governance.
- To process and refine mineral and coal.
- To encourage development of infrastructur, technology and manpower.
- To submit report on production, refinery, and sale to the government.

OVERVIEW CONDITION OF MINERAL AND COAL

2

2.1. Potential of Mineral Resources and Coal

2.1.1. Resources and Reserves of Mineral

Indonesia has a vast mineral commodities, mineral resources consist of main metal such as bauxite, copper, tin, iron and nickel. Some excellent metals include manganese, chromite, lead, titanium, and zinc, also rare metal such as platinum, monazite, molybdenum and quick silver. Vast potential of these metals includes bauxite of 726 million tons, copper 69 million tons, primary iron of 382 million tons, and so forth.(Table 2.1).

Table 2.1.
Metal Mineral Resources and Reserves

No.	Commodities	Units	Resources		Reserve	
1.	Nickel	Milln.Ton	Ores : 1.878	Metal : 42	Ores :546,83	Metal : 8,7
2.	Tin	Milln.Ton	Ores : 95	Metal : 0,65	Ores :0,54	Metal : 0,33
3.	Bauxit	Milln.Ton	Ores : 726,58	Metal : 249,67	Ores :111,79	Metal : 65
4.	Copper	Milln.Ton	Ores : 2.384	Metal : 69,76	Ores : 4.299	Metal : 42,85
5.	Primary Gold	Thous. Ton	Ores : 1.980.234,64	Metal : 4,2	Ores : 5.117.034,40	Metal : 4,3
6.	Alluvial Gold	Thous. Ton	Ores : 1.688.652,45	Metal : 0,14	Ores : 16.789	Metal : 0,0038
7.	Silver	Milln.Ton	Ores : 616,09	Metal : 0,5	Ores: 4.773,05	Metal : 0,026
8.	Iron sand	Milln.Ton	Ores : 1.014,79	Metal : 132,91	Ores : 4.732	Metal : 2,41
9.	Manganese	Milln.Ton	Ores : 10,62	Metal : 5,78	Ores : 0,93	Metal : 0,59
10.	Air Raksa	Ton	75,91		-	
11.	Laterit iron	Milln.Ton	Ores : 1.565,19	Metal : 631,6	Ores : 80,640	Metal : 18,08
12.	Primary iron	Milln.Ton	Ores : 382,24	Metal : 198,62	Ores : 1,85	Metal : 1,38
13.	Cobalt	Milln.Ton	Ores : 1.263,33	Metal : 1,4	Ores : 152,86	Metal : 0,22
14.	Plaser Chromite	Milln.Ton	Ores : 5,7	Metal : 2,4	-	-
15.	Primary chromite	Milln.Ton	Ores : 1,6	Metal : 0,75	-	-
16.	Molibdenum	Milln.Ton	Ores : 685	Metal : 0,21	-	-
17.	Monasit	Thous. Ton	Ores : 185,9	Metal : 10,5	Ores: -	Metal : 2,7
18.	Platina	Thous. Ton	Ores : 115.000	Metal : 13,03	-	-
19.	Zinc	Milln.Ton	Ores : 586,9	Metal : 6,78	Ores : 6,7	Metal : 0,97
20.	Lead	Milln.Ton	Ores : 74,9	Metal : 3,1	Ores : 1,6	Metal : 0,12
21.	Laterit titan	Milln.Ton	Ores : 741,2	Metal : 2,9	Ores : 2,7	Metal : 0,026
22.	Plkaser Titan	Milln.Ton	Ores : 71,3	Metal : 71,3	Ores : 1,4	Metal : 0,11
23.	Sediment iron	Milln.Ton	Ores : 23,7	Metal : 15,4	-	-

Source: Badan Geologi, 2010

Potential of Mineral Resources and Coal

Table 2.2.
Non metal mineral resources

No.	Commodities	Units	Resources
1.	Bentonit	Milln. Ton	551.1
2.	Dolomite	Milln. Ton	1,959.40
3.	Fosfat	Milln. Ton	18.9
4.	Gypsum	Milln. Ton	7.4
5.	Calcite	Milln. Ton	90.2
6.	Quartzite	Milln. Ton	3159
7.	Ocher	Milln. Ton	41.1
8.	Quartz sand	Milln. Ton	17,489.90
9.	Talk	Milln. Ton	3.1
10.	Zeolit	Milln. Ton	258.1
11.	Zircon	Milln. Ton	1
12.	Kaolin	Milln. Ton	732.8
13.	Pirofilit	Milln. Ton	104.8
14.	Diamond	Milln. Ton	0.1
15.	Kalsedon	Milln. Ton	1.7
16.	Onix	Milln. Ton	0.2
17.	Rijang	Milln. Ton	0.6
18.	Feldspar	Milln. Ton	7,411.20

Source: Badan Geologi, 2010

Vast resources and reserves of other minerals in Indonesia includes non metal minerals and rocks (Table 2.2. and Table 2.3).

Table 2.3.
Rocks resources

No.	Comodities	Units	Resources
1.	Pumice	Milln. Ton	621.4
2.	Limestone	Milln. Ton	253,585.60
3.	Diatomia	Milln. Ton	370.6
4.	Andesit	Milln. Ton	75,244.10
5.	Slate	Milln. Ton	1,943.70
6.	Diorit	Milln. Ton	7,629.30
7.	Gabro/Peridotit	Milln. Ton	8,336.90
8.	Granite	Milln. Ton	52,468.80
9.	Granodiorit	Milln. Ton	371.00
10.	Marble	Milln. Ton	436.10
11.	Trass	Milln. Ton	3,885.80
12.	Clay	Milln. Ton	29,517.90
13.	Obsidian	Milln. Ton	66.80
14.	Perlit	Milln. Ton	1,205.60
15.	Toseki	Milln. Ton	224.40
16.	Trakhit	Milln. Ton	4,124.30
17.	Ametis	Milln. Ton	0.008668
18.	Ornamental Stone	Milln. Ton	108.30
19.	Jasper	Milln. Ton	0.0006

Source: Badan Geologi, 2010

Some non metal minerals have increased production compared to that of previous years except quartz sand and limestone which decrease in reserve. Production rate of non metal mineral around 0,13% of total resources, however in future non metal mineral becomes a vast potential for national development.

2.1.2. Coal Resources and Reserves

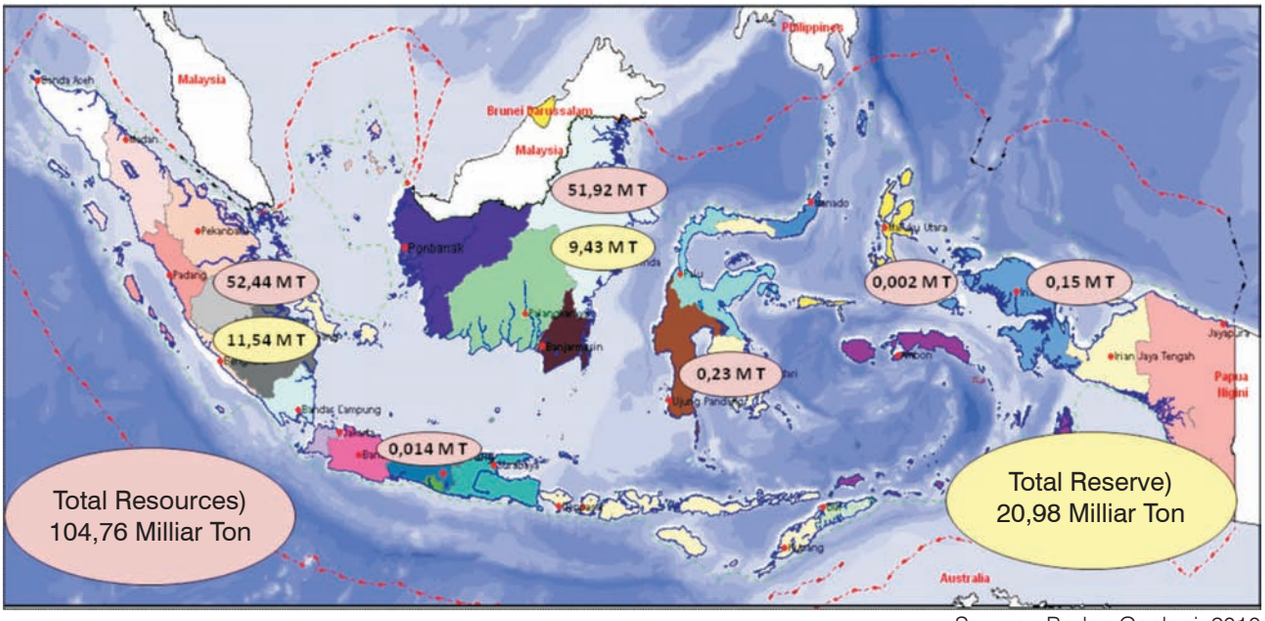
Based on intensive exploration, both by the government and private sectors, coal resources in Indonesia achieves 104.75 billion tons. Of which 22.2 billion tons measured and 15.7 billion tons indicated. While 20.98 billion tons reserve ready for mining (Table 2.1).

Around 38 % of coal reserve of Indonesia dispersed in Kalimantan, 61 % in Sumatera and the remaining in Jawa, Sulawesi and Papua. In South Sumatera, East Kalimantan and South Kalimantan vast potential of coal of about 47 billion tons, 37 billion tons and 12 billion tons respectively. In Papua, a little information and survey made, however, based on current gelogical data, a huge potential of coal identified.

Table 2.4.
Indonesia Coal Resources and Reserves (million tons)

No.	Areas	Resources					Reserves (million tons)		
		Hipothetical	Indicated	inferred	Measured	Total	Propable	Proven	Total
1.	Jawa	5.47	6.65	0	2.09	14.21	0	0	0
2.	Sumatera	20,153.72	13,949.29	10,634.37	7,699.18	52,436.56	10,644.45	904.8	11,549.25
3.	Kalimantan	14,377.52	18,050.73	5,136.65	14,535.91	52,100.80	2,833.15	4,624.57	7,457.72
4.	Sulawesi	0	146.92	33.09	53.09	233.1	0.06	0.06	0.12
5.	Maluku	2.13	0	0	0	2.13	0	0	0
6.	Papua	89.4	64.02	0	0	153.42	0	0	0
	Total	**34,628.24**	**32,217.61**	**15,804.11**	**22,290.27**	**104,940.23**	**13,477.66**	**5,529.43**	**19,007.09**

Source: Badan Geologi, 2010



Source : Badan Geologi, 2010

Figure 2.1.
Resources and reserves of coal

Potential of Mineral Resources and Coal

According to physical and chemical structures, Indonesia coal belongs to between bituminous and lignit, as shown in calorific value, water content and fly ash content, and low content of sulphur and ashes. Most Indonesia coal belongs to steam coal, which is good for fuels in steam electric generation, cement plants, and foundry industry.

Generally, Indonesia coal' scalorific value of 4400-7750 kkal/kg, water content of 2-35%, ash content of 1-15%, fly ash content of 11-45.4% and sulhphur of less 1%.

Coal of high calorific value but low water content available in East Kalimantan, South Kalimantan and Ombilin resulting in very high prices for export.

Table 2.5.
Quality of Coal Resources in Indonesia (million ton)

Quality	Resources (million ton)					Jumlah	Reserves (million ton)	
	Hipothetical	Predicted	Identified	Measured	Total	%	Indicated	Proven
Low calorie	5,057.69	6,632.83	3,721.16	5,815.96	21,183.05	(20,18%)	7603.88	1105.40
Medium calorie	27,806.97	18,909.50	11,007.87	12,001.69	69,734.03	(66,29%)	7063.52	2904.41
High calorie	1,924.58	6,173.76	1,071.36	4,050.91	13,021.50	(12,57%)	861.73	1410.44
Very high calorie	101.65	482.93	5.80	422.81	1,001.64	(0,96%)	73.29	109.18
Source : Badan Geologi KESDM, 2010								
TOTAL	34,890.89	32,199.02	15,806.19	22,291.37	104,940.22	100.00	15602.42	5529.43

Notes :
1. Depth limit 100 m
2. Quality based on calorific value
(Presidential Decision No. 13 of 2000, renewed by Government Regulation (PP) No. 45 of 2003)
   a. Low calorie < 5100 kal/gr
   b. Medium calorie 5100 - 6100 kal/gr
   c. High calorie > 6100 - 7100 kal/gr
   d. Very high calorie > 7100 kal/gr
3. Classification of coal resources
   a. Measured
   b. Identified
   c. Predicted
   d. Hipothetical
4. Reserves category
   a. Proven
   b. Probable
5. Production
   of 1990 - 2005

Source: Geologi Agency, 2010

Notes : Calorific value of coal based on coal resources.

2.1.3. Exsploration and Exploitation

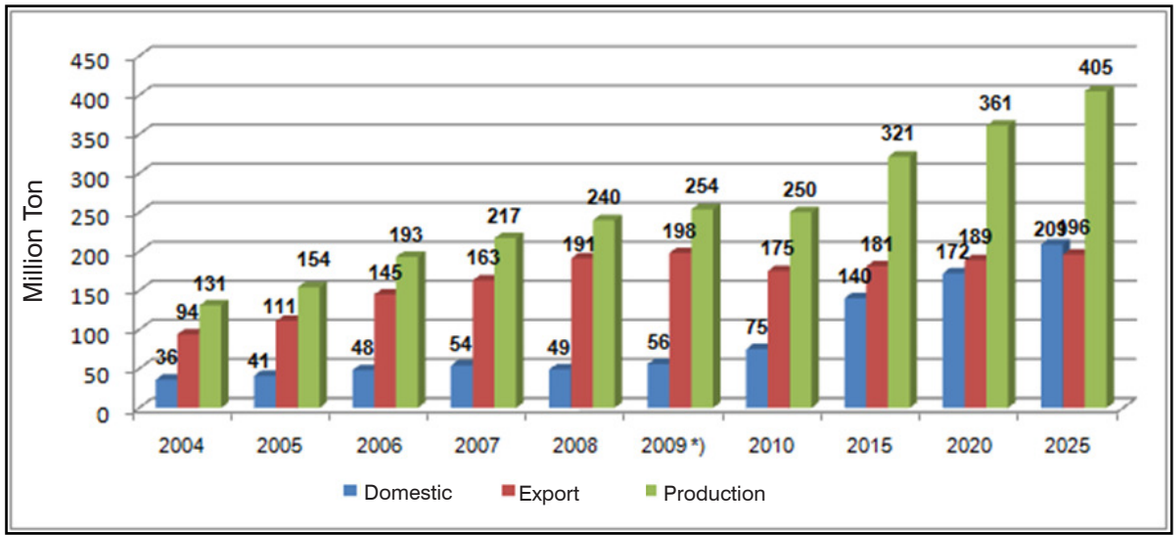
Indonesia coal mining business is carried out by four groups of mining operators, namely: a) State Ownd Enterprise (BUMN): PT Tambang Batubara Bukit Asam (Persero); b) Coal Business Mining Contract (PKP2B) Generation I, II and III; c) National Private Mining Holders (KP)/ Business licence (IUP); and d) Cooperative Units (KUD). Number PKP2B contractors of 47 companies in production, 12 in construction, 12 in feasibility study, and 5 in exploration.

In addition, there are a number of local KP/IUP business which emerged after autonomous local areas, since 2001, namely as a result of Government Regulation (PP) 75 of 2001 on Second Change of Government Regulation (PP) No. 32 of 1967 on Implementationb of Law UU No. 11 of 1967 on Main Stipulations of Mining, derived from Law 22, 1999 which was modified to become Law of 2004 on Local Government.

In 2009 Indonesia coal production batubara achieved 254 million tons, of which export of 198 million tons and domestic demand of 56 milli9on tons. Coal export presently achieves over 75% of total Production per year (Figure 2.2).

Table 2.6.
Status of PKP2B Mining Business (December 2010)

	Total	Terminated	Active	General Study	Expl	FS	Construction	Production
Generation I	1	1	0	0	0	0	0	0
Generation II	16	13	3	0	0	0	0	3
Generation III	13	11	2	0	0	0	0	2
Generation IV	95	88	7	0	0	2	2	3
Generation V	7	3	4	0	1	2	0	1
Generation VI	65	50	15	3	4	3	3	2
Generation VII	39	28	11	0	2	7	1	1
Total	236	194	42	2	7	14	7	12



*) Coal Production (Realization 2004-2009 and Plan 2010-2025), realization in 2010

Figure 2.2.
Realization and Plan of Coal Production and Sale

2.2. Condition of Mineral Industry

2.2.1. Structure of Mineral Industri and Coal

Structure of Mineral Industry reflects business process from upstream to downstream segments. Beginning with geological operations related to resources, primary industry which relates exploration and exploitation (upstream) and refining and distribution and sale (downstream).

The final use explains use of commodities for various industries, transportation, households, as well as commercials.

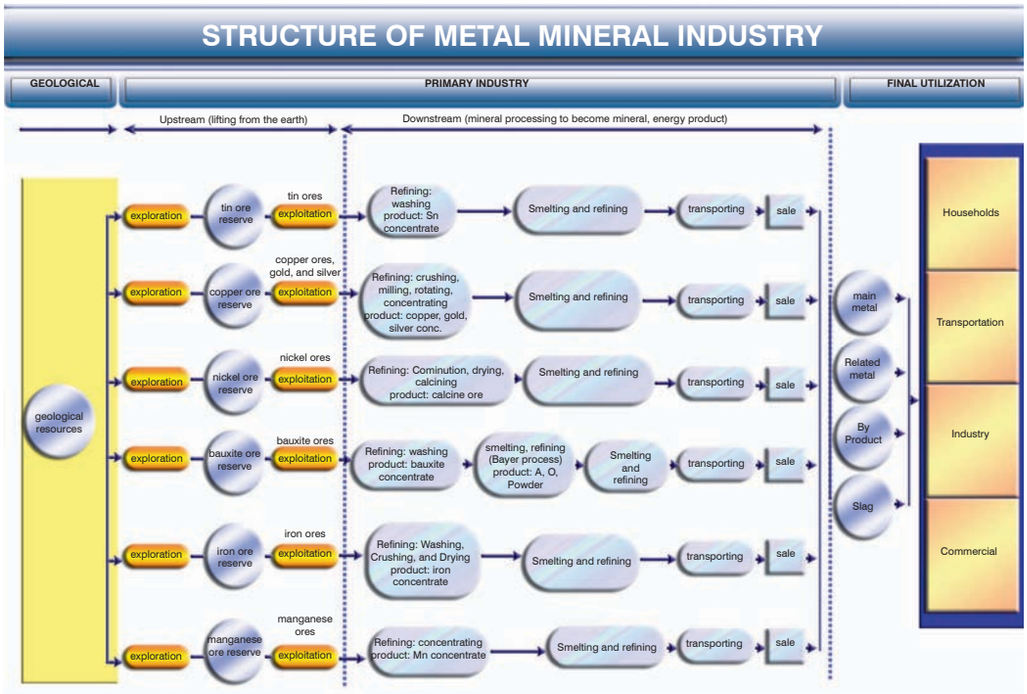


Figure 2.3
Structure of Metal Mineral Industry



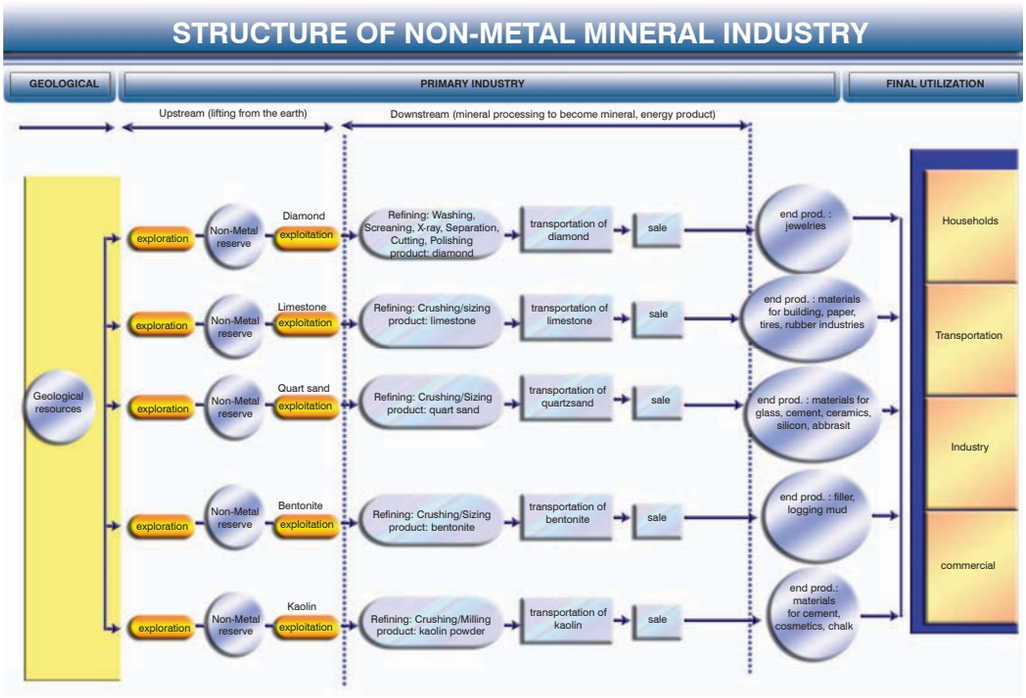


Figure 2.4.
Structure of Non-metal Mineral Industry

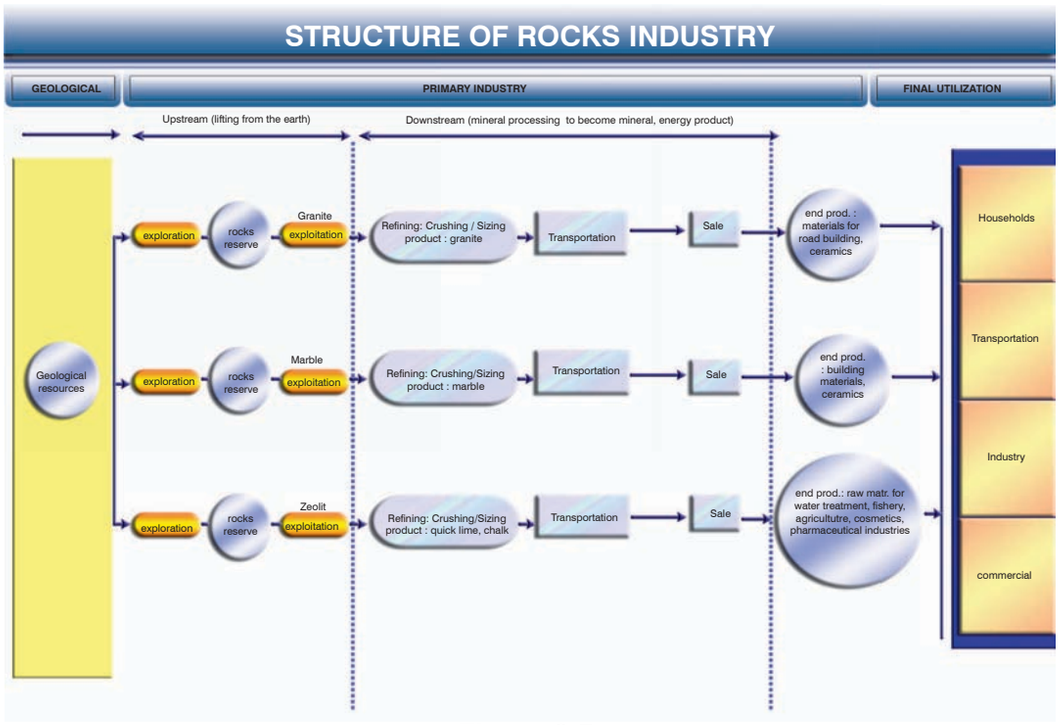


Figure 2.5.
Structure of Rocks Industry

Condition of Mineral Industry

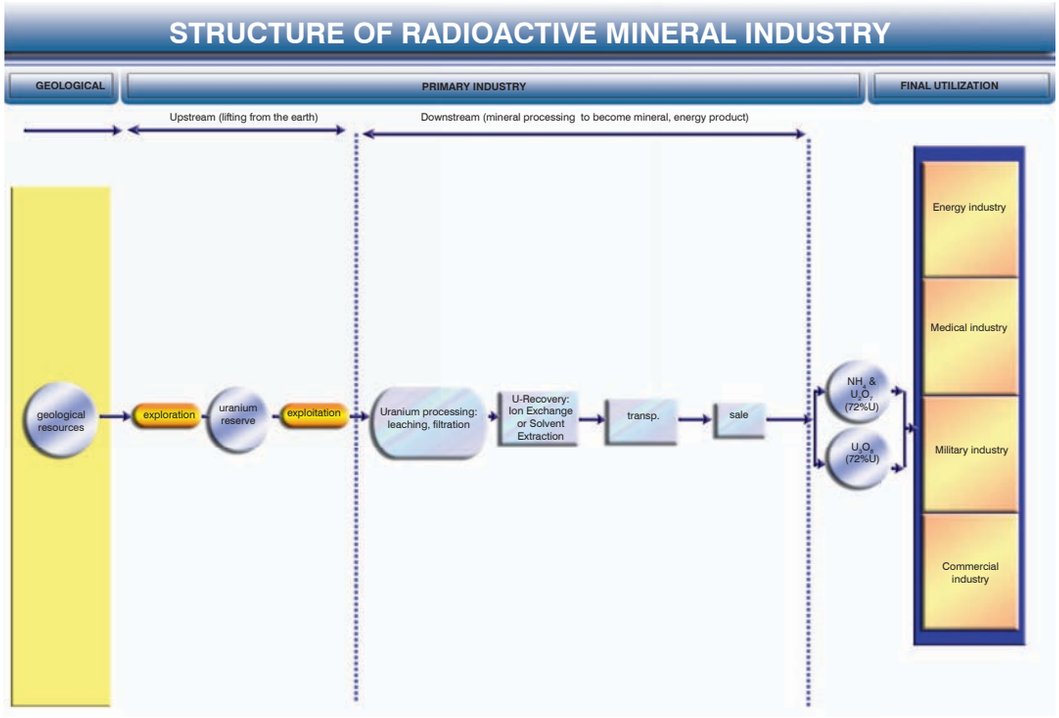


Figure 2.6.
Structure of Radioactuve Mineral Industry

2.2.2. Exploration and Exploitation

A number of 12 Work Contract (KK) in production, 6 in construction and 14 in feasibility study. Work Contract Business dominates in mineral mining, particularly mineral mining.

Table 2.7.
Status of Work Contract in Mineral Mining (Desember 2010)

	Total	Terminated	Active	General Study	Expl	Feasibility Study	Konst	Construction
Generation I	1	1	0	0	0	0	0	0
Generation II	16	13	3	0	0	0	0	3
Generation III	13	11	2	0	0	0	0	2
Generation IV	95	88	7	0	0	2	2	3
Generation V	7	3	4	0	1	2	0	1
Generation VI	65	50	15	3	4	3	3	2
Generation VII	39	28	11	0	2	7	1	1
Total	**236**	**194**	**42**	**2**	**7**	**14**	**7**	**12**

Commodities in production such as copper, silver, gold, bauxite, and nickel (Table 2.8 and Table 2.9).

Table 2.8.
Main Mineral Production

NO	COMMODITY	UNITS	2008	2009
			Realisation	Predicted Realisation
1	Copper metal	ton	655.058	868.171
2	Gold	kg	64.391	105.404
3	Silver	kg	225.702	232.064
4	Tin metal	ton	71.607	105.000
5	Bauxite	mt	13.005.502	10.083.258
6	Iron ores	mt	4.503.142	4.044.348
7	Nickel ores	ton	10.634.452	10.847.141
8	Ni+Co in matte	ton	73.356	63.548
9	Nickel in feronickel	mt	17.566	17.917
10	Diamond	crt	27.688	N.a
11	Granite	m3	1.950.494	1.989.504

PT Galuh Cempaka Status in Care and Maintenance

Table 2.9.
Main Mineral for Export

NO	MINERAL	VOLUME	2008		2009	
			Realization		Predicted Realization	
			Volume	Value (USD milln)	Volume	Value (USD milln)
1	Copper	Thousand Ton	450,7	3.151,18	781,30	3.008,26
2	Gold	Ton	57,2	1.756,20	94,90	3.042,00
3	Silver	Ton	172,5	91,07	208,90	110,28
4	Tin	Thousand Ton	67,9	1.254,77	94,50	1.106,82
5	Bauxite	Thousand Wmt	12.480.312	168,48	9.074,90	163,35
6	Ni+Co Matte	Thousand Ton	74,1	1.561,18	57,20	635,64
7	Nickel ores	Thousand Wmt	8.622,5	537,85	9.762,40	608,96
8	Nickel in FeNi	Thousand Ton	17,1	1,27	16,10	1,19
9	Granite	M3	1.690.800,0	12,68	1.790.500,00	14,32
10	Diamond	Carrat	32.748,0	8,16	N.a	N.a
11	Iron ore (concentrate)	Thousand Ton	3.182,2	334,13	3.639,90	389,46

2.3. Condition of Coal Industry

2.3.1. Structure of Coal Industry

In paragraphs 102-103 of Minerba Law, owners of coal IUP and IUPK are liable for added value in mining processes and refining. Coal refining, based on Government Regulation (PP) No 23, 2010 on Implementation of Business in Mineral and Coal mining includes coal crushing, coal washing, coal blending,coal upgrading, coal briquetting, coal liquefaction, coal gasification, and coal water mixer.

Refining process in mining operations, presently,mostly in coal crushing, coal washing,coal blending which are meant to meet market demand, both domestic and overseas, whereas quality enhancement, briquetting, liquefaction and gassification remain on development stage. Total of low rank coal and medium rank reaches (86 %), Which needs quality replacement for strategic value to increase economic value of coal.

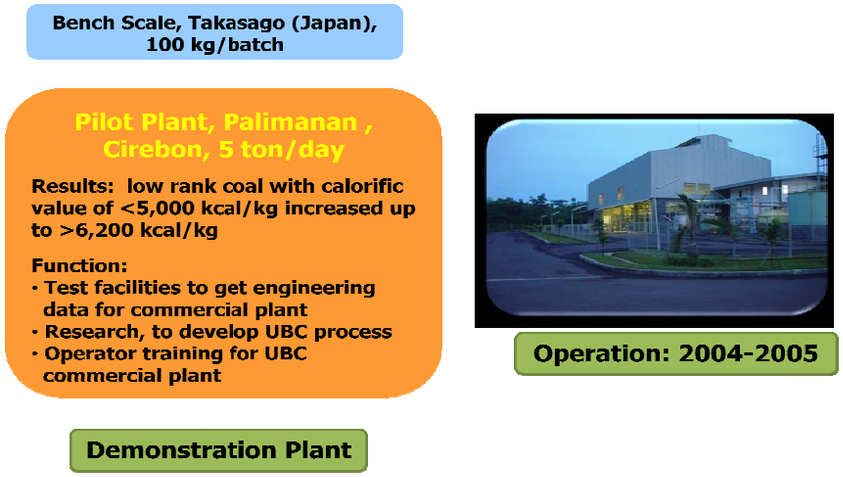


Figure 2.7.
UBC Plant in Palimanan, Cirebon

2.3.1.1. Enhancement of coal quality

Enhancement of low rank coal (< 5.000 kcal/kg) to medium rank and high rank (>6.000 kcal/kg) made by total moisture reduction. The enhancement of quality made using Up-grading Brown Coal (UBC) which is presently in demo-plant by R&D of Tekmira in Palimanan, Cirebon and PT Arutmin in Satui, South Kalimantan (Figure 2.3 and 2.4).

2.3.1.2. Coal Briquetting

Coal briqueting carried out by a number of companies such as : PTBA and private sector with production of 60 thousand tons per year, whereas installed capacity of plant 210 thousand tons. Production of coal briquetts is expected to gradually rise by 25% per year consisting of carbonised and non-carbonised. Coal briquettes may take the role as alternative energy replacing oil fuels or karosene in Jawa and other islands.PTBA as biggest produvcer of coal briquettes mainly carbonized.

Basically, coal briquettes as solid fuel with certain sizes and made of coal particles (kokas/semi kokas), pressurized for easy handling in usage.

As bituminous and sub-bituminous coal with fly matters and high water content, coal briquettes are non smoke, non smell and produced by carbonizing to minimise fly matters in order to be used for cooking .

In short, production process of coal briquettes are made by carbonizing.

- **With Carbonization Process**

Carbonisation is made with low rank coal such as lignit or sub bituminous. The objective of the proces is to increase solid content and eliminate part of fly matters so that semi kokas is produced with ideal fly matters content of 8% - 15% with sufficient calorific value above 6.000 kkal/kg. The process is done using kiln, where coal is carbonised at 600o –700oC for 6 – 8 hours.

Carbonization process runs well when the sizes of coal bigger than 2cm with recovery of around 50 %. Carbonisation process of coal size less than 2 cm will run well with sufficient supply of air through bottom of kiln.

- **Without Carbonisation**

Coal briquettes made of high calorie coal such as antrasit/semi antrasit, crushed coal at certain sizes is mixed with binding agent and additives then continued by molding process. To produce honey comb coal briquettes a carbonization process may be carried out.

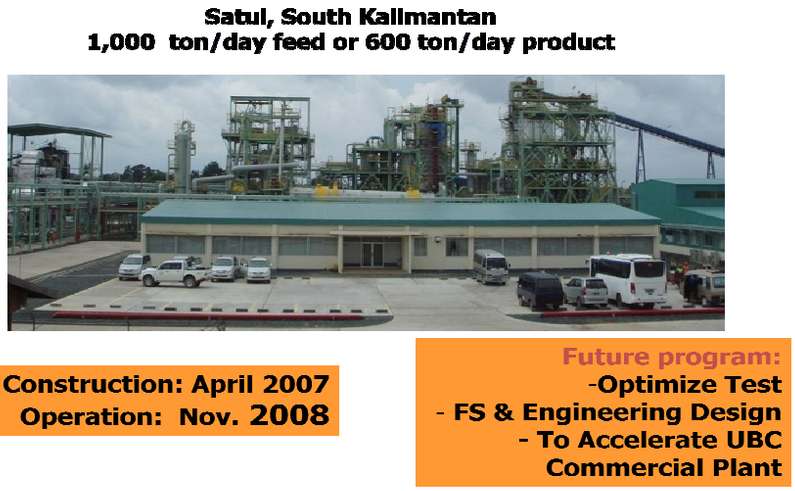


Figure 2.8.
Demo plant UBC in Satui, Arutmin, South Kalimantan

2.3.1.3. Coal liquefaction

Based on Presidential Regulations (Perpres) No.5 , 2006 on National Energy Policy and Presidential Instruction (Inpres) No.2 of 2006 on Supply amd Use of Coal as Alternative Fuels, the government targets of 2% (equivalent to 189.000 barel/per day) of national energy mix by 2025, from coal gasification.

Research on coal liuquefaction was mad at the beginning of 1990 usung Brown Coal Liquefaction (BCL) technology in cooperation with Japanese Team (Kobelco) for 10 years tahun (1992 – 2002) in 3 locations olignit coal (Banko - South Sumatera, Mulia – South Kalimantan and Berau – East Kalimantan). In further development, the government has an interest in SASOL technology as coal liquefaction technology for commercials with capacity of 160,000 barrel peer day in South Africa. Sound cooperation with South Africa strted in June 2008 when Indonesian Delegate chaired by Head Coordinating Board of Investment accompanied by Indonesian Ambassador for South Africa, with members from EMR (ESDM) Ministry, Coordinating Board of Investment (BKPM) and Indonesian Embassy in Pretoria visit SASOL Plant Dsynfuels International in Johannesburg. At furhter stage an initial discussion on location of k Coal-to-Liquid Plant in Indonesia with requirements of large water reservoir and good infrastructure. SASOL demanded incentives to be given by the government of Indonesia. On 3 December 2009, in London, BKPM signed an MOU on SASOL development in Indonesia followed by G to G being finalised by Ministry of Foreign Affairs. In its development coal liquefaction needs large coal mining areas with reserve of low rank coal of at least 4 billion tons.

2.3.1.4. Coal Liquefaction

Gasified coal technology was developed and available in market, and able to to produce required fuels for internal combustion engines such as Diesel Generator Unit (SPD) using dual-fuel system (PLTD). Using gasified coal in PLTD, energy efficiency is achieved and give less subsidy for diesel fuels in electric generation. Besides, using PLTD with gasified coal results in a better emission and quality of the environment as required; whereas the coal waste (fly ash) can be used to produce building bricks, filler and additive for tar (for road repair).

In reality, Indonesia owns a large potential Underground Coakl Gasifivation (UCG) for a number of purposes. UCG refers to utilization of coal using by in-situ conversion of of gas to become gas fuel for chemical industries. UCG proces ismndone nby steam injection and oxygen into underground coal seam through production well. A cavity will form and results in gasification and chemical processes where gas burns and produces gas. The gas is then transferred to the surface in gas processing unit. Part of the gas is used for electric power generation and as syngas for chemical such as hydfrogen, methanol an other chemicals (figure 2.6)

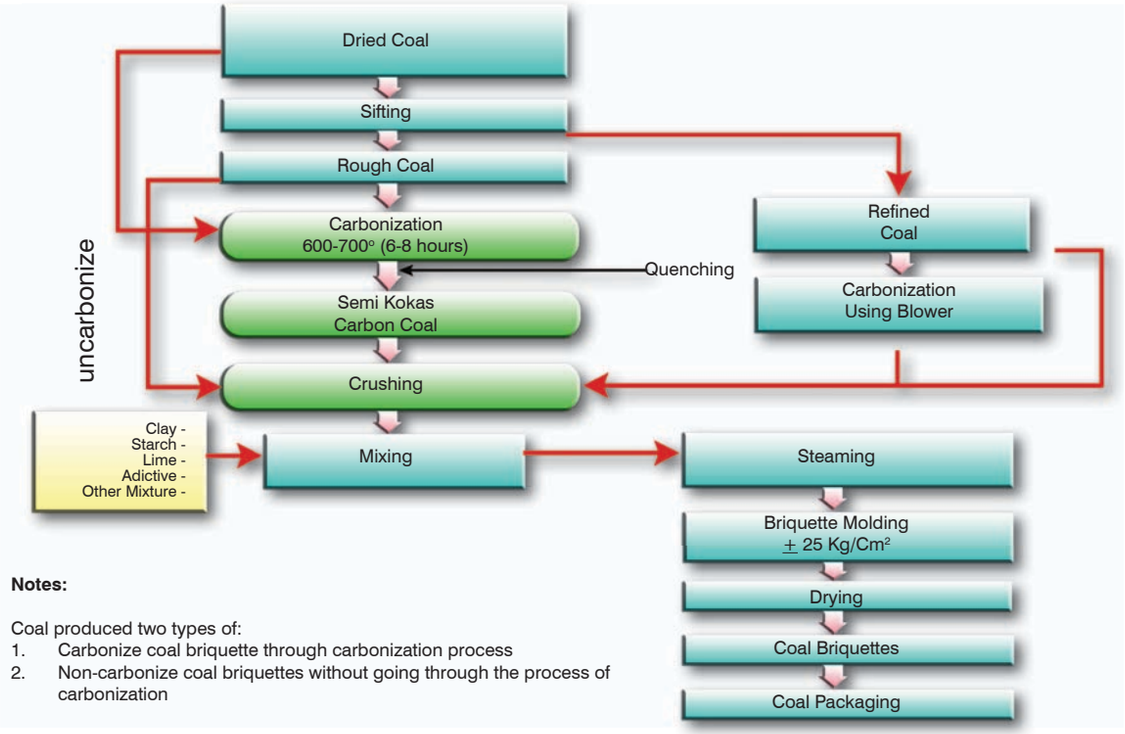


Figure 2.9.
Coal Briquette Production Flow using Carbonization

2.4. Condition of Coal Shipment

2.4.1. Coal Terminal

Coal products are shipped by land transportation (by railways or trucks) and river or sea (boats and ships). Coal shipment is carried out from Kalimantan (by sea and river) and Sumatera to Jawa.

2.4.2. Trading

Based on Law (UU) No 17, 2008 on Voyage, stipulates application of cabotage terms for domestic ship transportion, which includes coal shipment.

National coal production of 30% is for domestic market with capacity of shipment of only 40% using Indonesian flag ships. Shipment for export uses foreign ships, while Indonesian ships is below 10%.

Coal briquettes are mostly used by chicken farms and small industries.

There is presently a tendency of domestic market using more coal, especially supply for steam electric generation (PLTU) using coal which is included in the development acceleration of PLTU of 10.000 MW, stages I and II.

Figure 2.10
Indonesia Bulk Coal Terminal

3 OPPORTUNITY AND CHALLENGE INVESTMENT IN MINERAL AND COAL

3.1. Condition of Production and Sale Mineral and Coal

3.1.1 Mineral Production 2005 - 2010

No.	Commoditys	Units	2005	2006	2007	2008	2009	2010
1	Copper conct.	dmt	3,553,808	2,938,009	2,814,952	2,397,899	3,484,124	3,466,771
2	Copper	ton	1,063,849	817,796	796,899	655,046	998,530	878,376
3	Gold	kg	143,205	85,411	117,854	64,390	127,716	102,694
4	Silver	kg	328,749	261,398	268,967	226,051	326,773	266,492
5	Tin conct.	ton	78,404	80,933	66,137	53,228	46,078	41,070
6	Tin metal	ton	67,600	65,357	64,127	53,471	51,418	42,242
7	Bauxite	mt	1,081,739	1,501,937	1,251,147	1,152,322	783,097	104,692
8	Conv matte	ton	97,781	92,123	98,914	92,776	85,974	97,387
9	Ni+Co in matte	ton	77,471	72,782	77,928	73,356	68,228	77,186
10	Nickel ore	wmt	2,545,580	4,353,832	7,112,870	6,571,764	5,802,080	3,450,762
11	Ferro nickel	mt	20,036	-	-	-	-	-
12	Ni In Fe Ni	ton	3,985	14,474	18,532	17,566	12,550	9,634
13	Iron sand	wmt	32,203	5,489	-	-	-	-
14	Granite	ton	4,302,849	5,217,807	1,793,440	-	-	-
15	Diamond	crt	21,606	46,856	22,980	27,688	-	-

Source : Directorate of Minerals and Coal Enterprises 2010

3.1.2 Domestic Mineral Sale 2005-2010

No.	Commodity	Units	2005	2006	2007	2008	2009	2010
1	Copper	ton	-	-	-	216,761	240,782	227,812
2	Gold	kg	1,724	1,882	-	15,216	29,776	22,054
3	Silver	kg	11,985	12,967	-	58,392	70,397	62,804
4	Tin metal	ton	974	1,927	-	747	-	-
5	Bauxite	mt	-	-	-	-	-	-
6	Ni+Co in matte	ton	-	-	-	-	-	-
7	Nickel ore	wmt	-	-	-	-	-	-
8	Ferro nickel	mt	-	-	-	-	-	-
9	Ni In Fe Ni	ton	-	-	-	-	-	-
10	Iron sand	wmt	23,267	6,051	-	-	-	-
11	Granite	ton	155,507	455,778	30,049	-	-	-
12	Diamond	crt	-	-	-	-	-	-

Source : Directorate of Minerals and Coal Enterprises 2010

3.1.3 Mineral Sale for Export 2005-2010

No.	Commodity	Units	2005	2006	2007	2008	2009	2010
1	Copper	ton	1,054,778	816,181	785,552	450,661	698,190	597,231
2	Gold	kg	140,321	85,176	119,637	57,475	102,081	76,421
3	Silver	kg	306,603	244,144	268,051	172,484	303,346	197,212
4	Tin metal	ton	66,920	61,422	63,679	50,198	55,355	208,473
5	Bauxite	mt	1,039,380	1,536,542	964,282	893,088	445,662	164,498
6	Ni+Co in matte	ton	77,218	72,879	77,838	74,030	67,782	77,035
7	Nickel ore	wmt	2,688,477	4,309,134	6,907,459	5,342,924	4,901,699	2,760,344
8	Ferro nickel	mt	24,463	-	-	-	-	-
9	Ni In Fe Ni	ton	4,930	13,389	17,548	17,025	14,191	9,303
10	Iron sand	wmt	-	-	-	-	-	-
11	Granite	ton	3,856,074	5,160,623	684,948	-	-	-
12	Diamond	crt	24,075	47,039	10,411	32,748	-	-

Source : Directorate of Minerals and Coal Enterprises 2010

3.1.4 Coal Production 2005 – 2010

No.	Company	2005	2006	2007	2008	2009	2010	Total
	State owned company (BUMN)							
1	Bukit Asam	8,559,124.00	8,665,526.00	8,604,709.00	10,086,509.00	10,828,930.00	11,913,441.00	58,658,239.00
2	Bukit Asam - Ombilin	47,511.00	1,955.68	3,904.00	51,219.00	1,770.00	5,272.00	111,631.68
3	Bukit Asam - Tanjung Enim - Antrasit	-	-	-	-	-	-	-
	Sub Total	8,606,635.00	8,667,481.68	8,608,613.00	10,137,728.00	10,830,700.00	11,918,713.00	58,769,870.68
	CONTRACTOR							
1.		-	-	-	-	-	-	-
2.	Adaro Indonesia, PT	26,686,197.00	34,368,053.00	36,037,866.00	38,482,461.00	40,590,189.00	38,986,574.00	215,151,340.00
3.	Allied Indo Coal, PT	-	-	52,456.91	-	-	-	52,456.91
4.	Antang Gunung Meratus, PT	1,028,511.62	118,184.88	197,240.72	378,175.84	548,801.40	685,585.21	2,956,499.67
5.	Arutmin Indonesia, PT	16,756,700.00	16,316,240.00	15,394,067.00	15,701,501.00	19,298,463.00	20,426,166.00	103,893,137.00
6.	Asmin Koalindo Tuhup, PT	-	-	-	-	216,687.17	1,589,778.00	1,806,465.17
7.	Bahari Cakrawala Sebuku, PT	2,999,997.00	3,494,670.00	3,382,014.00	3,531,201.00	1,982,709.00	1,103,766.00	16,494,357.00
8.	Bangun Banua Persada Kalimantan, PT	-	220,155.99	298,368.10	346,467.28	254,801.40	556,206.38	1,675,999.14
9.	Baramarta, PD	1,285,553.94	2,258,366.80	3,722,960.05	4,334,720.79	3,252,121.50	2,526,879.08	17,380,602.17
10.	Baramulti Suksessarana, PT	27,335.29	-	-	-	-	-	27,335.29
11.	Batualam Selaras, PT	-	-	-	-	-	41,741.83	41,741.83
12.	Baturona Adimulya, PT	-	-	-	-	-	280,107.26	280,107.26
13.	Berau Coal, PT	9,197,371.00	10,592,718.00	11,811,494.00	12,924,990.00	14,336,892.00	17,382,639.00	76,246,104.00
14.	Borneo Indobara, PT	-	550,889.63	-	1,219,460.13	1,182,669.11	1,118,005.03	4,071,023.90

Condition of Production and Sale Mineral and Coal

No.	Company	2005	2006	2007	2008	2009	2010	Total
15.	Dharma Puspita Mining, PT	-	-	-	-	-	-	-
16.	Firman Ketaun Perkasa, PT	-	-	-	-	311,671.74	494,016.54	805,688.28
17.	Gunung Bayan Pratamacoal, PT	3,926,610.00	5,155,686.00	4,532,431.00	4,459,095.00	4,142,230.74	4,053,369.50	26,269,422.24
18.	Indominco Mandiri, PT	7,448,845.00	10,301,606.00	11,452,621.00	10,797,761.00	12,396,126.00	13,101,774.00	65,498,733.00
19.	Insani Bara Perkasa, PT	-	80,292.88	122,718.82	760,759.74	1,007,973.94	2,004,598.42	3,976,343.80
20.	Interex Sacra Raya, PT	-	57,110.00	158,178.00	111,697.00	93,574.00	82,224.00	502,783.00
21.	Intitirta Primasakti, PT	-	-	-	-	-	-	-
22.	Jorong Barutama Greston, PT	3,028,935.00	3,091,645.00	2,631,985.00	2,419,454.00	3,132,616.00	456,522.00	14,761,157.00
23.	Kadya Caraka Mulia, PT	167,416.39	434,184.25	198,548.12	225,943.47	121,807.85	43,380.96	1,191,281.04
24.	Kalimantan Energi Lestari, PT	600,805.00	153,907.35	62,295.00	20,254.00	-	-	837,261.35
25.	Kaltim Prima Coal, PT	28,183,329.00	35,300,852.00	38,454,558.00	36,280,348.00	38,154,491.00	39,951,221.00	216,324,799.00
26.	Kartika Selabumi Mining, PT	1,035,136.43	1,108,889.47	341,572.47	207,844.34	-	187,315.00	2,880,757.71
27.	Kendilo Coal Indonesia, PT	-	-	-	-	-	-	-
28.	Kideco Jaya Agung, PT	18,125,043.00	18,911,954.00	18,889,931.00	21,900,596.00	24,692,299.00	26,428,452.00	128,948,275.00
29.	Lanna Harita Indonesia, PT	1,886,550.24	1,684,775.95	1,479,745.32	1,301,670.34	1,397,227.33	1,843,052.64	9,593,021.82
30.	Mahakam Source Jaya, PT	2,304,470.09	2,943,896.98	2,936,482.00	3,059,294.00	4,537,033.00	5,303,363.00	21,084,539.07
31.	Mandiri Intiperkasa, PT	1,081,728.02	1,165,287.39	1,735,951.57	1,983,839.00	2,451,357.26	2,653,911.34	11,072,074.58
32.	Mantimin Coal Mining, PT	-	-	-	-	-	-	-
33.	Marunda Graha Mineral, PT	824,004.78	1,380,719.24	847,407.46	1,443,221.08	932,684.39	1,340,569.57	6,768,606.52
34.	Multi Harapan Utama, PT	896,588.00	1,178,800.00	1,055,614.00	1,872,714.00	1,528,163.00	1,677,862.00	8,209,741.00
35.	Multi Tambangjaya Utama, PT	-	-	-	-	357,706.00	508,808.00	866,514.00
36.	Nusantara Termal Coal, PT	388,499.44	142,937.40	944,415.69	889,683.27	920,863.65	687,230.64	3,973,630.09
37.	Pendopo Energi Batubara (D/H Pt Barito Putra)	-	-	-	-	440.00	-	440.00
38.	Perkasa Inakakerta, PT	-	-	523,575.52	1,144,163.24	2,012,806.25	2,684,902.21	6,365,447.22
39.	Pesona Khatulistiwa Nusantara (D/H Astra Binabakti Intisari)	-	-	-	-	56,268.00	577,529.98	633,797.98
40.	Riau Bara Harum, PT	167,029.60	916,948.00	713,849.75	325,516.00	1,265,331.00	1,865,251.70	5,253,926.05
41.	Santan Batubara, PT	-	-	-	-	1,249,915.00	1,992,075.00	3,241,990.00
42.	Senamas Energindo Mulia, PT	-	-	11,950.00	6,750.00	18,133.00	48,674.00	85,507.00
43.	Singlurus Pratama, PT	-	-	-	-	478,951.70	847,274.79	1,326,226.49
44.	Source Kurnia Buana, PT	870,184.85	1,340,600.00	1,525,990.71	1,018,232.81	1,305,702.40	672,680.57	6,733,391.34

No.	Company	2005	2006	2007	2008	2009	2010	Total
45.	Tanito Harum, PT	2,402,775.51	2,678,894.50	2,690,198.12	2,660,915.48	3,239,300.39	3,512,859.16	17,184,943.16
46.	Tanjung Alam Jaya, PT	750,810.84	1,465,675.31	1,465,219.12	1,655,109.62	1,028,797.38	958,170.14	7,323,782.41
47.	Teguh Sinar Abadi, PT	-	-	15,963.00	209,390.03	1,021,443.74	1,091,697.36	2,338,494.13
48.	Trubaindo Coal Mining, PT	1,610,389.00	5,738,035.00	3,555,107.00	4,544,935.00	5,183,618.00	5,544,568.00	26,176,652.00
49.	Wahana Baratama Mining, PT	-	-	-	780,451.99	2,887,669.89	2,573,872.15	6,241,994.03
	Sub Total	133,680,816.03	163,151,975.03	167,242,774.45	176,998,615.46	197,589,535.24	207,884,673.45	1,046,548,389.66
	Private company (KP)							
1.	Prov. Bengkulu	-	-	-	990,550.98	1,455,137.49	-	2,445,688.47
2.	Prov. Jambi	-	-	-	404,540.50	3,046,940.81	280,779.88	3,732,261.19
3.	Prov. Kalimantan Selatan	-	-	-	695,777.71	4,374,833.65	7,415,426.51	12,486,037.87
4.	Prov. Kalimantan Tengah	-	-	-	-	42,448.50	226,434.11	268,882.61
5.	Prov. Kalimantan Timur	-	-	-	3,777,423.37	10,635,507.00	12,978,026.94	27,390,957.31
6.	Prov. Riau	-	-	-	312,668.92	278,379.85	80,604.01	671,652.78
7.	Prov. Sumatera Barat	-	-	-	784,865.34	1,249,355.74	326,267.89	2,360,488.97
8.	Prov. Sumatera Selatan	-	-	-	698,170.76	1,054,158.77	449,491.50	2,201,821.03
	Sub Total	-	-	-	7,663,997.58	22,136,761.81	21,757,030.84	51,557,790.23
	Total	142,287,451.03	171,819,456.71	175,851,387.45	194,800,341.04	230,556,997.05	241,560,417.29	1,156,876,050.56

Source :Directorate of Minerals and Coal Enterprises 2010

3.1.5 Domestic Sale of Coal 2005-2010

No.	Company	2005	2006	2007	2008	2009	2010	Total
	State owned company (BUMN)							
1	Bukit Asam	7,151,010.00	6,753,252.00	6,694,418.00	7,974,842.00	7,638,084.00	8,222,560.00	44,434,166.00
2	Bukit Asam - Ombilin	41,756.00	1,622.10	184,733.55	5,386.00	2,044.00	84,914.00	320,455.65
3	Bukit Asam - Tanjung Enim - Antrasit	-	-	-	-	-	-	-
	Sub Total	7,192,766.00	6,754,874.10	6,879,151.55	7,980,228.00	7,640,128.00	8,307,474.00	44,754,621.65
	CONTRACTOR							
1.		-	-	-	-	-	-	-
2.	Adaro Indonesia, PT	8,738,327.15	10,023,713.00	9,837,045.68	9,318,647.20	9,570,127.00	9,312,533.00	56,800,393.02
3.	Allied Indo Coal, PT	-	-	73,851.78	-	-	-	73,851.78
4.	Antang Gunung Meratus, PT	416,864.82	279,590.67	275,153.05	533,682.49	662,287.68	693,998.05	2,861,576.76
5.	Arutmin Indonesia, PT	4,576,812.17	882,296.40	2,033,171.10	1,198,955.66	2,267,323.65	3,304,126.34	14,262,685.31
6.	Asmin Koalindo Tuhup, PT	-	-	-	-	-	-	-
7.	Bahari Cakrawala Sebuku, PT	-	-	-	-	-	14,900.00	14,900.00
8.	Bangun Banua Persada Kalimantan, PT	-	158,900.56	338,650.32	199,575.97	278,411.94	673,496.26	1,649,035.04
9.	Baramarta, PD	398,143.72	-	3,722,969.05	4,270,554.47	3,277,417.04	2,526,879.08	14,195,963.35

Condition of Production and Sale of Mineral and Coal

No.	Company	2005	2006	2007	2008	2009	2010	Total
10.	Baramulti Suksessarana, PT	24,874.45	-	-	-	-	-	24,874.45
11.	Batualam Selaras, PT	-	-	-	-	-	41,189.36	41,189.36
12.	Baturona Adimulya, PT	-	-	-	-	-	154,109.06	154,109.06
13.	Berau Coal, PT	3,752,957.00	3,223,516.40	4,191,278.58	4,908,024.60	4,121,855.00	4,415,534.00	24,613,165.58
14.	Borneo Indobara, PT	-	213,621.52	-	232,218.59	577,763.45	72,580.03	1,096,183.59
15.	Dharma Puspita Mining, PT	-	-	-	-	-	-	-
16.	Firman Ketaun Perkasa, PT	-	-	-	-	-	-	-
17.	Gunung Bayan Pratamacoal, PT	3,818,317.34	4,209,902.08	3,525,877.15	2,880,284.87	3,038,417.31	2,997,121.03	20,469,919.76
18.	Indominco Mandiri, PT	46,787.00	998,696.00	260,047.00	624,075.00	632,724.00	857,197.00	3,419,526.00
19.	Insani Bara Perkasa, PT	-	30,495.94	42,688.94	49,219.00	69,893.60	88,261.73	280,559.21
20.	Interex Sacra Raya, PT	-	21,613.98	-	36,214.44	97,794.13	74,203.45	229,826.00
21.	Intitirta Primasakti, PT	-	-	-	-	-	-	-
22.	Jorong Barutama Greston, PT	840,529.76	434,520.27	736,569.14	616,925.55	928,092.00	165,770.27	3,722,406.98
23.	Kadya Caraka Mulia, PT	167,417.00	-	198,548.12	236,526.05	125,105.77	50,911.33	778,508.27
24.	Kalimantan Energi Lestari, PT	-	90,915.02	-	-	-	-	90,915.02
25.	Kaltim Prima Coal, PT	905,068.00	1,188,333.00	2,726,875.00	3,329,181.00	3,419,350.00	3,949,200.00	15,518,007.00
26.	Kartika Selabumi Mining, PT	992,557.86	1,109,713.34	593,673.33	188,298.65	85,484.66	39,598.95	3,009,326.79
27.	Kendilo Coal Indonesia, PT	-	-	-	-	-	-	-
28.	Kideco Jaya Agung, PT	6,353,879.00	4,807,555.00	5,617,460.00	5,582,846.17	5,606,307.15	6,058,542.77	34,026,590.10
29.	Lanna Harita Indonesia, PT	-	-	-	-	11,120.51	5,829.17	16,949.68
30.	Mahakam Source Jaya, PT	1,006,097.00	-	7,734.00	1,291,265.00	689,957.00	606,383.00	3,601,436.00
31.	Mandiri Intiperkasa, PT	-	32,378.31	32,896.59	24,584.12	-	5,331.00	95,190.01
32.	Mantimin Coal Mining, PT	-	-	-	-	-	-	-
33.	Marunda Graha Mineral, PT	-	-	-	-	-	-	-
34.	Multi Harapan Utama, PT	242,323.82	316,325.02	101,136.62	183,479.00	-	-	843,264.46
35.	Multi Tambangjaya Utama, PT	-	-	-	-	-	-	-
36.	Nusantara Termal Coal, PT	-	128,565.58	925,312.89	906,383.97	840,085.29	546,926.53	3,347,274.26
37.	Pendopo Energi Batubara (D/H Pt Barito Putra)	-	-	-	-	-	50.00	50.00
38.	Perkasa Inakakerta, PT	-	-	82,413.98	8,067.92	-	-	90,481.91
39.	Pesona Khatulistiwa Nusantara (D/H Astra Binabakti Intisari)	-	-	-	-	-	225,007.97	225,007.97
40.	Riau Bara Harum, PT	68,400.27	753,781.49	34,720.00	-	-	-	856,901.76

No.	Company	2005	2006	2007	2008	2009	2010	Total
41.	Santan Batubara, PT	-	-	-	-	581,466.00	144,264.00	725,730.00
42.	Senamas Energindo Mulia, PT	-	-	8,845.79	6,100.00	21,569.29	47,071.38	83,586.46
43.	Singlurus Pratama, PT	-	-	-	-	-	-	-
44.	Source Kurnia Buana, PT	497,650.80	-	1,485,795.33	1,039,673.93	1,250,305.88	747,680.87	5,021,106.80
45.	Tanito Harum, PT	9,129.00	-	428,858.26	781,925.00	1,240,555.87	1,153,828.00	3,614,296.13
46.	Tanjung Alam Jaya, PT	-	749,997.00	-	1,351,644.39	1,021,576.35	991,431.94	4,114,649.67
47.	Teguh Sinar Abadi, PT	-	-	-	168,310.16	-	-	168,310.16
48.	Trubaindo Coal Mining, PT	1,171,441.63	1,589,191.11	1,321,968.66	558,428.39	1,500,466.98	2,550,458.34	8,691,955.10
49.	Wahana Baratama Mining, PT	-	-	-	-	-	-	-
	Sub Total	34,027,577.79	31,243,621.67	38,603,540.34	40,525,091.57	41,915,457.55	42,514,413.89	228,829,702.81
	Private company (KP)							
1.	Prov. Bengkulu	-	-	-	63,039.70	317,569.99	-	380,609.69
2.	Prov. Jambi	-	-	-	306,932.32	350,977.64	116,009.32	773,919.28
3.	Prov. Kalimantan Selatan	-	-	-	639,516.67	346,245.63	486,041.89	1,471,804.19
4.	Prov. Kalimantan Tengah	-	-	-	-	-	-	-
5.	Prov. Kalimantan Timur	-	-	-	2,551,355.20	3,677,052.36	2,219,653.02	8,448,060.58
6.	Prov. Riau	-	-	-	144,266.61	24,613.90	-	168,880.51
7.	Prov. Sumatera Barat	-	-	-	736,189.27	1,174,654.20	32,473.62	1,943,317.09
8.	Prov. Sumatera Selatan	-	-	-	526,632.39	850,978.17	857,692.54	2,235,303.10
	Sub Total	-	-	-	4,967,932.16	6,742,091.89	3,711,870.39	15,421,894.44
	Total	41,220,343.79	37,998,495.77	45,482,691.89	53,473,251.73	56,297,677.44	54,533,758.28	289,006,218.90

Source :Directorate of Minerals and Coal Enterprises 2010

3.1.6 Sale of Coal for Export 2005-2010

No.	Company	2005	2006	2007	2008	2009	2010	Total
	State owned company (BUMN)							
1	Bukit Asam	2,492,201.00	2,848,534.00	3,808,057.00	4,008,249.61	4,416,312.00	4,659,928.00	22,233,281.61
2	Bukit Asam - Ombilin	-	-	-	71,225.00	-	-	71,225.00
3	Bukit Asam - Tanjung Enim - Antrasit	-	-	-	-	-	-	-
	Sub Total	7,192,766.00	6,754,874.10	6,879,151.55	7,980,228.00	7,640,128.00	8,307,474.00	44,754,621.65
	CONTRACTOR							
1.		-	-	-	-	-	-	-
2.	Adaro Indonesia, PT	17,317,389.00	24,137,923.00	24,465,249.00	30,182,587.00	31,585,017.00	29,958,937.00	157,647,102.00
3.	Allied Indo Coal, PT	-	-	-	-	-	-	-
4.	Antang Gunung Meratus, PT	-	-	-	-	-	-	-
5.	Arutmin Indonesia, PT	12,516,891.00	13,276,712.12	13,544,669.00	14,262,641.95	17,169,828.00	17,081,559.00	87,852,301.06

Condition of Production and Sale of Mineral and Coal

No.	Company	2005	2006	2007	2008	2009	2010	Total
6.	Asmin Koalindo Tuhup, PT	-	-	-	-	191,482.19	1,337,873.09	1,529,355.28
7.	Bahari Cakrawala Sebuku, PT	2,822,636.00	3,621,795.00	3,466,451.00	3,603,775.00	1,922,341.00	1,076,772.00	16,513,770.00
8.	Bangun Banua Persada Kalimantan, PT	-	-	-	-	-	-	-
9.	Baramarta, PD	95,176.73	2,256,367.00	-	-	-	-	2,351,543.73
10.	Baramulti Suksessarana, PT	-	-	-	-	-	-	-
11.	Batualam Selaras, PT	-	-	-	-	-	-	-
12.	Baturona Adimulya, PT	-	-	-	-	-	50,828.50	50,828.50
13.	Berau Coal, PT	5,762,556.00	6,757,761.49	7,605,711.00	8,188,801.00	10,019,991.00	12,650,877.00	50,985,697.49
14.	Borneo Indobara, PT	-	-	-	1,077,438.65	635,310.13	763,722.49	2,476,471.27
15.	Dharma Puspita Mining, PT	-	-	-	-	-	-	-
16.	Firman Ketaun Perkasa, PT	-	-	-	-	227,138.00	467,270.00	694,408.00
17.	Gunung Bayan Pratamacoal, PT	-	949,843.00	934,868.00	623,549.00	1,152,284.00	1,042,399.00	4,702,943.00
18.	Indominco Mandiri, PT	8,901,843.00	10,466,251.00	12,061,964.65	10,258,735.65	13,059,005.00	12,578,374.46	67,326,173.76
19.	Insani Bara Perkasa, PT	-	17,142.56	113,330.46	733,617.55	930,278.98	1,851,859.50	3,646,229.05
20.	Interex Sacra Raya, PT	-	26,282.81	138,554.28	66,012.28	12,317.09	-	243,166.46
21.	Intitirta Primasakti, PT	-	-	-	-	-	-	-
22.	Jorong Barutama Greston, PT	2,138,520.84	1,480,467.90	1,941,560.45	2,033,898.33	2,145,041.79	455,104.00	10,194,593.32
23.	Kadya Caraka Mulia, PT	-	434,185.00	-	-	-	-	434,185.00
24.	Kalimantan Energi Lestari, PT	600,000.00	15,833.98	80,317.07	24,401.96	-	-	720,553.01
25.	Kaltim Prima Coal, PT	26,622,409.00	34,153,393.31	37,041,285.00	32,224,315.00	35,268,125.00	36,056,639.00	201,366,166.31
26.	Kartika Selabumi Mining, PT	-	-	-	-	-	151,909.22	151,909.22
27.	Kendilo Coal Indonesia, PT	-	-	-	-	-	-	-
28.	Kideco Jaya Agung, PT	11,703,485.00	10,965,896.00	13,566,872.00	16,072,395.80	19,172,515.04	20,111,632.00	91,592,795.84
29.	Lanna Harita Indonesia, PT	1,732,691.00	1,668,104.00	1,598,524.00	1,447,330.49	1,209,500.00	1,868,912.00	9,525,061.49
30.	Mahakam Source Jaya, PT	-	2,921,351.98	3,035,724.00	1,744,813.00	3,631,792.00	4,579,329.00	15,913,009.98
31.	Mandiri Intiperkasa, PT	1,020,531.00	897,204.59	1,814,040.00	1,979,410.00	2,441,500.00	2,628,490.85	10,781,176.44
32.	Mantimin Coal Mining, PT	-	-	-	-	-	-	-
33.	Marunda Graha Mineral, PT	788,254.83	779,598.00	1,635,549.00	1,247,519.00	876,179.00	1,442,051.00	6,769,150.83
34.	Multi Harapan Utama, PT	648,073.40	934,481.00	961,700.79	1,717,417.53	1,531,207.62	1,760,376.34	7,553,256.68
35.	Multi Tambangjaya Utama, PT	-	-	-	-	316,172.25	480,107.30	796,279.55
36.	Nusantara Termal Coal, PT	-	-	-	-	-	-	-

No.	Company	2005	2006	2007	2008	2009	2010	Total
37.	Pendopo Energi Batubara (D/H Pt Barito Putra)	-	-	-	-	-	20.00	20.00
38.	Perkasa Inakakerta, PT	-	-	307,561.00	1,101,785.00	2,018,909.00	2,627,558.00	6,055,813.00
39.	Pesona Khatulistiwa Nusantara (D/H Astra Binabakti Intisari)	-	-	-	-	38,682.00	326,362.00	365,044.00
40.	Riau Bara Harum, PT	-	368,347.00	706,205.00	282,147.00	1,307,199.00	1,984,234.45	4,648,132.45
41.	Santan Batubara, PT	-	-	-	-	534,554.00	1,858,463.00	2,393,017.00
42.	Senamas Energindo Mulia, PT	-	-	-	-	-	-	-
43.	Singlurus Pratama, PT	-	-	-	-	430,069.22	907,121.36	1,337,190.58
44.	Source Kurnia Buana, PT	-	-	-	-	-	-	-
45.	Tanito Harum, PT	5,467,352.00	1,218,648.00	5,008,126.49	1,811,581.00	2,019,011.00	2,335,161.00	17,859,879.49
46.	Tanjung Alam Jaya, PT	-	-	-	-	-	24,528.57	24,528.57
47.	Teguh Sinar Abadi, PT	-	-	-	54,366.00	736,594.00	1,366,963.00	2,157,923.00
48.	Trubaindo Coal Mining, PT	389,197.00	2,754,648.88	2,400,654.28	4,025,068.55	3,632,390.74	2,976,783.00	16,178,742.45
49.	Wahana Baratama Mining, PT	-	-	-	524,312.00	2,914,863.71	2,424,809.00	5,863,984.71
	Sub Total	98,527,005.81	120,102,237.61	132,428,916.47	135,287,918.73	157,129,297.75	165,227,026.12	808,702,402.50
	Private company (KP)							
1.	Prov. Bengkulu	-	-	-	997,228.88	866,876.28	-	1,864,105.16
2.	Prov. Jambi	-	-	-	17,806.84	-	92,094.74	109,901.58
3.	Prov. Kalimantan Selatan	-	-	-	-	48,006.00	-	48,006.00
4.	Prov. Kalimantan Tengah	-	-	-	-	-	79,786.32	79,786.32
5.	Prov. Kalimantan Timur	-	-	-	1,422,055.22	7,393,903.33	8,845,798.55	17,661,757.10
6.	Prov. Riau	-	-	-	269,475.21	301,714.42	81,483.90	652,673.53
7.	Prov. Sumatera Barat	-	-	-	-	177,412.05	105,465.74	282,877.79
8.	Prov. Sumatera Selatan	-	-	-	14,436.70	-	65,800.00	80,236.70
	Sub Total	-	-	-	2,721,002.85	8,787,912.08	9,270,429.25	20,779,344.18
	Total	101,019,206.81	122,950,771.61	136,236,973.47	142,088,396.20	170,333,521.83	179,157,383.37	851,786,253.29

Source :Directorate of Minerals and Coal Enterprises 2010

3.2. Priority Development of Infrastructure for Minerals and Coal in the Future

3.2.1 Process and Refinery of Mineral

Indonesia minerals for export are as raw materials. A number of industries use imported products as raw minerals for their main or supporting materials. This certainly will not result in added-value as expected.

On the other hand, industrial countries often make benefit from added value from exporting countries by further processing of the imported materials in their countries or their company groups.This is because the processing technology remains in their possession including the marketing of their products.

Somestic processing results in a lot of multiplier effect such as employment opportunity, transfer of technology, and other benefits which are available from the ores as well as local economic development. Depending on types of mines, commonly processing of mineral ores consists of beneficiation process where mineral ores are processed to become ore concentrate for further process or for sale,then followed by metalurgical process and refining. Beneficiation process normally consists of preparation, crushing, concentrate increase by gravitation, or magnetic separation, or flotation, then followed by dewatering and filtering. Result of this process is ore concentrate and wastes (tailing) and ash emission. Tailing commonly contains chemical waste and heavy metal.

Increase added value (PNT) of mining products is important because Indonesia is just as a producer or seller of mining mineral mining which are mostly with out processing, whereas domestic mining industries import their raw materials from other countries imported from Indonesia. Producer or seller of raw materials has become producers of ready- raw materials in order that they gain added value and also for the sake of national benefit and for development of local areas where mining minerals are originated.

A number of mineral commodities have been processed into ready for use products, by domestic plants, which can be used as raw materisls for industrial sectors, such tin ores, nickel ors, and copper ores.

These ores products are used for different purposes such as medical industry, manufacturing industry, machinery and basic metal industry, defence industry and other industries. Domestic metal mineral processing industries are useful as secure supply of raw materials, not dependent on import.

3.2.2. Processing and Refining of Tin

Main metal extract plants have been operating in Indonesia, pioneered by PT Timah tin smelter set up since the end of Dutch colony. Smelters in production presently ara ferro nickel, aluminium and copper. In addition, gold and silver have been produced through refining process of bullion, extract of ores, that result in pure gold and silver produced by PT Logam Mulia. Tin refining industry in Indonesia has developed well and produced pure tin, ready for manufacture industry as seen in Figure 2.12.

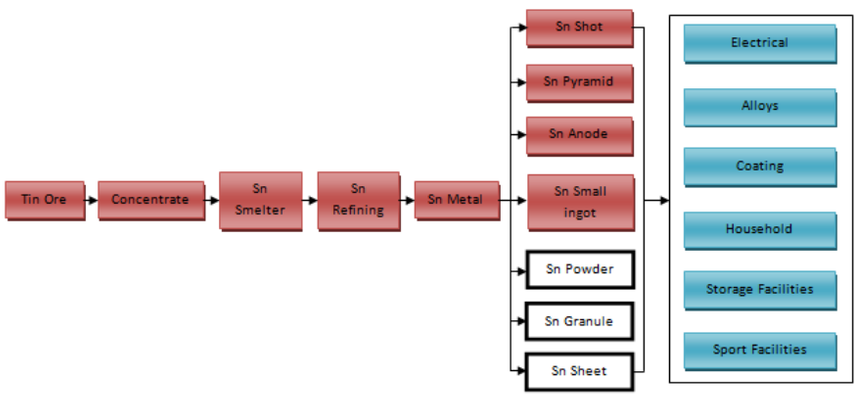


Figure 2.12. The Diagram of Tin Industry

3.2.3. Processing and refining of Bauxit

Smelting plant of aluminum through salt smelt process (Hall- Heroult) remains use of imported alumina raw materials. When local alumina is available from domestic refinery, it is used to supply the need of aluminium plants. Aluminium refinery plant as illustrated in the diagram below showing domestic aluminium refining industry is able to produce pure aluminium for manufacturing insdustry. But alumina raw materials remains imported from, whereas local bauxit ores are exported as raw materials. The tree of aluminimu industry as seen in Figure 2.13.

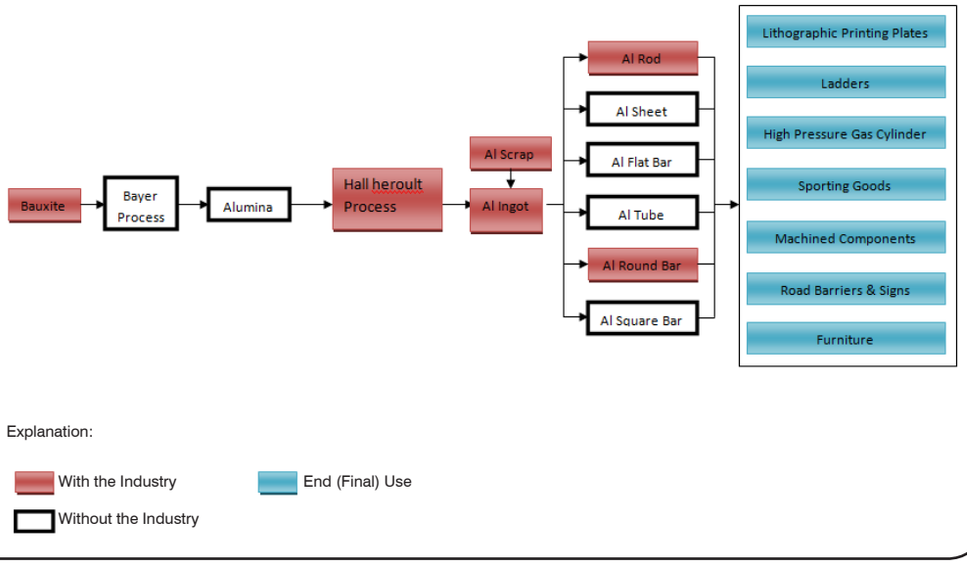


Figure 2.13. The Diagram of Aluminium Industry

3.2.4. Processing and Refining of Nickel

Nickel smelting plant cosnsists of 2 refining process Which have been developed for commercial purposes namely ferro-nikel (by PT Antam) and nikel-matte (by PT INCO). Ferro nikel is a process which manufactures final product, granular Fe-Ni to be used in market as raw materials of steel industry, which is growing largely now. Whereas nikel-matte needs further refining process to become end products by which the downstream manufacturing units will depend on and be used asend goods. Ferro nickel is a final product because it follows refining processes and is used for the industry. Whereas nikel matte is defined as temporatry product, because it should be further refined to become final products. In the diagram shown the growth of ferro nickel processing industry has been used by domestic manufacturing industries. Whereas nickel matte refining and its use is not yet available In Indonesia. The tree of nickel industry as seen in Figure 2.9

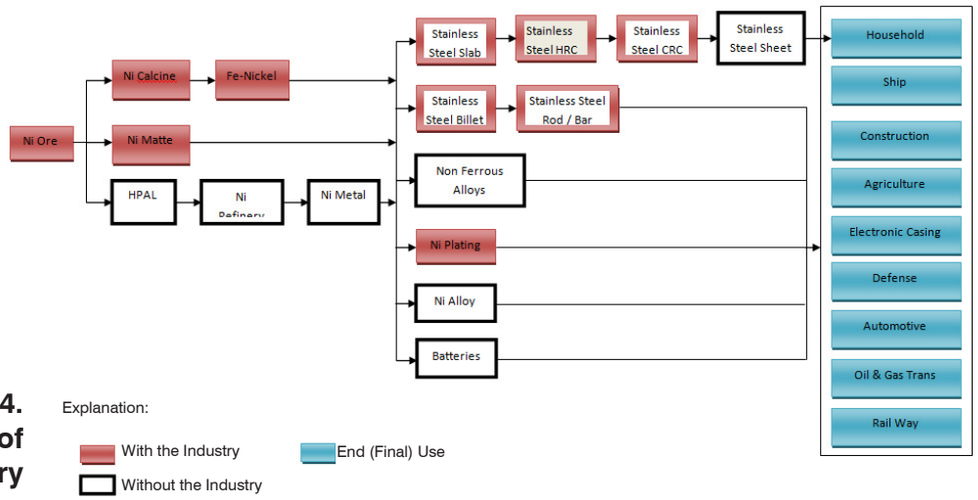


Figure 2.14. The Diagram of Nickel Industry

3.2.5. Processing and Refining of Copper

Processing of copper has been cdarried out in the country beginning from mineral comcentration, by PTFreeport and PT NNT, to smelting and refining of copper ore to become pure copper metal by PT Smelting Gresik. The smelting plant has been in production since 1999 with capacity of 300 tons of copper per year. World smelting technology has been developed in different alternative processes and each has its own advantage and its option is based on energy consumption. Smelting product of PT Smelting Gresik includes: pure copper metal (99.99%), anoda slime, sulphate acid and slag. Of the total production of copper metal by PT Smelting Gresik, 40% has been used by domestic market, and the remaining for export. Whereas sulphate acid is used by petrochemical industry producing fertilizer and slag cement industry. It shows that domestic processing of minerals has advantages for the industries in the country as the by products are completely usedful. The Copper Industrial Tree as seen in Figure 2.10.

However, national mining concentrate industry remains worried that only 30% of concentrate produced by PT Freeport thatbcan be refined in the country, whereas the remaining and product of PT NNT continue to export because of limited refining capacity of PT Smelting Gresik. Also, anoda slime produced by copper refining plant Remains exported to other country including Japan because anoda slime refining plant not available. The unavailability of the plant will bring disadvantage since anoda slime contains precious metal such as gold, silver, selenium, platinum and other precious metal which are beneficial for domestic industry, if extracted in the country.

It can be clioncluded now that industry using Katoda copper raw materials are only a few while Bilet is used for production of electric rod. Other industries are not yet available

3.2.6. Processing and Refining Iron

As big potential reserve of sand and iron ores, Indonesia, Indonesia iron and steel industry remains dependent on import of raw materials such as pig iron and sponge iron. In 2008 the import achieves 516,2 thousand ton, most of which from Brazil. Whereas iron ores produced by ming sector in Indonesia are exported as raw materials. See Figure 2.16 as an illustration

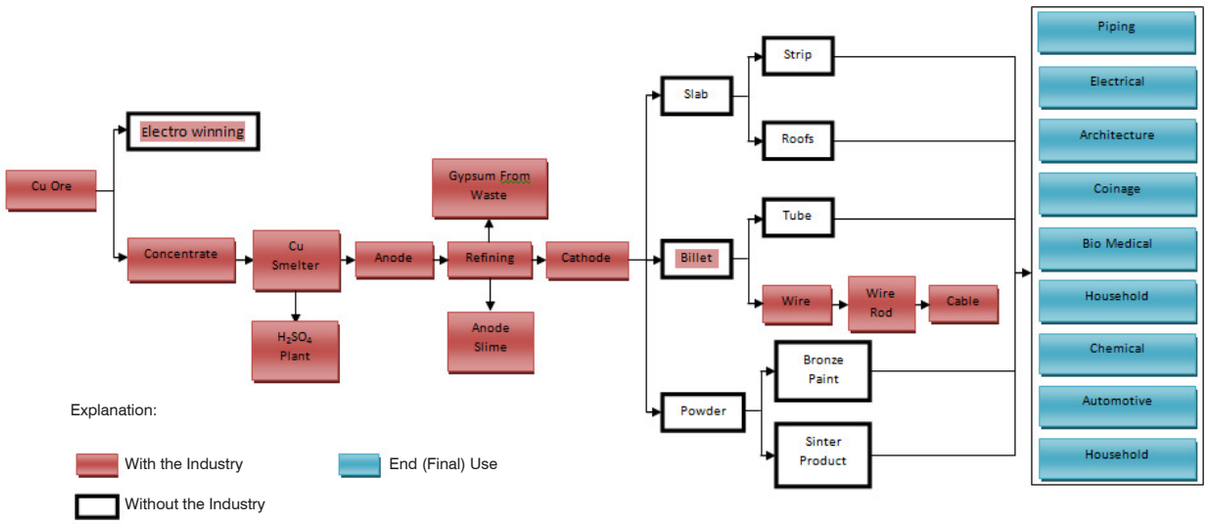
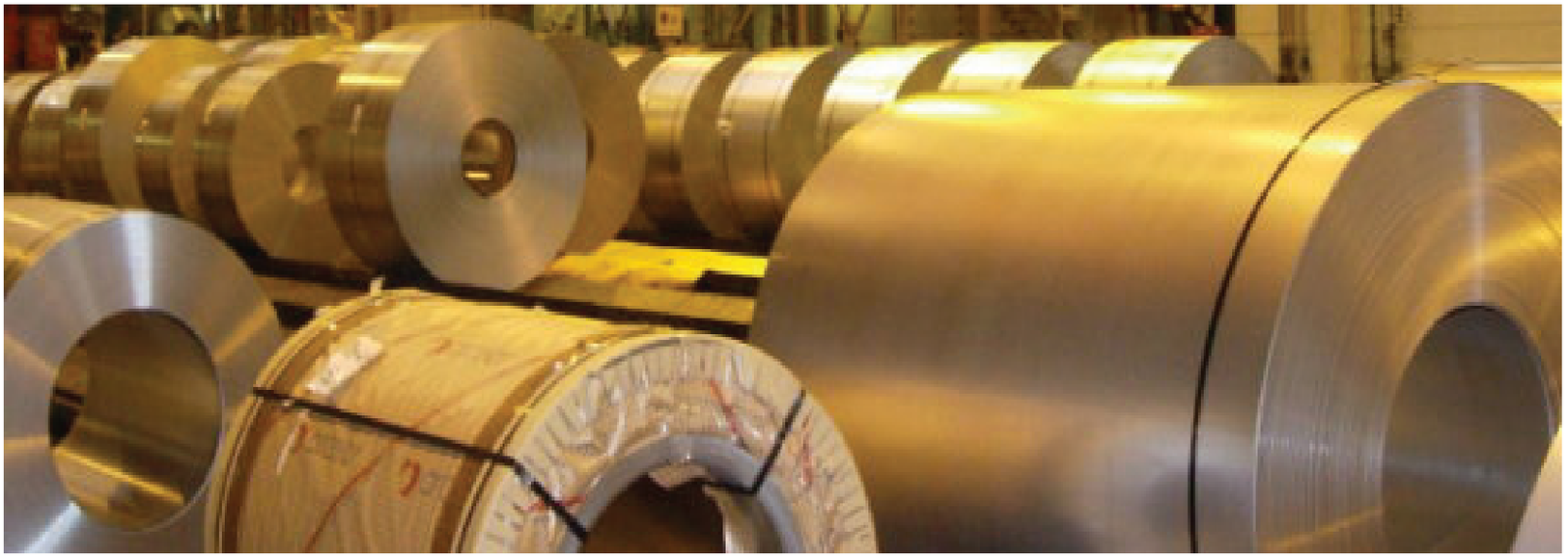


Figure 2.15.
The Diagram of Copper Industry



Priority Development of Infrastructure for Minerals and Coal in the Future

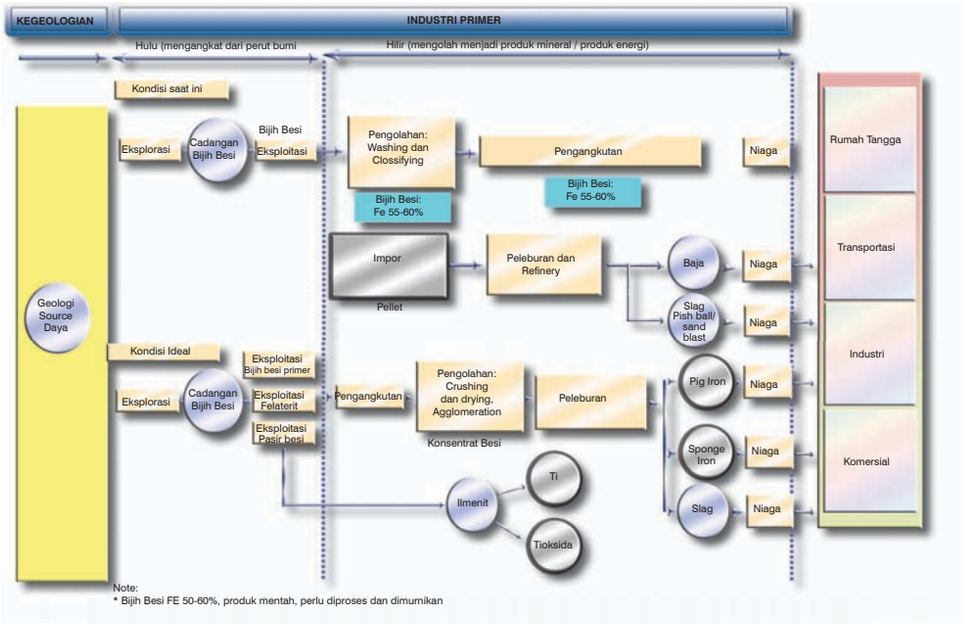


Figure 2.16. The Diagram of Iron Industry

3.2.7 Processing and Refining of Lead and Zinc

HSimilar conditions happen to lead and zinc (Figure 2.17. and Figure 2.18 respectively), in which mining sector in Indonesia producing only lead ores and zinc ores for export purposes as raw materials. Whereas raw meterials for industries using lead and zinc import the raw materials from other countries.

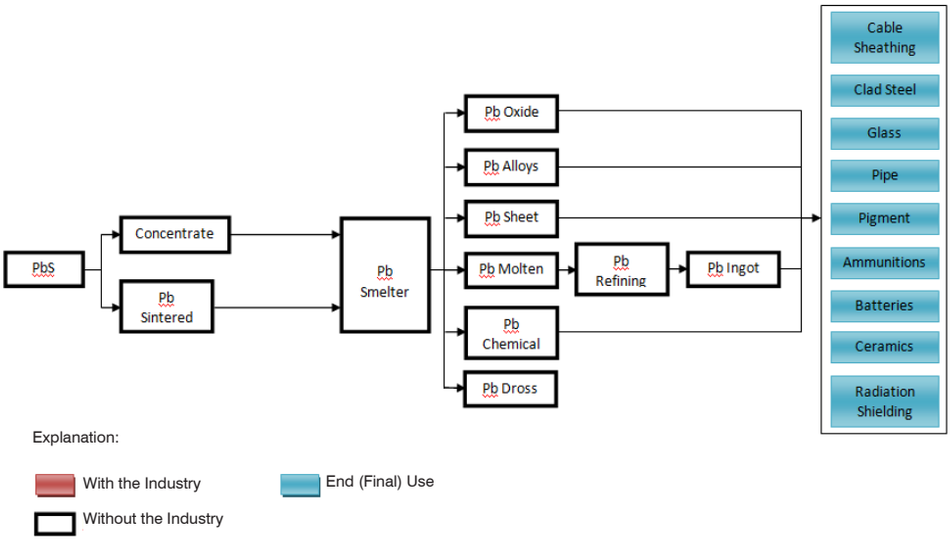


Figure 2.17. The Diagram of Lead Industy

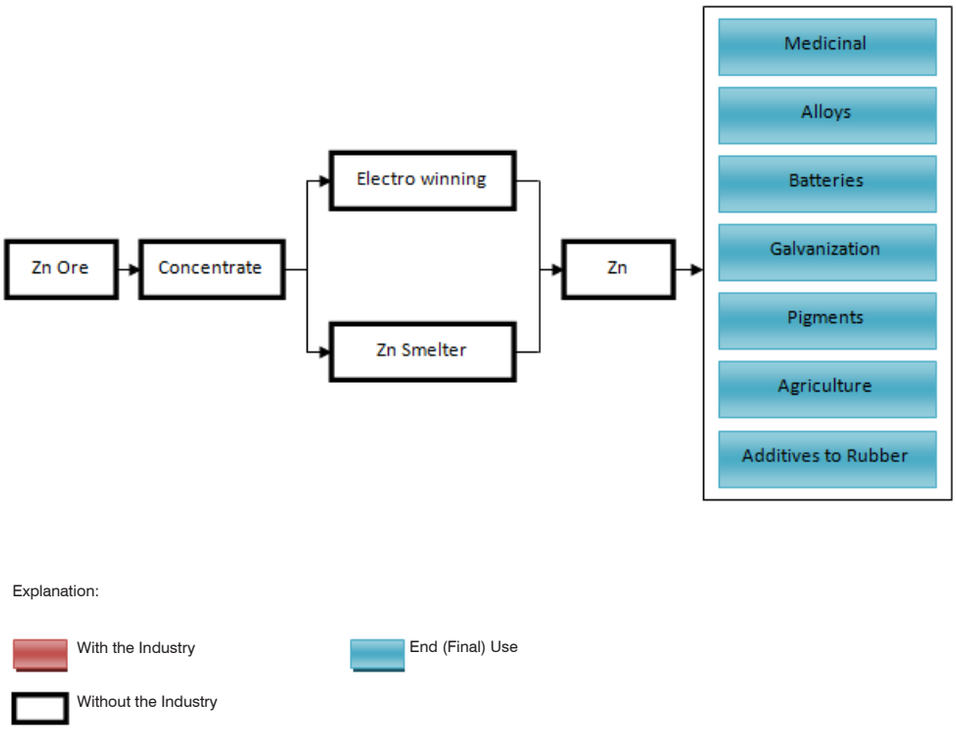


Figure 2.18. The Diagram of Zinc Industry

Other mining commodities are not processed and refined that they are dold as raw materials, such as iron, alumunium, nickel and manganese ores. Industries forn these mining ores are not developed because of a number of reasons such as:

1. Mastering of the refining technology is quite limited that needs technology and competent manpower from other countries.
2. Refining industry needs big investment as well as required production capacity.
3. A paradigm for economical benefit and easy access for sale of material without refining in advance.

Disability of mining industry for supply of industrial needs results in import of raw materials from othr countries. The above mentioned condition reults in domestic industrial security which so far dependent on import of raw materials. In this free trade, it is quite volatile and protective for each mineral producing country to secure their industry so that they do not depend on import supply. It is therefore expected that mining industry is able to meet demand of other industries in quantity and quality.

3.3. Opportunity and Challenge Investment in Minerals and Coal

3.3.1. Investment Opportunity in Sectors of Mineral and Coal

- The Law of Minerba gives opportunity in law enforcement.
- Investment in added value of mining products as new opportunity including potential of refining of metal mineral, coal, non metal mineral which increase state revenue and employment increase of mineral coal and Coal for domestic market

3.3.2. Investment Challenge in Sub Sector of Mineral and Coal

- Legislation among sectors (Mining, Forestry, Enviroinment and Space Arrangement) are not synchronised
- Good governance in mining activities are not optimum such as companies that do not comply with environment requirements, etc.
- Refining capacity is limited which means less added value.
- Local content in mining activities is not yet optimum.
- Prices of mining conmmodities are fluctuating which influence the mining and sale.
- Overlap areas of cross sectors in mining practices
- Increase contribution for local development such as revenue, employment etc.)
- Limited capacity of technology, qualified manpower and infrastructures.
- No incentives for development of refining for mining products.
- Big investment for development of refined products.

PROCEDURES AND METHOD OF INVESTMENT

4

4.1. Procedures and Method for Licencing Business in Minerals and Coal Mining

4.1.1. Format of Application for IUP/ IUPK Exploration Licence

Excellency,
Director General/Governor/Regent/Mayor*)
in
.....

We are pleased to apply for Exploration Licence (IUP/IUPK *) with details as follows :

A. Applicant
1. Name of undersigned : .....
   Position / job : .....
2. Name of undersigned : .....
   Position / job : .....
3. Nam of undersigned : .....
   Position / job : .....

B. Applicant
1. Name of company : .....
   Address : .....
   Telephone / faximile : .....
2. Name of company : .....
   Address : .....
   Telephone / faximile : .....
3. Name of company : .....
   Address : .....
   Telephone / faximile : .....
4. Organization of Directors and Commisioner : .....

a. Board of Directors

No.	Name	Position
1		
2		
3		
4		
5		

b. Commisioners

No.	Name	Position
1		
2		
3		
4		
5		

5. Number and Certificate of Company Establishment : .....
   Number and date of certification
   Ministry of Justice : .....
   Change of Nuber and date
   Latest certification : .....
6. Financial Report as audited by Public Accountant of latest year
   1)Total Net Asset : .....
   2)Total debt : .....
   3)Net income : .....

C. Location andareas and types of mining commodities/minerals applied for
1. Location : .....
   a.Province : .....
   b.Regent /City : .....
2. Total areas : ..... hectares
3. Mining commodities : .....

D. Attachments
1. Original map of areas available from Unit Pelayanan Informasi Wilayah Pertambangan
2. Receipt of guaranty payment from the bank appointed
3. Receipt of latest Annual Statement (SPT) / Tax Number (NPWP)
4. Financial Report of the last 3 years as audited by Public Accountant

We are looking forwards to hearing from Excellency with admittance of true data and information otherwise we shall receive sanctions as stipulated in the current law and regulations.

Jakarta, ...date ..... **)

(meterai Rp. 6.000,-)

Name of Applucant

Copies to :
1.Director of Business in Mineral and Coal
2.Head Mining Division of Province/Regent/City

Notes :
1.*) Crossr if unvalid
**) Appropriate to Point 1 *)
2.Use block letters
3.Application in 2 copies

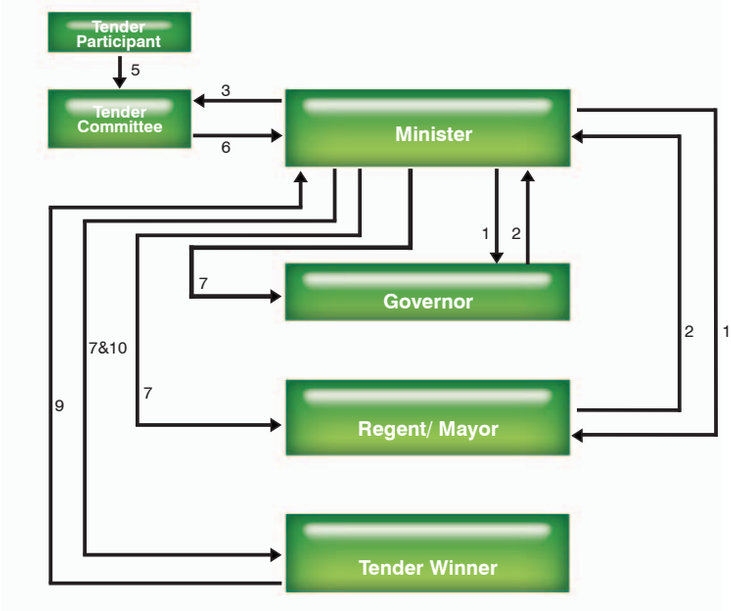
4.1.2. Requirements for Application of Exploration Licence (IUP/ IUPK)

The application of IUP/IUPK Exploration made as adapted to format of Form (Daftar isian) which should be submitted by the applicant in 5 days since date of tender winner from the Minieter/Governor/Regent/ Mayor appropriate to their authority, with enclosures of :

1. Peta Map of areas published by UPIWP;
2. Copy of receipt of guaranty seriousness payment to government bank appointed for areas under authority of government or Government Development Bank, or copy of transfer payment from applicant bank;
3. Certificate of company establishmen
4. Financial report of the last 3 years audited by public accountant;
5. Letter of authority from the Director approved by company commissioners to representative to sign application letter, or involve in negotiation or write initial, or sign licence IUP/ IUPK, if the Director himself unable to do so ;
6. Receipt of latest Annual Statement (SPT)/Tax Number (NPWP) if national company.

4.2. K Authorization and Business Licencing in Mineral and Coal Mining

4.2.1. Diagram Flow of Process Application for exploration licence (IUP/IUPK) to WIUP/ WIUPK Government authority



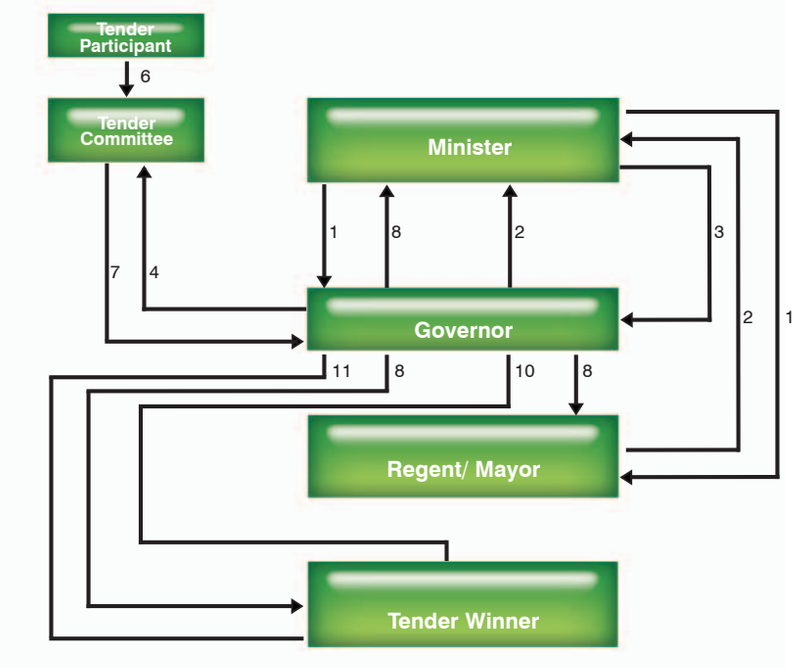
Notes:

1. Minister in coordination with Governor /Regent /Mayor to decide licence (WIUP/ WIUPK)
2. Regent /Mayor and Governor give recommendation to Minister to decide licence WIUP/WIUPK, Minister to decide licence WIUP/ WIUPK
3. Minister to set up teender committee
4. Tender committee to announce PEMENANG LELANG tender WIUP/WIUPK
5. Tender participant to register and join tender process
6. Tender committee to carry out tender process and propose a winner to the Minister
7. Minister to decide winner and inform to the Governor, Regent/Mayor and the winner
8. The winner to make payment on data available for map of locations of wark areas (WIUP/WIUPK)
9. The winner to apply exploration licence (IUP/IUPK) to Minister in 5 work days at the latest after annoubcement of winner (WIUP/WIUPK), completed with the following requirements:
   a. Map of work areas (WIUP/WIUPK) of tender winner (WIUP/WIUPK)
   b. Proof payment of data available, as decided by result of tender (WIUP/WIUPK) on metal mineral or coal mining
   c. Proof of seriousness of 4-year exploration activities
10. Minister to issue Letter of Decision (IUP/IUPK) for exploration in 7 days after date of receipt of application letter (IUP/IUPK) for exploration.

Notes:

If tender winner (WIUP/WIUPK) does not make application nor complete requirements as stipulated in article 3 letters a,b and c; considered a resign and the opportunity (IUP/IUPK) will be given to the winner that follows.

4.2.2. Diagram Flow of Process Application for exploration licence (IUP/ IUPK) for WIUP Authority of the Province



Explanation::

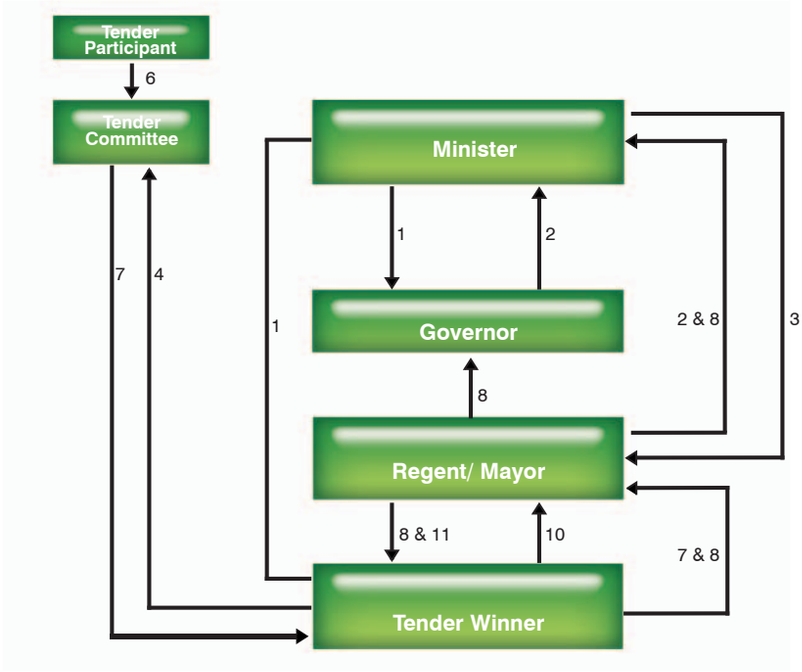
1. Minister to coordinate with Governor / Regent/ Mayor to decide WIUP/ WIUPK
2. Regent / Mayor and Governor to give Rekommendation to Minister for decision of WIUP/ WIUPK
3. Minister to decide WIUP/ WIUPK and deliver to Governor
4. Governor to set up Tender Committee
5. Tender Committee to announce tender (WIUP/ WIUPK)
6. Participants of tender to register for procxess of tenbder
7. Tender committee to conduct process tender and propose the winner to Governor
8. Giovernor to decide the winner and deliver to the Minister, Regent/ Mayor, and to the winner
9. The winner to make payment for data available to receive map of work areas (WIUP/WIUPK)
10. The winner to apply for exploration licence (IUP/IUPK) to Governor in 5 work days at the latest after date of announcement of winnera (WIUP/WIUPK, completed with the following requirements :
    a. Map of work areas (WIUP/WIUPK) as result of tender process (WIUP/WIUPK)
    b. Proof payment for data available as stipulated in decision of tender (WIUP/WIUPK) for mining in metal mineral or coal.
    c. Proof guaranty of seriousness in 4-year exploreation
11. Governor to issue Letter of Decision (IUP/IUPK) for Exploreation, in 7 days at the latest after receipt of application for IUP/IUPK Exploration

Notes:

If tender winner (WIUP/WIUPK) does not make application nor complete requirements as stipulated in article 3 letters a,b and c; considered a resign and the opportunity (IUP/IUPK) will be given to thewinner that follows.

Authorization and Giving Business Licence for Minerals and Coal Mining

4.2.3. Diagram Flow of Process Application for exploration licence (IUP/IUPK) for WIUP Authority of the Regent / Mayor



EXPLANATION:

1. Minister to coordinate with the Governor / Regent/ Mayor for proposal of work areas (WIUP/ WIUPK)
2. The Regent/Mayor and Governor to give Recommendation to the Minister for approval of licence (WIUP/WIUPK)
3. the Minister approved work areas (WIUP/WIUPK and deliver to The Regent/Mayor
4. The Regent/Mayor to set up tender committee
5. Tender committee to announce tender (WIUP/WIUPK)
6. Tender participants to register and join tender process
7. Tender committee to cinduct tender process and propose the winner to the Regent/Mayor
8. The Regent/Mayor to decide the tender winner and hand over to the Minister, Governor and the winner
9. The winner to make payment for data available of work areas map (WIUP/WIUPK)
10. The winner to apply for exploration licence (IUP/IUPK) to the Regent/Mayor Walikota in 5 work days after date of announcement of tender winner (WIUP/WIUPK), completed with requirements as follows:
    a. Map of work areas (WIUP/WIUPK) won in the tender
    b. Proof payment of data available, as stipulated in decision of tender (WIUP/WIUPK) for mining in metal mineral or coal.
    c. Proof guaranty of seriousness in 4-year exploration
    d. The Regent to issue Letter of Decision (IUP/IUPK) for Exploreation, in 7 days at the latest after receipt of application for IUP/IUPK Exploration

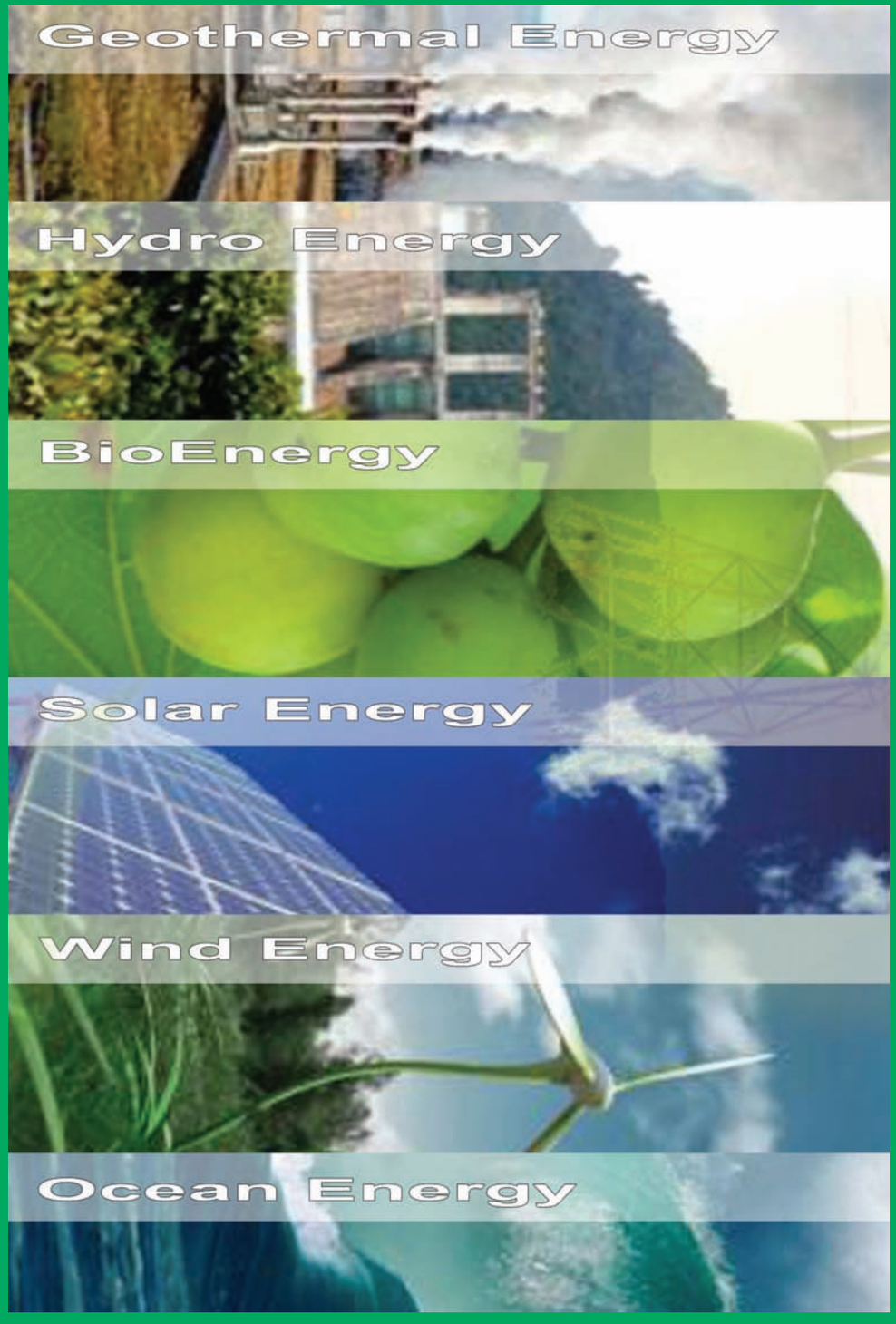
Notes:

If tender winner (WIUP/WIUPK) does not make application nor complete requirements as stipulated in article 3 letters a,b and c; considered a resign and the opportunity (IUP/IUPK) will be given to the winner that follows.

MINISTRY OF ENERGY AND MINERAL RESOURCES
THE REPUBLIC OF INDONESIA

INVESTMENT OPPORTUNITY IN NEW AND RENEWABLE ENERGY, AND CONSERVATION

MINISTRY OF ENERGY AND MINERAL RESOURCES
Jakarta, February 2011


Geothermal Energy
Hydro Energy
BioEnergy
Solar Energy
Wind Energy
Ocean Energy

1 INTRODUCTION

1.1. Background information

The people of Indonesia has been endowed with natural resources as a source of energy. The resources are quite strategic and important to keep the body and soul together, to update economic activities, give job opportunities and keep national security. It is therefore important that these resources should be dominated by the government for the sake of the welfare of the nations. This purpose has been stipulated by the Convention of the Republic of Indonesia 1945, Article 33.

Energy management includes supply, utilization and its business undertaking should be carried out as fair as possible, with most favourable result and integrated in such a way to provide added value to the economy of the country. The management of the energy resources should be in harmony and go hand in hand with environment.

Energy consumption continuous to rise along with increasing number of population and national economy and for the needs of the people in particular.

Fossil energy has been dominating the country for years until the present time as seen in the National Energy Supply and Demand, of 1990-2009, see Figure 1.1.

The significant trend in energy consumption has resulted in unbalanced rate between exhausting of the fossil energy and coal resources and the acceleration of the recovery of new resources.

As the supply of fossil energy is decreasing in the near future the country will possibly depend on big import of energy.

The provision of subsidy for energy price for the people by the government is not enough to be

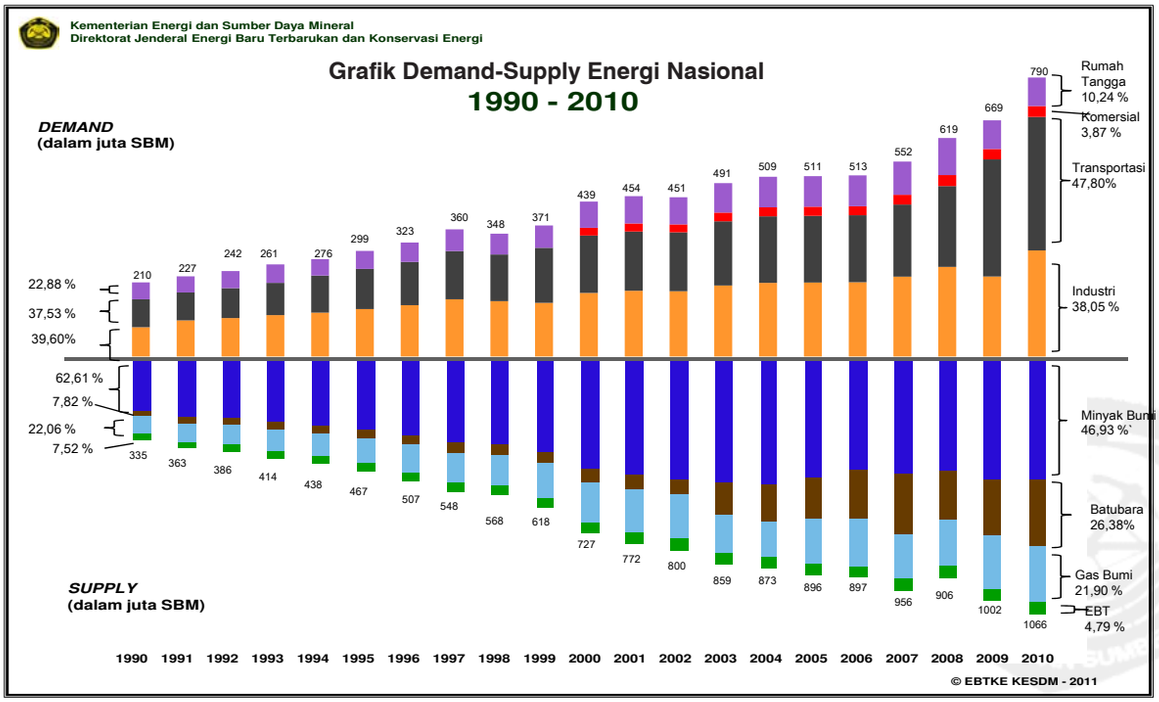
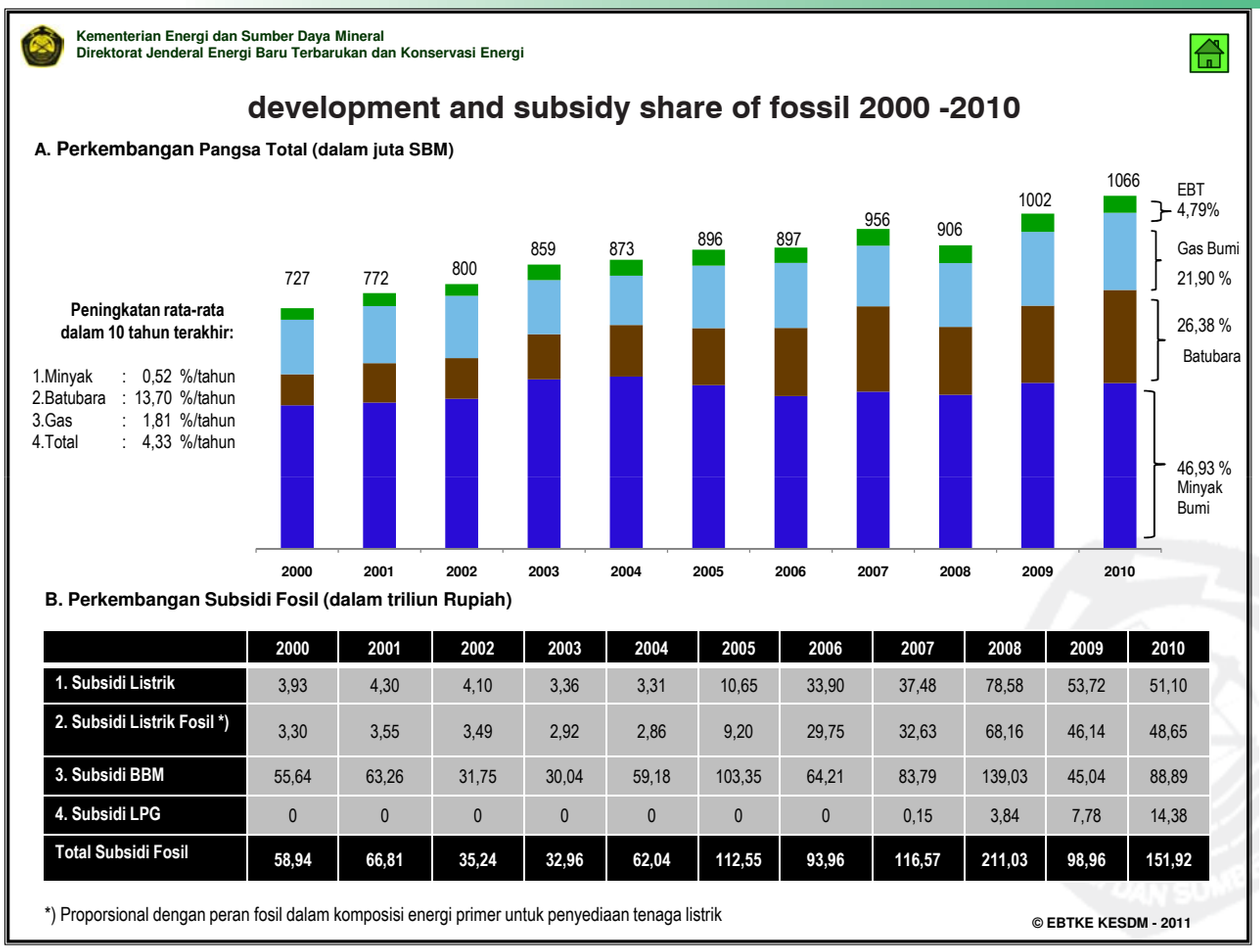


Figure 1.1
Grafik Demand-Supply Energi Nasional

Background information



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1. Subsidi Listrik	3,93	4,30	4,10	3,36	3,31	10,65	33,90	37,48	78,58	53,72	51,10
2. Subsidi Listrik Fosil *)	3,30	3,55	3,49	2,92	2,86	9,20	29,75	32,63	68,16	46,14	48,65
3. Subsidi BBM	55,64	63,26	31,75	30,04	59,18	103,35	64,21	83,79	139,03	45,04	88,89
4. Subsidi LPG	0	0	0	0	0	0	0	0,15	3,84	7,78	14,38
Total Subsidi Fosil	58,94	66,81	35,24	32,96	62,04	112,55	93,96	116,57	211,03	98,96	151,92

Table 1.1
Subsidy for Fossil Energy

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Subsidy for Electricity	3,93	4,30	4,10	3,36	3,31	10,65	33,90	37,48	78,58	53,72
Subsidy for Fossil Electricity *)	3,30	3,55	3,49	2,92	2,86	9,20	29,75	32,63	68,16	46,14
Subsidy for Fossil Fuel	55,64	63,26	31,75	30,04	59,18	103,35	64,21	83,79	139,03	45,04
Subsidy for LPG	0	0	0	0	0	0	0	0,15	3,84	7,78
Total Subsidy for Fosill Energy	**58,94**	**66,81**	**35,24**	**32,96**	**62,04**	**112,55**	**93,96**	**116,57**	**211,03**	**98,96**

*) The role of fossil energy as primary energy for electricity supply.

economical in the utilization of energy as a whole. To be thrifty in energy use then has not been considered as an important step to solve the problem..

Domination of fossil energy has resulted in increase of subisdies for energy. Development of subsidy for energy 2000-2009 continues to rise, as seen in Table 1.1. Consequently, the government imposes energy pricing policy which is economical and affordable by the public. By stages the energy subsidy will be decreased and that can be used for the wellfare of the people.

Energy does not reflect fair energy for the people. Receiver of energy prices are those who have access to modern energy, oil fuel as well as elctricity. Whereas people living in urban and remote areas have not yet access of the modern energy. Supply of energy for people living in remote areas needs a lot of funding, it is therefore suggested that energy subsidy is allocated

to access suply of modern energy for people in remore areas.

Dependence on subsidy tends to be uneconomical to the public. Low price energy will only diminish urgency in energy efficiency. However, subsidized energy price, efficiency is not really meaniungful, therefore energy efficiency is not considered important.

Considering limited potential of non renewable enrgy, it is important to meka diversification of energy to secure energy supply. Diversification of energy is made through utilization of new and renewable energy (EBT) such as geothermal, hydro power, solar power, wind power, biamass and nuclear. Using EBT, dependence on fossil in national energy supply is decreasing. In addition, global warming related to the use of fossil fuel, is one of reasons to decrease fossil fuel.

The Presidential Rgeulation No. 5, 2006, the EBT is expected to contribute 17% of national energy use by 2025. National Energy Management Blueprint 2006-2025 gives details about national energy mix.

Role of new renewable energy will be increased from 4.4% to 25% in 2010. While use oil will be minimized from 43,9% in 2010 to 20% in 2025.

To the use of fossil energy is one of the reasons to decrease consumption.

Eventually, supply of energy – including fossil energy - in time, needs diversification. In the last 10 years, the world has changed its conservation and intensification of energy in a consistent and a more purposeful way by all parties concerned.

The change is related to the attention and global effort to minimize climate change due to increasing green house gasses.

These efforts need a big funding and technology which at the same time support skillful and qualified workforce.

In the context of new renewable energy, it is important that a lot of different efforts made to decrease green house gasses. To anticipate the problem of climate change, Indonesia has developed local energy, which at the same time make the concerned parties develop new and renewable energy through ratification of the climate change.

Domestic Industrial capacity using partnership

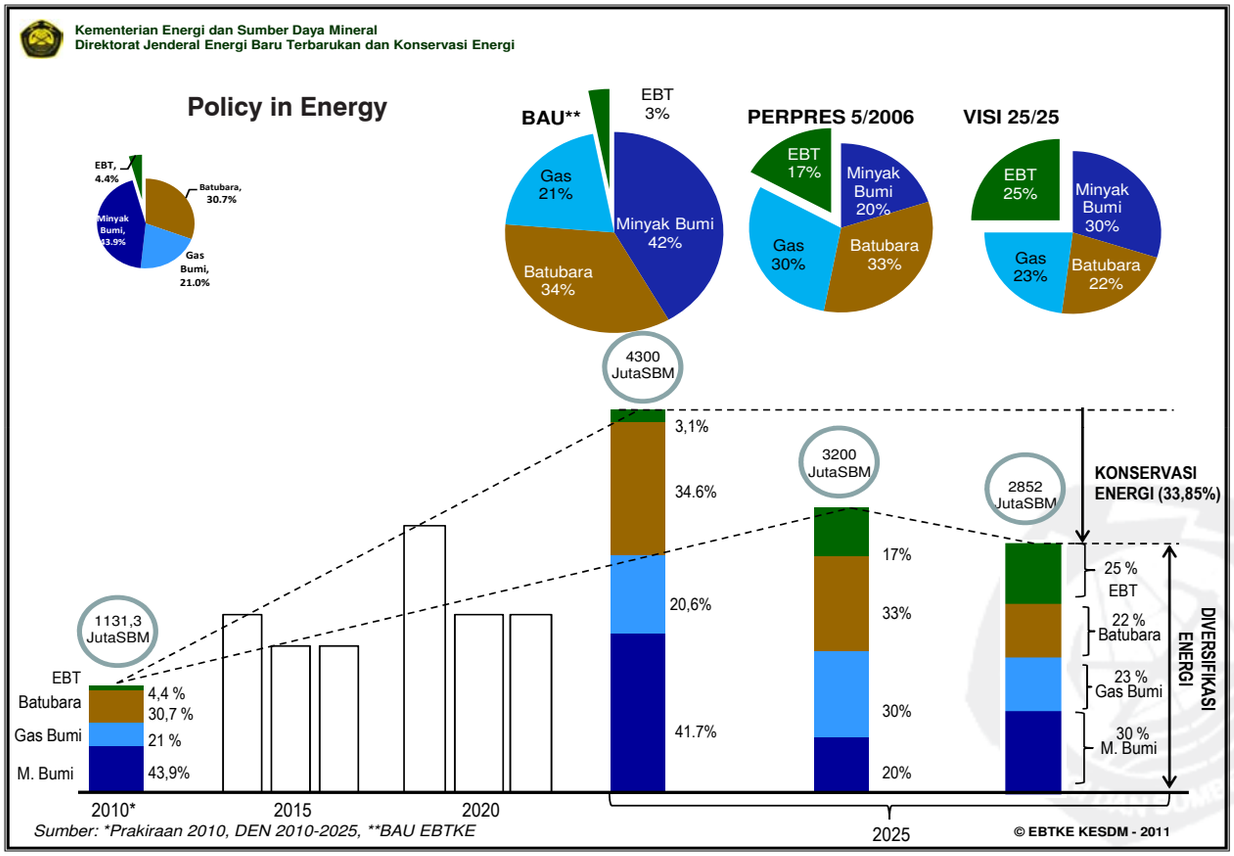


Figure 1.2
Policy in Energy: Conservation and Diversification

Background information

between the government and private enterprises, as well as between domestic resources and funding, technology and expertise from other countries. It is also important to create a conducive investment atmosphere, consistent and firm legal supports in its implementation attractive to investors.In relation to the climate change, a commitment which is

The effort in conservation and intensification of energy is related to world commitment concerning climate change. In 1994 Indonesia has ratified United Nation Framework Convention on Climate Change (UNFCCC) by issuing Law No. 6 of 1994, concerning application of the UNFCCC which is the ratification of Kyoto Protocol (using Law No 17 of 2004 concerning the application of Kyoto Protocol. Indonesia has adopted the eight objectives of the Millennium Development Goals to motivate.

The development of continuing environment through variety of different actions, and to stop emission of green house gases in the framework of climate change mitigation.

To prevent the effect of climate change, most countries in the world are discussing more participation by all countries in mitigating and adapting the climate change. This will involve transfer of green technology from advanced countries to developing countries such as technology of renewable energy development and conservation.

The Directorate General for New and Renewable Energy and Conservation is making arrangement of Indonesia. Initiative for Clean Energy, by REFF-Burn (Reducing Emissions from Fossil Fuel Burning). by combination of efforts, those existing and those are planned, to manage green house gases emitted by energy in three stages, namely

(1) Pre-Fossil Combustion, to avoid use of fossil energy as efficient as possible and development of new and renewable energy
(2) During Fossil Energy Combustion, Using Clean Energy Technology; and
(3) Post Fossil Combustion, such as The application of Carbon Capture & Storage/CCS, and development of algae as raw energy material.

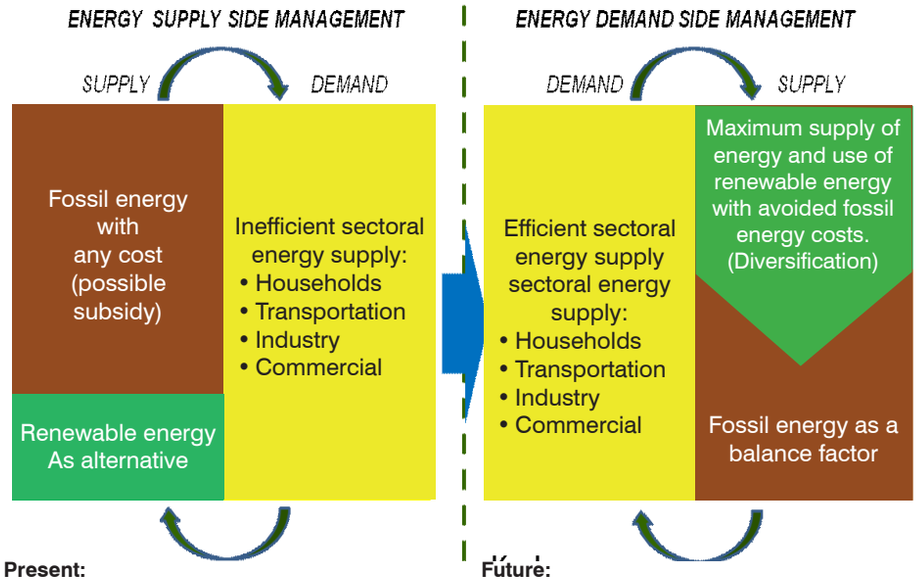
The fossil energy which is still dominating national supply of energy system is expected to be reduced to less than 20%. To achieve national energy mix, an effort is needed to change energy management model.

Integrated between the government and the people as stakeholders of new and renewable energy.

Until the present time the fossil energy is still dominating in its use,whereas new and renewable energy is regarded as an alternative energy. It is important to change the paradigm jn the management of energy which emphasizes upon diversification and conservation of energy to maximize the role of new and renewable energy and at the same time use of fossil energy as a complement role, as illustrated in Figure 1.3.

One effort to realize the new paradigm in energy sector is the establishment of the Directorate General for New and Renewable Energy and Conservation.

Paradigm Changes in Energy Management



Present:

- Inefficient Energy supply.
- Supply of Fossil energy with any costs, possibly with subsidy.
- Reneweable energy as alternative.
- Unused renewable anergy as a waste.

Future:

- Efficient demand of energy.
- Maximum demand and use of renewable enegy at avoided fossil energy cost, with subsidy if necessary.
- Fossil energy as a balance.
- Fossil energy as heritage for next generation or for export.

Figure 1.3
Paradigm Changes in Energy Management

The use of new and renewable energy is taken as new national model for future of energy supply while fossil energy as an alternative. New energy is produced by new technology and originated from renewable and non-renewable energy sources such as gas,

Some uses of new energy, as stipulated in government regulation includes:

1. (Liquefied Coal) - G1

Conversion of coal into liquid. G1 was developed initially as synthetic fuel in Germany at the beginning of 19 century using synthetic process Fischer-Tropsch.

In 1983, NEDO (New Energy Development Organization), a Japanese organization which focused on development of new energy (coal bed methane)

Liquefaction of bituminous coal is done by using pyrolysis system, solvent extraction system and direct hydrogenation to liquefy bituminous coal. The three processes are integrated in a process called NEDOL (NEDO liquefaction) system, The objective is to obtain a higher liquefaction. To liquefy low calorie coal NEDO develops a liquefaction of Brown Coal Liquefaction Technology (BCL)

2. Coal Bed Methane (popular name CBM) – G2

from coal. CBM has long been identified in the earth in coal mining. and often cause dangerous underground blast and fire. The term CBM derives from methane gas which is absorbed in the pores of solid coal (matrix), unlike crude oil stored in a reservoir. Methane gas trapped in the pores of coal is in a liquid form.

3. Gasification of Coal – G3

Gasification of coal is generated from coal which is gasified, from solid into a mixture of carbon monoxide and hydrogen. The process of gasification is made at liquefied coal, gasified coal, nuclear and hydrogen. With a high temperature at the beginning of pyrolysis process of material that is easily evaporated and become gas. The next process is the combustion of gas that reacts with oxygen and results in carbon dioxide and carbon monoxide. Gasification process takes place at a high temperature with a balance concentration of monoxide, vapor, carbon dioxide and hydrogen. Refining coal vconverted into synthetic gas is a better potential of efficiency compared to direct combustion of synthetic gas. Synthetic gas is flammable at high temperature, Synthetic gas resulted from coal gasification has been used in Indonesia sincethe end of 18 century for supply of city gas by a Dutch private company I.J.N Eindhoven & Co.

I..J.N. Eindhoven & Co was established in 1859. This company was a start-up of PT.Perusahaan Gas Negara (PGN), a government owned firm, which operates in the utilization of natural gas for the city.

4. Nuclear Energy – G4

Nuclear energy is produced from controlled reaction of nuclear. Nuclear reactor produces vapor heat which can be used to start an electric generator. Nuclear electric generator has been used by a number of developed countries and in 2009 contributed over 15% of global demand of electricity. Technology of nuclear electric generation is quite advanced but since the disaster in Chernobyl (Russia) the use of nuclear generator has been abandoned. CBM is a form of natural gas which is extracted

5. Hydrogen – G5

Hydrogen is electrochemical cell as a conventional battery. The difference is that fuel cell uses hydrogen which can be recharged continuously. Hydrogen is mixed with oxygen and produce electricity in a liquid form. Hydrogen is a carrier of matters not a source of energy. Hydrogen can be produced from a variety of renewable energy sources, such as gasification of biomass. biogas, and so forth.

Technology of fuel cell has been developed very fast. And presently Center for Assesment and Application Technology (BPPT) has been able to design hydrogen fuel cell using Proton Exchange Membrane Fuel Cell (PEMFC) with hydrogen fuel and Direct Methanol Fuel Cell (DMFC) using methanol as fuel.

Fuel cell is a device that directly changes chemical energy into electric power. The device is quite different from conventional electric generator. It changes chemical energy into heat then to kinetic energ to operate electric generator. In each stage of changes there will be losses, especially in the process of combustion which is limited by the highest efficiency known as “Carnot Limit”, as explained in thermodynamics law. The limitation is not applicable in electric generation using fuel cell.

Sources of renewable energy is available from sustainable sources, such as geothermal, wind power, bio-energy, solar radiation, water stream, movement of sea water and different temperature of sea water. Source of non-renewable energy derives from energy which is increasing after long exploitation, examples of

Background information

non-renewable energy are as natural oil, natural gas, coal, peat and bitumen cuttings.

Another view as to differentiate between renewable energy And non-renewable is based on the length of period needed by the nature to restore the capacity of supply of resources of energy. Energy sources which is restorable in its supply by nature in a relatively short period is called renewable. On the contrary, if the nature needs a very long period to restore the capacity of the resources is called non-renewable energy.

To anticipate the capacity of the nature in restoring the resources it is important to manage the development the utilization of the resources in such a way that the supply can always be in balance development in demand. It can be achieved if the the development in usage is the same. lower than the speed of regeneration. The requirements is mandatory in the utilization of renewable energy. In reality, renewable energy originates from three main sources of energy, radiation of solar energy, geothermal, and gravitation. Radiation of solar energy which arrives the earth play the roles in hydrological energy and provides potential water energy with temperature and atmospheric pressure to produce wind power, solar radiation absorbed by plants in the process of photosynthesis produces biomass, and so forth.

The revolving positions of the sun and the moon against the earth exerts a gravitation which influences the height of water level and produces tidal energy. The disintegration of radioactive from minerals available in the earth which continuous, produces heat that spreads over surface of the earth and its temperature is high enough to be economic as a source of heat. The potential of geothermal provides the need of global energy, but only a small part of it is utilized due to lack of knowledge, technology and investment.

Technologies for developing renewable energy from renewable sources includes the followings:

1. Geothermal – (T1)

Geothermal can be directly or indirectly used.

Direct utilization of geothermal such as in drying agricultural crops, sterilizing media for mushroom cultivation, hot water bathing, and so forth. Indirect use of geothermal as in conversion of steam into electric energy. Geothermal electric generation system uses steam of water with high pressure originated from reservoir in the earth. It is heated by magma in the earth around the reservoir. The pressurized steam is transferred to steam the turbine which then moves the generator to produce electricity which is commonly named PLTU.

2. Water Stream and Waterfall (Hydro)- (T2)

Water stream and waterfall are forms of potential energy and kinetic (motion) water can be changed into mechanical energy and can further be converted into electricity. Hydro electric generation (PLTA) can be generally classified as PLTA runoff river and PLTA dam. PLTA run-off river should be in operation continuously as long as the generator receuves supply of water available in the reservoir. While PLTA dam can be controlled based on the need. One of popular PLTA run-off river is Mycrohydro Electric Power (PLTMH). The height of the waterfall is made available by removing part of the stream water of the river to the other side of the river then let the stream fall into the same river in a location where the supply of water needed (head) is achieved.

3. Bioenergi – (T3)

Bioenergy is energy source derived from living creatures which are processed such as biomass, solid fuel, liquid biofuel and biofuel gas.

Bioenergy which has been utilized thousand years in the past is wood, for home cooking in particular. Wood can be used for boiler to produce steam. In electricity generation, steam moves turbine and generates electricity. A number of electric generation system using coal, also uses biomass as additional source of energy known as co-firing. In wood and paper industries, wood cuttings are directly input to boiler to produce steam for production processes.

Biogas is also be produced from biomass to generate electric power. Gassification system at high temperature changes biomass into gas fuel. The gas can be used as fuel in combustion engine or gas turbine.

Bio-fuel is fuel produced from bio resources such as biodiesel, bioethanol, and pure plant oil.

- Biodiesel is meant to substitute automotive diesel oil, and industrial diesel-oil. Biodiesel is commonly produced with specification similar to that of diesel oil which is applicable purely or mixed with diesel oil.
- Bioethanol is used as fuel for gasoline engines of vehicles, especially in the form of gasohol, which is fuel mixture of dry ethanol (absolute ethanol) and gasoline.
- Pure bio oil can be used as alternative fuel

such as kerosine or marine fuel-oil. Pure bio oil replacing kerosine is called bio kerosene. Another use of pure bio oil is as substitute of diesel oil for stationary diesel engine, such as for generating electricity.

4. Solar Energy- (T4)

Solar energy is used in two categories, namely active solar and passive solar. In active solar, solar power is directly converted and its application is classified into two, namely solar thermal for heating, and solar-photovoltaic in electric generation. In passive solar , however the application of solar power tends are for lighting and ventilation of building.

5. Wind Power – (T5)

Wind power is kinetic (movement) of air at a high speed and then converted by turbine or wind mill to become mechanical energy to operate electric generator or other machines such as water pump, rice mill, et cetera. Wind power has been in use hundred years ago such as in moving sailing ships, draining water pumps, rice mills or wheat mills.

6. Movement and Temperature Difference of Sea Water or Ocean (EBT) – (T6)

Movement and temperature difference of sea water (ocean) is a source of energy available in waters. They occur in the forms of tidal energy, wave energy, stream energy, and of the temperature difference in sea water. Utilization technology of such energy is being developed. Some have been appllied in Indonesia and become commercial. Huge potential of EBT in Indonesia has been developed by a number of research and development (R&D) centers and universities, as well as by private sectors, both as pure research, in prototype or for commercial programs. To combine and implement those activities toward a specific purpose, a Master Plan for New and Renewable Energy Development (Rencana Induk Pengembangan Energi Baru Terbarukan) in Indonesia is expected to provide information to the stakeholders of new and renewable energy in Indonesia.

Development in new and renwable energy based on their sources, are grouped into 11 clusters consisting of 5 new energy clusters and 6 renewable energy clusters. The stakeholders concerned includes core business, support business, engineering/technical association, and users association. Groups of new and renewable energy has been established, with the name Indonesia Renewable Energy Community (Masyarakat Energi Terbarukan Indonesia - METI).

Clusters of New and Renewable Energy

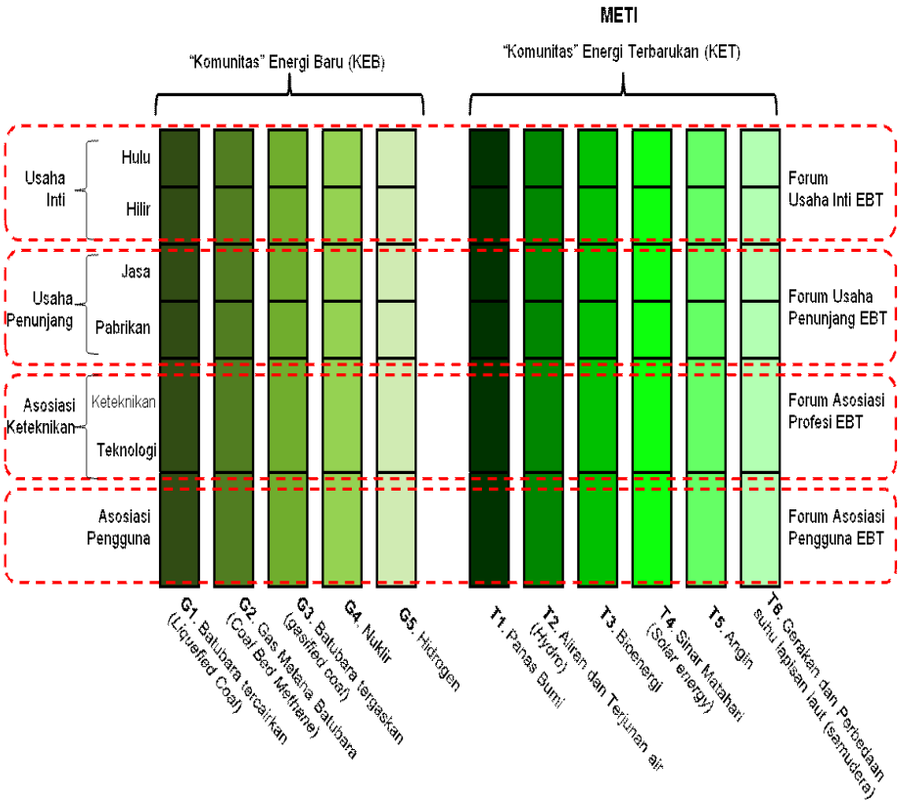


Figure 1.4
Clusters of New and Renewable Energy

1.2. Legal Basis

Legal basis to start business in use of new and renewable energy and conservation is arranged in law and regulations as follows :

1. Law No 30 of 2007 on Energy (Undang-Undang Nomor 30 Tahun 2007 tentang Energi)
2. Law No 30 of 2009 on Electric Power (Undang-Undang Nomor 30 Tahun 2009 tentang Ketenagalistrikan)
3. Law No 32 on Environment Management (Undang-Undang Nomor 32 Tahun 2009 tentang Pengelolaan Lingkungan Hidup)
4. Law No 27 on Geothermal (Undang-Undang Nomor 27 Tahun 2003 tentang Panas Bumi)
5. Presidential Regulation No 5 of 2006 on National Energy Policy (Peraturan Presiden Nomor 5 Tahun 2006 tentang Kebijakan Energi Nasional)

Special legal basis related to business ventures in New and renewable energy and conservation are as follows:

A. Geothermal

- ESDM Ministerial Regulation No 32 of 2009 cocerning Primary Purchase Price for Electric Power by PT PLN from Geothermal Electric Generation.
- Government Regulation No 62/2008 on Amendment of Government Regulation No. 1 of 2007 on Income Tax Facilities for Investors in Certain Business and/or in Certain Areas
- Presidential Regulation No 4 of 2010 on Appointment of PT PLN to Accelerate Development of Electric Generation using New and Renewable Energy, Coal and Gas
- Government Regulation No 70 of 2010 as amendment of Government Regulation No 59 of 2007 on Business Ventures in Geothermal
- Finance Ministerial Regulation No 24/PMK/011/2011 on Value Added Tax to be Borne by the Government for Import of Goods for Upstream Exploration in Oil and Gas and Geothermal
- ESDM Ministerial Regulation No 2 of 2009, on Guidelines of Initial Survey in Geothermal
- ESDM Ministerial Regulation No 11 of 2008 on Procedures of Work Areas Concession of Geothermal
- ESDM Ministerial Regulation No. 2 of 2009 on Guidelines of Initial Survey on Geothermal
- ESDM Ministerial Regulation No. 05 of 2009 on Purchase Price of Electricity by PLN from Cooperatives or Other Business Operators
- ESDM Ministerial Regulation No. 11 of 2009 on Guidelines of Business Ventures in Geothermal
- ESDM Ministerial Regulation No. 31 of 2009 on Purchase Price of Electric Poewer by PLN in Small and Medium Size or Excess of Electric Power
- ESDM Ministerial Regulation No 2 No 11 of 2011 on Appoointment to PLN to Purchase Electricity from Geothermal Generator and Basic Purchase Price of Electricity by PLN
- ESDM Ministerial Regulation No 15 of 2010 on List of Projects Development Acceleration Uising New and Renewable Energy, Coal, and Gas and Transmission
- ESDM Ministerial Regulation on Appointment to Business Operators for Initial Survey
- ESDM Ministerial Regulation on 26 Geothermal Work Areas Concession of
- ESDM Ministerial Regulation No 1944 K/30/MEM/2009 on Appointment of Producing Areas and Primary Calculation Share for Producing Areas of Geothermal 2006-2009
- ESDM Ministerial Regulation No 2010 K/30/MEM/2009 on Appointment of Areas of Initial Survey of Geothermal.

B. Energy Conservation

- Government Regulation No 70 of 2009 on Energy Conservation
- Presidential Instruction No 2 of 2008 on Economizing of Energy and Water
- ESDM Ministerial Regulation No 31 of 2005 on Implementation Procedures in Economizing Energy
- Ministry of Finance Regulation No 21/PMK.011/2011 on Provision of Tax and Customs Facilities for Utilization of Renewable Energy
- Finance Ministerial Regulation No 177/KMK.01/2010 on Government Direct Investment in Environmentally Friendly

Investment

- ESDM Ministerial Regulation No 13 of 2010 on Implementation of Standard Competence of Manager in Energy for Industry
- ESDM Ministerial Regulation No 14 of 2010 on Implementation of Standard Competence of Manager in Energy for Building Management
- Decision of Director General for Electricity and Utilization of Energy No 238-12/47/600 on Procedures of Putting Labels of Economizing Energy.

C. Variety of New and Renewable Energy

- Government Regulation No 26 of 2006 on Supply and Use of Electric Power, amendment of Government Regulatoon No 3 of 2005 and No 10 of 1989)
- ESDM Ministerial Decision No 1122 K/30/ MEM/2002 on Guidelines of Business Ventures in Spread of Small Scale Electric Generation
- ESDM Ministerial Regulation No 002 of 2006 on Medium Scale Business Ventures in Renewable Electric Generation
- ESDM Ministerial Regulation No 5 of 2009 on
- Guidelines of Purchase Price of Electric Power by PT PLN from Cooperatives and or Other Business Operators.
- ESDM Ministerial Regulation No ... of 2009 on Purchase Price of Electric Power by PT PLN from Small and Medium Scale Electric Generation or from Excess of Electric Power.
- Finance Ministerial Regulation No 21/ PMK.011/2010 on Provision of Tax and Customs for Utilization of Renewable Energy.
- Presidential Regulation No 4 of 2010 on the Appointment of PT. PLN (Persero) to develop electric power from new and renewable energy sources, coal and gas.
- ESDM Ministerial Regulation No 15 of 2010 on List of Projects of Acceleration Development of Electric Generation Using New and Renewable Energy, Coal and Gas and their Transmission.

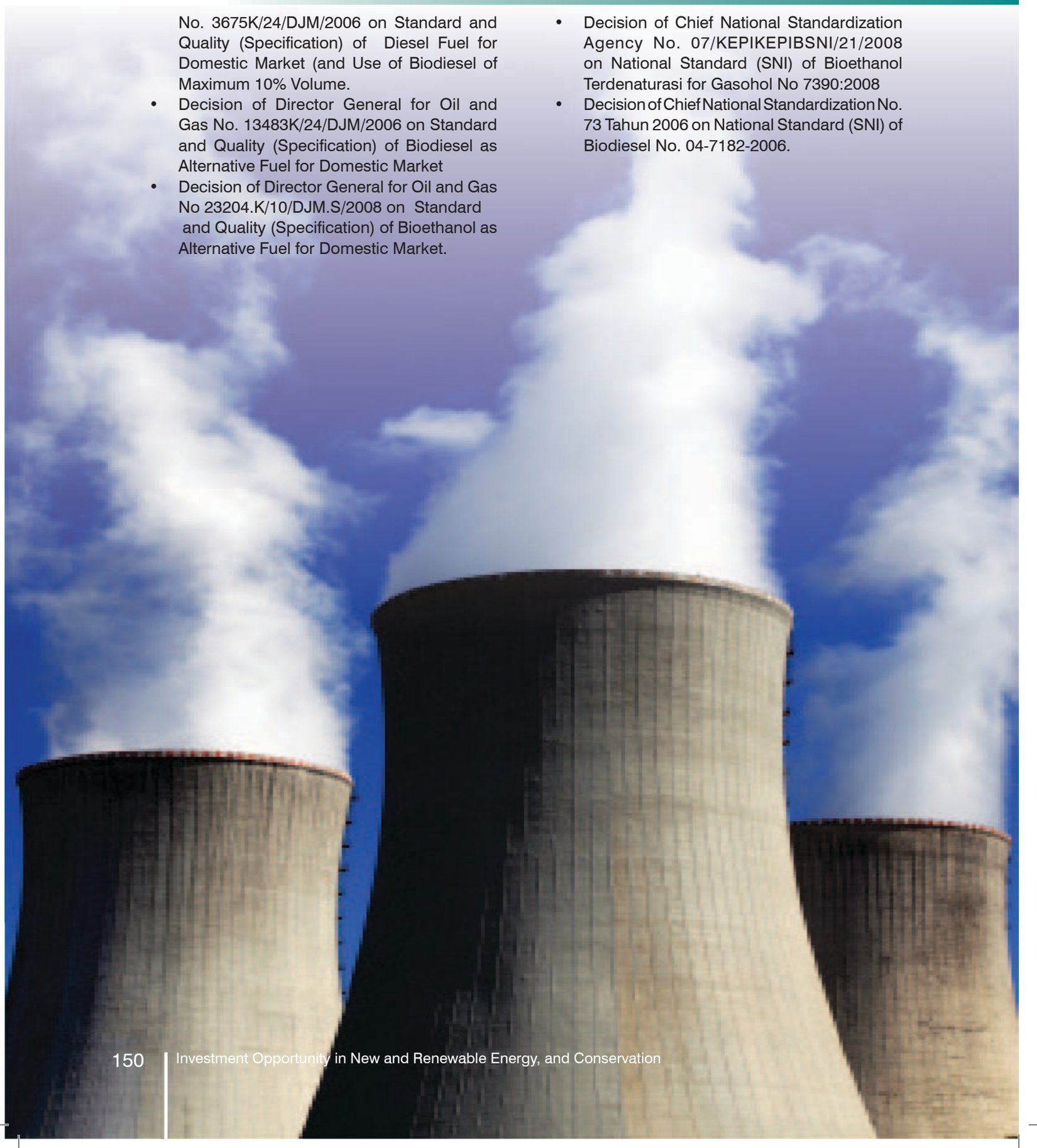
D. Bioenergi

- Government Regulation No 1 of 2007 on Provision of Income Tax for Investors in Certain Business Ventures and/or in Certain Areas.
- Government Regulation No 8 of 2007 on Government Investment (development of Public Service Agency (BLU) including Bio Fuel).
- Presidential Regulation No 5 of 2006 on National Energy Policy.
- Presidential Regulation No 45/2009 on Amendment of Presidential Regulation No 71 of 2005 on Supply and Distribution Certain Fuel Oil, which includes Bio Fuel
- Presidential Instruction No 1/2006 on Supply and Utilization of Biofuel as Alternative Fuel.
- Presidential Decision No 10/2006 on Establishment of National Team for Development of Bio Energy and Acceleration of Minimizing Poverty and Unemployment.
- ESDM Ministerial Regulation No 31 of 2009 on Power Purchase by PT PLN (Persero) from Electric Generator Using New and Renewable Energy of Small and Medium Scale Enterprise or from Remainder of Electric Power.
- ESDM Ministerial Regulation No 0002 of 2004 on Development of Green Energy Policy.
- ESDM Ministerial Regulation No 0219 K/12/ MEM/2010 on Market Index Price of Fuel Oil and Market Index Price of Bio Fuel which is Mixed with Certain Fuel.
- ESDM Ministerial Regulation No 0048/2005 on Standard and Quality (Specification) and Control of Oil Fuel, Gas Fuel, Other Fuel, LPG, LNG and Other Refined Products for Domestic Market.
- ESDM Ministerial Regulation Nor 32/2008 on Supply, Utilization and Trade of Biofuel as Alternative Fuel.
- Ministerial (Finance) Regulation No 117/ PMK.06/2006 on Credit for Development of Bioenergy and Revitalization of Plantation.
- Agriculture Ministerial Regulation No 26/ Permentan/ar.140/2/2007 on Guidelines for Licencing of Business in Plantation.
- Decisioon of Director General for Oil and Gas No. 3674K/24/DJM/2006 on Standard and Quality (Specification) of Oil Fuel for Domestic Market and Maximum Use of Bioethanol of 10% Volume.
- Decision of Director General for Oil and Gas

Legal Basis

No. 3675K/24/DJM/2006 on Standard and Quality (Specification) of Diesel Fuel for Domestic Market (and Use of Biodiesel of Maximum 10% Volume.

- Decision of Director General for Oil and Gas No. 13483K/24/DJM/2006 on Standard and Quality (Specification) of Biodiesel as Alternative Fuel for Domestic Market
- Decision of Director General for Oil and Gas No 23204.K/10/DJM.S/2008 on Standard and Quality (Specification) of Bioethanol as Alternative Fuel for Domestic Market.
- Decision of Chief National Standardization Agency No. 07/KEPIKEPIBSNI/21/2008 on National Standard (SNI) of Bioethanol Terdenaturasi for Gasohol No 7390:2008
- Decision of Chief National Standardization No. 73 Tahun 2006 on National Standard (SNI) of Biodiesel No. 04-7182-2006.



2 OVERVIEW OF NEW AND RENEWABLE ENERGY AND CONSERVATION

2.1. Potential and Use of New and Renewable Energy and Conservation

Most recent data of potential of new and renewable energyfor utilization as seen in Table 2.1 below:

Brown Coal Liquefied (BCL) has been implemented for 8 years.There are several stages and processes which are to be carried out to arrive at stage of BCL which all takes approximately 8 years.

Table 2.1.
Reserve and Production of New and Renewable Energy of Indonesia

No	Types of New and Renewable Energy	Potential Resources	Energy Production	Percentage of Utilization (%)
1	Geothermal	28.543 MW	1,189 MW	7.54
2	Hydro Power	75.670 MW	5,705.29 MW	4.17
3	Mini/Micro Hydro	769.69 MW	217.89 MW	28.31
4	Biomass	49.810 MW	1,618.40 MW	3.25
5	Solar Power	4,80 kWh/m2/day	13.5 MWp	-
6	Wind Power	3 – 6 m/s	1.87 MW	-
7	Uranium	3.000 MWt (eq. 24,112 ton) for 11 years *)	30 MWt	1.00

Source: www.world-nuclear.org/info/inf75.html

2.1.1. Potential of New Energy

2.1.1.1. Liquefied Coal

The present reserve of coal in Indonesia is about 60 billion tons available over the country. Approximately 85% of the the amount is lignit or low range coal with low quality as it contains 30% of water, low calorie content and low sale price. While quality coal commonly called Black Coal is mostly for export.

Low range coal commonly named brown coal will be developed as alternative source of ebergy replacing oil. The government of Japan and her businessmen are interested to explore brown coal and has been in cooperation with BPPT to realize the project. The government of Japan is represented by NEDO, a a technology assesment agency in Japan,which focusses on energy development in Japan, whereas the participating company is Nissho Iwai Corporation.

BPPT (Center for Assessment and Application of Technology) is planning to negotiate with government of Japan to Provide funding to establish BCL manufacturing plant to produce gasoline and diesel fuel from coal. The funding will be in the form of soft loan. The funding for BCL manufacturing plant will approximately reacg USD5.8 billion, because the experts and technology are not available. If the project is realized, the experts and technology are outsourced from Japan as Indonesia only has a few experts in coal and other technology related to BCL.

The BPPT has been active in research of BCL in South Sumatera areas, East Kalimantan and South Kalimantan. It is identified that 30.000 tons of coal are potential to produce around 130.000 barrel oil per day. One example of Master Plan of BCL is successfully in Australia and in Japan by Japanese expert.

PT. Tambang Batubara Bukit Asam is planning to develop a liquified coal refinery in South Sumatera Selatan with investment of US$5.2 billion. South Africa's Sasol Limited, producer of the biggest synthetic oil in the world has started a negotiation with PT Pertamina and PT Tambang Batubara Bukit Asam for development of liquified coal refinery of US$ 10 billion value.

At the beginning of 2010 an MOU between Indonesian government and Sasol has been signed to start preliminary studies for liquified coal refinery.If the project is successful the refinery will produce a clean and quality fuel of approximately 80,000 barrels, or over 1.1 million barrel oil equivalent per day (BOEPD). If the project is realized as planned the construction will be finalised by end of 2014 and in production by 2015.

There four potential locations ready for setting up liquified coal refinery namely Musi Banyuasin in South Sumatera with coal reserve of 2.9 billion tons of coal and Berau in East Kalimantan with 3 billion tons of coal.

2.1.1.2 Coal Bed Methane (CBM)

Coal bed methane (CBM) reserve in Indonesia is around 453.3 triliun Cubic Feet (TCF) spread over at 11 hydrocarbon basins. The basins are reserved in 11 coal Basins at different locations in Indonesia, Sumatera, Java, Kalimantan and Sulawesi. The locations of CBM are South Sumatera (183 TCF), Barito (101,6 TCF), Kutei (89,4 TCF) and Central Sumatera (52,5 TCF) which are highly prospective. Those in North Tarakan (17,5 TCF), Berau (8,4 TCF), Ombilin (0,5 TCF), Pasir/ Asam-Asam (3,0 TCF) and Jatibarang (0,8) are of moderate prospective. While those in Sulawesi (2,0 TCF) and Bengkulu (3,6 TCF) are low prospect. The CBM potential of 453,3 TCF consists of 112,47 TCF proven and 57,60 TCF reserve.

By 2015 Indonesia is predicted to produce up to 500 million cubic feet CBM per day (MMSCFD) and even more than 900 MMSCFD by 2020. By 2025 production of CBM of Indonesia will reach 1.500 MMSCFD. Until November 2010, at least 23 work contracts for CBM have been signed. In December 2010 the government offered 13 CBM work areas.

2.1.1.3. Gasified Coal

Energy from gasified coal is potential for development since Indonesia's potential of coal is huge. In 2008, coal reserve is identified at 104,8 billion tons, with total reserve of 20,98 billion tons and production at 0,254 billion tons.

The resources is mostly located in Kalimantan of about 61%, Sumatera 38 % and in other locations. Based on their types they are classified as lignite of 58.6 %, sub-bituminous 26.6 %, bituminous 14.4 % and anthracite 0.4 %.

The vast reserve of coal is potential for producing gas fuel and Electricity using coal gasification process.

2.1.1.4. Nuclear Energy

The exploration of uranium as fuel in Indonesia has not been made at a maximum stage. There are 2 locations potential explored, namely in Kalan, West Kalimantan of 34.112 tons and in Kawat, East Kalimantan of 10.000 tons. Total potential of uranium of the two areas are potential to generate electricity of around 1000 MWe PLTN for 170 years, or 4000 MWe PLTN for 40 years. Other areas in Indonesia from Sabang to Merauke have a big potential of uranium ready for investment. Development of exploration of uranium and other nuclear fuel in other areas over the country to identify national nuclear energy resources takes a long period.

The average impact of uranium in the earth crust is around 2,7 ppm, much bigger than that of lead. The needed concentration to form economic mineral sediment, depending on physical and geological conditions. Average content of uranium in active mines is between 0,03% and up to 24%, but not more than 1%. Uranium is discovered in all parts of the earth, some of them as seen in Figure 2.1:

Table 2.2
Content of Uranium from Several Sources

Sources of Uranium	Content
High quality ore (Canada) - 20% U	200.000 ppm U
High quality ore - 2% U	20.000 ppm U
Low quality ore - 0,1% U	1.000 ppm U
Very low quality ore (Namibia) - 0,01% U	100 ppm U
Granite	4-5 ppm U
Sedimentary rocks	2 ppm U
Average crusts	2,8 ppm U
Sea water	0,003 ppm U

Sources: www.world-nuclear.org/info/inf75.html

Spread of uranium in Indonesia as seen in figure 2.1. below.

Figure 2.1
Potential of Uranium

2.1.1.5. Hydrogen

Hydrogen energy produced from coal is a promising potential for development as Indonesia reserve of coal is huge. In 2008, reserve of coal identified is atound 104,8 billion tons, with total reserve 20,98 billion tons and production of 0,254 billion tons. The reources are mostly located in East Kalimantan of 61 %, Sumatera of 38 % and the rest are spread in other locations.

According to the types coal can be classiufied as lignite of %, sub-bituminous of 26.6 %, bituminous of 14.4 % and the remainings is anthracite of 0.4 %. The huge potential of coal in Indonesia enables the country to produce hydrogen gas fuel through coal gasification process.

2.1.2. Potential of Renewable Energy

2.1.2.1. Geothermal

Geothermal is a clean energy, environmentally friendly, and renewable. It has widely known that Indonesia owns potential of geothermal of 28.543 MW or 40% of world potential. The potential of geothermal in Indonesia is scattered over 265 locations. However, its utilization is not yet optimum. Only a small part of 1.189 MW or 4,2% of the total potential.

Figure 2.2
Spread of Potential Geothermali in Indonesia

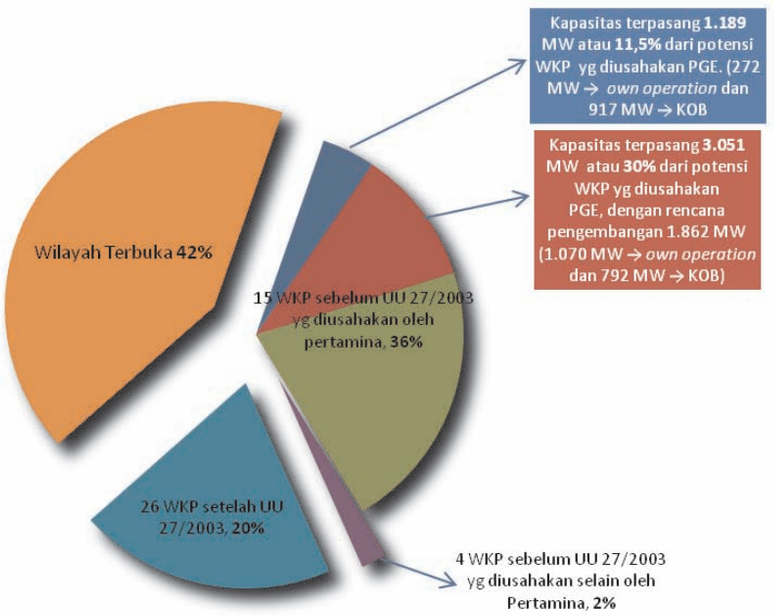


Figure 2.3
Potential of Geothermal, 2009

No	Work Areas	Potential (MW)	Percentage (%)
1.	Work Areas before Law No 27/2003		
	15 work areas managed by Pertamina	10.340	36
	4 work areas managed by other than Pertamina	529	2
2.	26 work areas after Law No 27/2003	5.826	20
3.	Open work areas	11.848	42
	Total	**28.543**	**100**

Sources : Data processed from Distribution Map of Geothermal Potential in Indonesia 2009 by Geology Agency

2.1.2.2. Stream water and Waterfall (Hydro)

Potential of hydro in Indonesia has achieved 75.670 MW, dispersed in a number of locations, with capacity of 4.200 MW or only 5,6% of hydro energy potential in Indonesia.

Detail potential of hydro power and its implementation in energy as seen in Table 2.3.

Table 2.3
Potential and Implementation of Hydro

No	Island	Large Scale (<10 MW)		Skala kecil (> 10 MW)		Total (MW)	
		Potential	Implementation	Potensi	Implementasi	Potensi	Implementasi
1	Sumatera	16.100,00	1.154,00	281,76	83,44	16.381,76	1.237,44
2	Jawa	12.050,00	2.012,50	222,02	212,32	12.272,02	2.224,82
3	Kalimantan	5.999,50	30,00	277,75	31,27	6.277,25	61,27
4	Sulawesi	14.550,00	352,00	167,56	118,05	14.717,56	470,05
5	Bali-NTT-NTB	4.900,00	0,00	31,64	12,25	4.931,64	12,25
6	Maluku-Papua	21.057,00	23,00	32,78	4,67	21.089,78	27,67
Total		**74.656,50**	**3.571,50**	**1.013,50**	**462,00**	**75.670,00**	**4.033,50**

2.1.2.3. Bioenergi

Bio Fuel (BBN)

- Potential plants for biofuel available in Indonesia includes palm trees, sugar cane, cassava, sweet sorghum nyamplung, nipah and so on. They are potential for cultivation in large scale over the country. While those potential for growing in marginal soil covering eastern part of Indonesia such as jatropha, is quite prospective for raw material of biofuel production.
- In addition to food crops and non food crops as raw material for biofuel production, agricultural refuse are potential for raw material for biofuel such as refuse of bioethanol, and other industrial wastes which come to about 74.000 million tons.

Biogas

- Potential of biogas in Indonesia comes to 684.8 MW which are mostly derived from manure of cattles and other organic matters.
- In 2009, cattle producing biogas amounted to 13 million cows, and about 15.6 million goats.
- Prices of energy at certain local areas are relatively higher particularly at urban or village areas, that the utilization of biogas, biomass in those areas may become economical.

Biomass

- Biomass derived from agricultural activities is available quite significantly and renewable, especially in areas of agricultural development locations such as farming, plantation and forestry. Agricultural wastes are in the forms of refuse of materials, unused or remainders of refining processed materials.
- Availability of wastes or refuse from agricultural industry amounted to 64 million tons.
- Sugar cane biomass which are commonly used as source of energy by Sugar Factory (PG) is generally called cane pulp (Kurniawan 1999; Kurniawan . et al. 2007) . Calorific value of cane pulp around 7.600 kJ/ kg with water content of 50% (Paturau 1989). The calorific value of cane pulp is lower than that of wood which is 11.715 kJ/kg with water content of 30%. However, cane pulp is still potential as it is readily available in the vicinity of sugar factories and it is available at big quantity and renewable in nature. In each hectare of areas of sugar cane plants arouhd 30 tons of cane pulp can be produced.
- City wastes are potential as source of electric energy. In 39 districts (Kabupaten/Kota) which own garbage disposal (TPA) such as in DKI Jakarta, Batam, Kota Semarang, Kota Palembang, Kota Surabaya, Kota Padang, Kota Pontianak, Kota Medan, Kota Bogor, Kota Malang, Kota Depok, Kota Jogya, Kota Jambi, Kota Samarinda, Kab. Bogor, Kab. Tangerang, Kota Sukabumi, Kab. Garut, Bali, Kota Madiun, Kab. Sidoarjo, Kota Balikpapan, Kab. Banyuwangi, Kota Bandung, Kab. Tegal, Kab. Cirebon, Kota Tangerang, Kab. Purwakarta, Surakarta, Kab. Pasuruan, Kab. Probolinggo, Kab. Kediri, Kota Pekanbaru, Kota Bandar Lampung dan Kota Makassar, with garbage of between 100 tons/per day and 8.733 tons/per day depending on number of populaton.

2.1.2.4. Solar Energy

Potential of solar energy as renewable energy is not yet much utilized at the moment, in spite of its abundant potential. According to statistical data of renewable energy of Indonesia in 2010 (Indonesia Tahun 2010), of the ESDM Ministry, the potential of solar energy in Indonesia as seen in Table 2.4 below.

Table 2.4
Potential of Solar Power in Indonesia

No	Districts (Kabupaten/Kota)	Province (Provinsi)	Latitude – Longitudinal Position (Lintang ; Bujur)	Average Radiation per day (kWh/m2)
1	Banda Aceh	NAD	4°15'N;96°52'E	4,10
2	Palembang	Sumatera Selatan	3°10'S;104°42'E	4,95
3	Menggala	Lampung	4°28'S	5,23
4	Jakarta	DKI Jakarta	6°11'S;106°5'E	4,19
5	Bandung	Jawa Barat	6°56'S;107°38'E	4,15
6	Lembang	Jawa Barat	6°50'S;107°37'E	5,15
7	Citius, Tangerang	Jawa Barat	6°07'S;106°30'E	4,32
8	Darmaga, Bogor	Jawa Barat	6°30'S;106°39'E	2,56
9	Serpong, Tangerang	Jawa Barat	6°11'S;106°30;E	4,45
10	Semarang	Jawa Tengah	6°59'S;110°23'E	5,49
11	Surabaya	Jawa Timur	7°18'S;112°42'E	4,30
12	Kenteng, Yogyakarta	DIYogyakarta	7°37'S;110°01'E	4,50
13	Denpasar	Bali	8°40'S;115°13'E	5,26
14	Pontianak	Kalimantan Barat	4°36'N;9°11'E	4,55
15	Banjarbaru	Kalimantan Selatan	3°27'S;144°50'E	4,80
16	Banjarmasin	Kalimantan Selatan	3°25'S;114°41'E	4,57
17	Samarinda	Kalimantan Timur	0°32'S;117°52'E	4,17
18	Menado	Sulawesi Utara	1°32N;124°55'E	4,91
19	Palu	Sulawesi Tengah	0°57'S;120°0'E	5,51
20	Kupang	NTT	10°09'S;123°36'E	5,12
21	Waingapu, Sumba Timur	NTT	9°37'S;120°16'E	5,75
22	Maumere	Papua	8°37'S;122°12'E	5,72

2.1.2.5. Wind Power

Research and assessment for potential of wind power have been made in a number of locations/areas in Indonesia by government agencies, non-government such as LAPAN, BMG, local government and foreign organizations/companies as seen below :

- Survey and direct measurement of wind power on location by;
  - LAPAN : >120 locations, in several areas in Indonesia;
  - Wind Guard : 12 locations (NTT);
  - Windrock Int : 20 locations (NTT);
  - Soluziona : 3 locations (Sulsel dan Jateng);
  - Nipsa : 2 locations (Sumut).
- Secondary Data : BMG, WMO, NCDC dan 3 TIER
- Potential Map of Wind Power NTT : Sumba and Timor (NREL)
- A number of offices at different locations

Potential of wind power in Indonesia formed by nature is relatively small becasue of its location in the equator. However, a number of areas which are geofigureically located in windy areas which are of nozzle effect or narrowing between two islands or between slopes of two adjacent mountains. Potential of wind power in Indonesia as seen in Table 2.5 below.

Table 2.5 (1/2)
Potential of Wind Power in Indonesia

No	Village/Districts	Provinces	Period of Measurement	Average speed At elevation of 24m (m/ second)	Classification of Potential
1	Ds. Bulak Baru, Kab. Jepara	Jawa Tengah	1995	4,6	Medium Scale
2	Ds. Karimunjawa, Kab. Jepara	Jawa Tengah	1996	3,6	Medium Scale
3	Bungaiya, Kab. Selayar	Sulawesi Selatan	1996	4,9	Medium Scale
4	Stasiun Inderaja Lapan Pare - pare	Sulawesi Selatan	1996	3,53	Medium Scale
5	Ds. Dongin, Kab. Banggai	Sulawesi Tengah	1996	2,8	Small scale
6	Ds. Bulungkobit, Kab. Banggai	Sulawesi Tengah	1996	2,2	Small scale
7	Palu	Sulawesi Tengah	1991-1994	2,85	Small scale
8	Ds. Paudean, Kab. Bitung	Sulawesi Utara	1995	2,8	Small scale
9	Ds. Libas, Kab. Minahasa	Sulawesi Utara	1995	3,23	Medium Scale
10	Dsn. Doropeti, Kab. Dompu	NTB	1995	3,7	Medium Scale
11	Ds. Bajo Pulau, Kab. Bima	NTB	1995	3,7	Medium Scale
12	Ds. Sambela, Kab. Lombok Timur	NTB	1995	4,5	Medium Scale
13	Dsn. Tember, Kab. Lombok Timur	NTB	1995	4,4	Medium Scale
14	Dsn. Selayar, Kab. Lombok Timur	NTB	1995	3	Medium Scale
15	Dsn. Gilgede, Kab. Lombok Barat	NTB	1995	4,95	Medium Scale
16	Dsn. Nangadoro, Kab. Dompu	NTB	1995	4,3	Medium Scale
17	Ds. Pai, Kab. Bima	NTB	1996	3,7	Medium Scale
18	Ds. Kute, Kab. Lombok Tengah	NTB	1996	3,1	Medium Scale

Table 2.5 (2/2)
Potential of Wind Power in Indonesia

No	Village/Districts.	Province	Period of Assessment	Average speed at (m/second)	Level of Potential
19	Ds. Sajang, Kab. Lombok Timur	NTB	1996	3,3	Medium Scale
20	Nangabalang, Kab. Manggarai	NTT	1995	3,3	Medium Scale
21	Ds. Nangalili, Kab. Manggarai	NTT	1996	4,5	Medium Scale
22	T.N. Komodo, Kab. Manggarai	NTT	1995	3	Medium Scale
23	Ds. Pasir Putih, Kab. Manggarai	NTT	1995	3,5	Medium Scale
24	Ds. Maubesi, Kab. Kupang	NTT	1996	4,1	Medium Scale
25	Ds. Palakahembi, Kab. Sumba Timur	NTT	1996	4,84	Medium Scale
26	Ds. Watumbelar, Kab. Sumba Timur	NTT	1996	2,86	Small Scale
27	Ds. Sibowuli, Kab. Ngada	NTT	1996	3,2	Medium Scale
28	Dsn. Ujung, Kab. Manggarai	NTT	1996	3,4	Medium Scale
29	Dsn. Papanggarang, Kab. Manggarai	NTT	1996	2,8	Small Scale
30	Waingapu	Irja	1991-1994	2,6	Small Scale
31	Ds. Kaimbulawa, Kab. Buton	Sulawesi Tenggara	1996	3,95	Medium Scale
32	Ds. Gerak Makmur, Kab. Buton	Sulawesi Tenggara	1996	2,81	Small Scale
33	Ds. Kalasuge, Sangihe-Talaud	Sulawesi Utara	1996	3,2	Medium Scale
34	Ds. Kamangge, Sumba Timur	NTT	1996	4,01	Medium Scale
35	Ds. Parang, Jepara	Jawa Tengah	1996	6	Large Scale
36	Ds. Jorang, Tana Laut	Kalimantan Selatan	1996	2,3	Small Scale
37	Ds. Semaras, Kota Baru	Kalimantan Selatan	1996	2,2	Small Scale
38	Ds. Masebewa, Sikka	NTT	1996	3,1	Medium Scale
39	Tomenas, Timor Tengah Selatan	TB	1996	6,7	Large Scale
40	Netpala	TTS	1996	5,3	Medium Scale
41	Oil Bubuk	TTS	1996	7,5	Large Scale
42	Sakteo	TTS	1996	6,4	Large Scale
43	Oesao, Kupang	NTT	1996	3,1	Medium Scale
44	Hansisi, Kupang	NTT	1996	4,2	Large Scale
45	Unkris (Rote)	NTT	1996	6	Medium Scale
46	Mondu	NTT	1996	4,6	Medium Scale
47	Tuak Luba	NTT	1996	3,6	Medium Scale
48	Nusa	NTT	1996	4,3	Medium Scale
49	Paipaha, Sumba Timur	NTT	1996	3,3	Medium Scale
50	Wala Kiri	NTT	1996	4,8	Medium Scale
51	Napu	NTT	1996	5,2	Medium Scale

2.1.2.6. Movement and Difference of temperature of Sea waters (Ocean)

Indonesia is one countrywhich has the largest sea waters in the world. Around two thirds of world areas are seas. Indonesia has second longest coast in the world after Canada. The length of Indonesia's coast is about 80,000 Km and the area is around 52 million square kilometers.

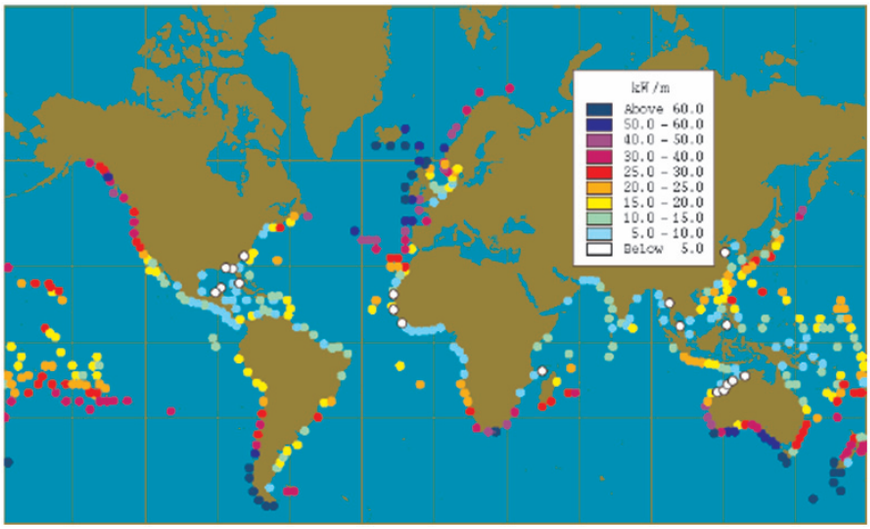


Figure 2.4
Average sea waves power yearly (kW/m)

Waves are formed by wind that moves over the surface of the sea. As long as there is a different temperature between two or more areas, stream of wind will occur and form waves The power of waves varies in each location. The world wave map (Electric Power Research Institute) shows sea areas of Indonesia along the south coast from Java to Nusa Tenggara is the location which possess potential of big wave power around 10 – 20 kW per meter. A number of research results indicate spots of wave power in several locations in Indonesia may achieve 70 kW/m.

Characteristics of sea power are very appropriate for city harbour that needs energy and also for remote islands in Indonesia. Unfortunately development and application of sea waves technology in Indonesia has not been optimally made although quite promising

According to the data mentioned above, southern part of West Sumatera coast, and southern coast of Java in western areas, sea waves are potential of around 40 kW/m. In addition to pursuing the best technology to convert sea waves into energy, there are a number of alternative technologies to choose from other sources Alternative technology appropriate for development for south coast of Java is called Tapered Channel Technology (Tapchan).

Center for Coastal Dynamics Assessment (Balai Pengkajian Dinamika Pantai (BPDP) of Center for Assessment and Application Of Technology (BPPT) Yogyakarta has made a research since 2003 and has developed application of sea waves as source of alternative electric energy. Using OWCS technology, BPDP-BPPT has developed a prototype in Parangracuk coast, Baron, Gunung Kidul,DIY of Yogyakarta and successfully produced potential of 522 watt.

Research and development in the application of sea waves technology is continued by researchers and academicians. A number of research to develop power through conversion of sea waves of cavity resonator is by modifying the forms of the cylinders. Result of the research shows that if the periods of waves are magnified, the air pressure that occurs in the orifice (the small holes on top cylinder) will be quite significant which is at the average of 40% bigger than those that occur at the beginning. Now if the height of waves is magnified the pressure becomes bigger which is at the average of 200%. However

At the research stage (potential data and feasibility study) carried out by a number of researchers among others Prof. Dr, Safwan Hadi and Dr. Totok Suprijo of the Faculty of Earth Science and Technology, D r. Ir. Bonar P Pasaribu of the Department of Ocean Science and Technology (IPB), and Dr. Donny Achiruddin of the Umiversitas Persada Indonesia, who is now carrying

out a joint research with Universitas Saga, of Japan, and will realize the research results in pilot projects to be funded by Japanese government.

Pattern of streams of Indonesian, at full moon of highest tide (at maximum speed) and rise tide, at low , except in tide (at minimum stream), generally identifies that available stream not big, except in Strait of Bali, Lombok Strait, and Makassar Strait..energy efficiency remains high. Stream waters for electric generation has been implementred as a pilot project by TimT-files of Indonesia Hydrodinamics Laboratory, Center for Research and Application Technology (BPPT) and BRKP of Ministry of Ocean and Fishery. The Tim T-files of ITB designed hydrokinetic turbine, of gorlov helical and has been tested in Nusa Penida, Bali at the end of Juli 2009 with capacity of 5 kW (in cooperation with Balitbang KESDM). While BPPT dan BRKP-KKP in cooperation with PT. Kobold Nusa (joint venture between Ponte di Archimede (PdA), Italy and PT. Walinusa Energi) will develop sea wave turbine with capacity of 20 kW at Lombok Channel. The project is expected to finalise by mid of 2011.

2.1.3. Potential of Energy Conservation

In addition to main policy of energy diversification, energy conservation is another. which is in line with a change in energy management which is Demand Side Management stressing on efficiency enhancement by end users of energy. Indonesia is considered an inefficient energy country which can be seen in its, bigger energy elasticity figures than 1.

This condition shows a potential increase in energy use. Potential conservation of energy is classified into four groups of energy users namely industrial, commercial, transportation, and households. Data of potential energy conservation by ITB and Dr. Erwandi, of groups of energy users as seen in Table 2.6.

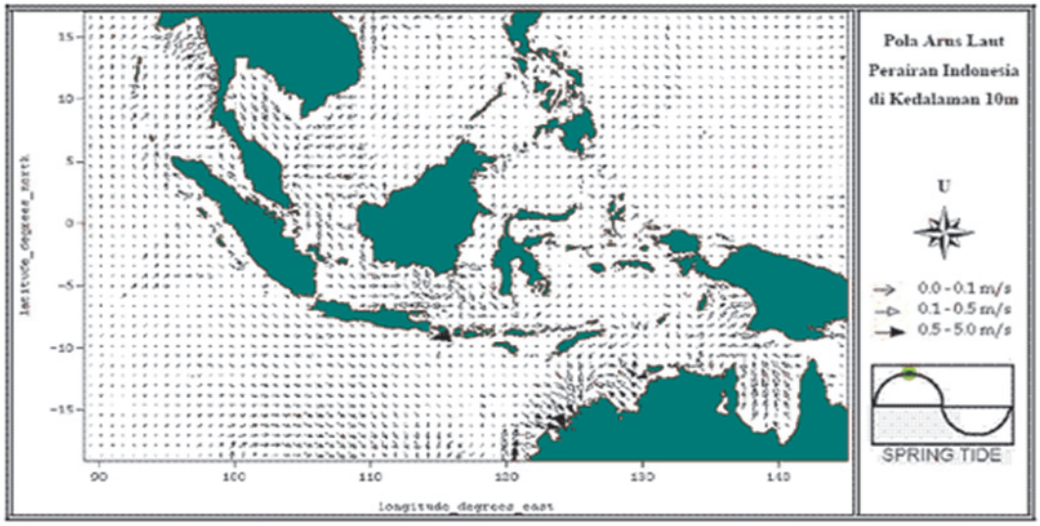


Figure 2.5 Pattern of stream in Indonesian waters condition of tide at full moon at the highest tide

Source : Safwan, dkk. 2006

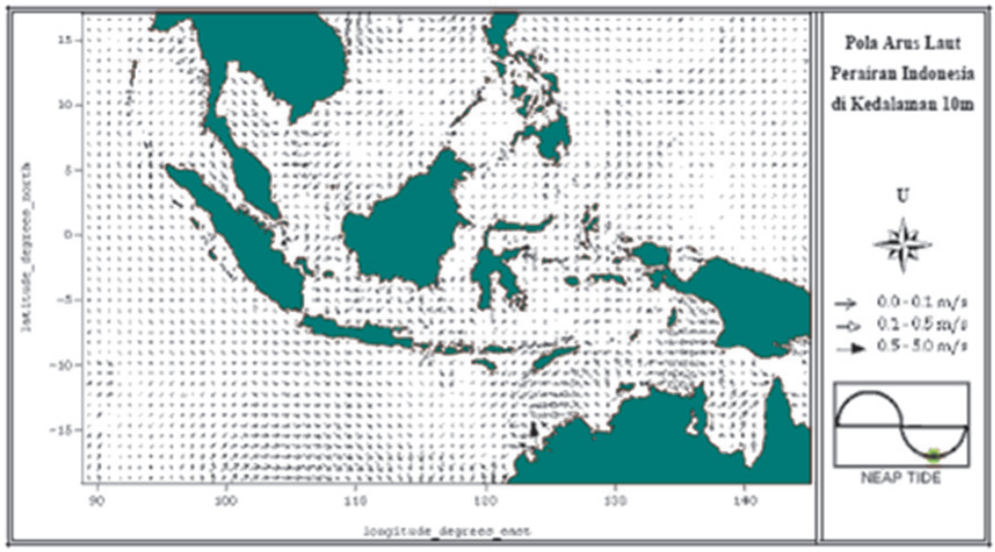


Figure 2.6
Pattern of sea waves at sea waters in Indonesia, condition of neap tide at lowest tide

Source : Safwan, dkk. 2006

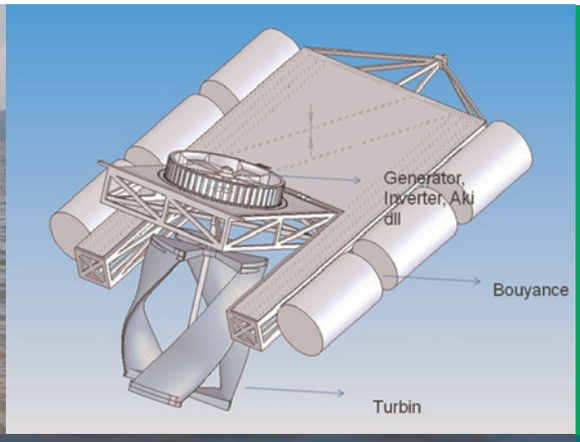


Figure 2.7
Sea wave turbine by T-FilesTeam of ITB

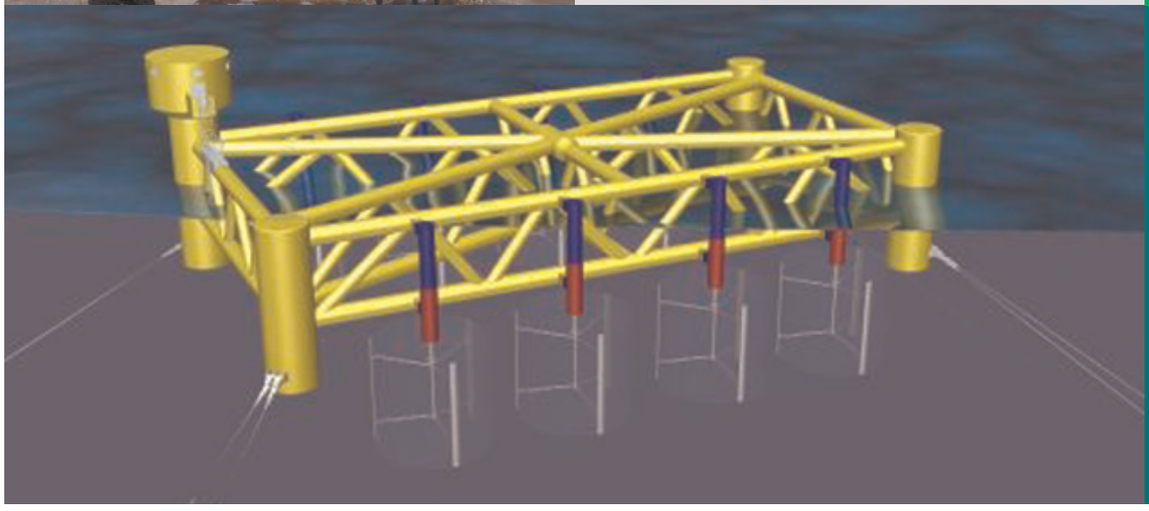


Figure 2.8
marine turbine farm by BPPT

Table 2.6
Potential and Target of Economic Energy for Groups of Energy Users

Sector	Potential of Economic Energy	Alocation of Final Energi	Target of Energy Conservation				
			(2010-15)	(2016-20)	(2021-25)	By Sectors (2025)	Total (2025)
Industry	15-30%	49%	5%	7%	8%	20%	9.80%
Commercial	10-30%	4%	3%	7%	5%	15%	0.60%
Transportation	20-35%	30%	8%	7%	9%	24%	3.40%
House holds	20-30%	13%	5%	10%	11%	26%	3.40%
Others	25%	4%	0%	0%	0%	0%	0%
Total	29%	100%	5.6%	7.1%	8.3%	21%	21%

1. Potential energy for Industrial Sector

Of the total energy group users, the biggest energy user is the industry which achieves 40% of the total energy consumption. In the year 2006-2009, JICA (Japan International Cooperation Agency) in cooperation with ESDM Ministry have made an audit study of energy used by industri sector and has concluded that the total energy consumption is around 27 million TOE per year, with potential of economic energy of 18%. (see Table 2.11). The energy economy which amounted to 5 million TOE or equivalent to 58 TWh per year. If the economic energy is successful it would be equial to delay in the development of electricity generation with production of 58 TWh / (24 X 365) = 6.600 MW.

2. Potential of Energy Conservation for Commercial Sector.

At the moment electric power has been used for commercial sector, 70% is supplied by fossil fuel. Oil fuel used for commercial sector in 2000 around 50%, has decreased by 26% in 2008. Electric power which has long been used in the last 10 years has increased 2 times, replacing oil fuel which has decreased by years. Efficient use of electricity for commercial sector, will siginificantly decrease national energy consumption. Potential of energy efficiency for commercial sector as seen in Table 2.8.

Table 2.7
Potential of Energy Efficiency in Industries

No	Industry	Potential of Energy Efficiency (%)			
		Total	Without/ Low Investment	Medium Investment	Biaya Investasi Tinggi
1	Food	13-15	5	5	5
2	Iron and steel	11-32.	10	5	13
3	Textile	20-35	10	5	15
4	Cement	15-22	5	5	8
5	Glass and Ceramics	10-20.	5	5	5
6	Paper and Pulp	10-20.	5	5	5
7	Petrochemical	12-17.	5	5	5

Sources : Energy Audit by JICA, DJLPE, Ministry of Industry, 2006 - 2009

Table 2.8
Potential of Energy Efficiency for Commercial Sector

No	Buildings	Potential of Energy Efficiency		
		Without/ Low Investment	Medium Investment	High Investment
1	Hotel	5	5	8
2	Hospital	5	5	10
3	Shopping Mall	5	5	10
4	Private Office Building	5	10	12
5	Government Office Building	5	10	16

Sources : Energi Audit by DJLPE dan JICA, 2006 – 2009

3. Potential of Energy Conservation for Transportation

Use of energy for transportation of about (99,9%) is supplied by fossil fuel. which is getting more and more by years. In the last 10 years the use of fossil fuel for transportation sector has jumped to 1.5 times.

Transportation is the largest national user of oil fuel and only contribute small value added to GDP of IDR 167 trillion or 8%. This amount indicates a national wasting, which receives the biggest subsidy of oil fuel price. Based on the data mentioned above, the intensity of using energy for transportation sector comes to 1407 TOE/million$ or equivalent to156.3 thousand TOE/IDR trillion.

The population of transportation is still dominated by personal cars, especially for short distance of less than 100 km. A number of transportation companies such as taxis and buses have implement program of energy efficiency by testing exhaust gas to increase low emission. Delay in the development of Mass Rapid Transportation (MRT) and Bus Rapid Transit (BRT) due to soaring cost, uncomfortable and unsafe city public transport has caused people to choose personal cars, motor bikes, which result in high consumption of oil fuel.

Potential conservation of energy in transportation sector is quite significant, which achieves 35%. Several factors which result in inefficiency in this sector, among others include the following :

- Passenger transportation is still dominated by personal cars. Ratio between public transport and personal cars in urban areas is around 20 : 80, whereas the ideal condition 60 : 40
- Road infrastructures in urban areas are not enough, take for example density of vehicles on the road compared to other countries such as :
  - in Jakarta 0,6 km/resident, Surabaya 0,4 km/ rersident,
  - in Tokyo 2 km/resident and in the US 7 km/ resident
- Freight transportation by trains and ferries are not optimal.
- Disciplines in traffic is relatively low, and results in traffic jam.
- In cities, old vehicles are used, which are not efficient and disrupt the environment.
- Use of cars with energy efficiency technology such as hybrid car, electric cars, which can save energy up to 40%, is still very limited.
- Target of minimizing emission for transportation sector is 0.08 G.tons of CO2 by 2025, as imposed by the government, target decrease in energy use for transportation should be around 25%.

4. Potential of Energy Conservation in Households Sector

Statistical data shows that households sector uses 13.17% of total consumption of final energy. It is therefore important to increase energyu conservation in this sector. Around 47% energy used by households derives from oil energy. The remaining type of energy is used for lighting, tV, air conditioners, fans, water pump, electric irons, etc.

Effcient use of electricity for house holds has become an important emphasys in the implementation of energy conservation, as its impact will be significant

in decrease of national energy consumption and development of new electric generation.

In recent studies of energy use by house holds sector, potential of electric energy efficiency is quite significant and achieves 30%. Potential of electricity efficiency derived from a number of factors :

- No sense of people awareness in energy efficiency.
- Using less efficient electric equipment, especially for lighting and air conditioner.
- Uneconomic energy price setting. Price of electric power and gas for households are still subsidized.

2.2. Structure of New and Renewable Energy Industries and Efficient Use

Structure of new and renewable shows a process Rom upstream to downstream business, starting from geological resources, primary industry related to upstream segment, from exploration to exploitation, and downstream segment, including refining, shipment and trading. The final use illustrates use of commodities for variety of needs of industry, transportation, households, and commercial, as seen in Table 2.9 below.

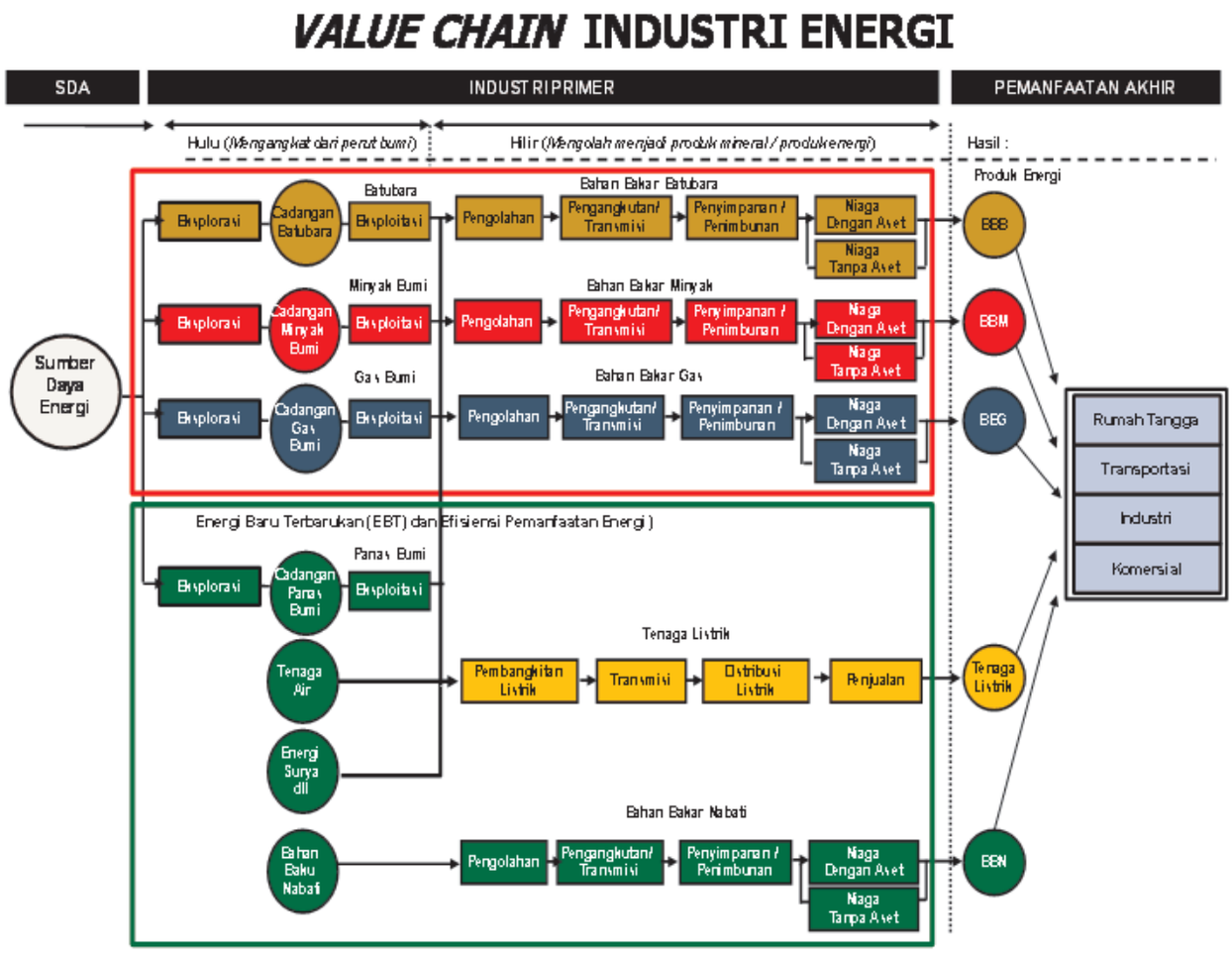


Figure 2.9
Value Chain Industri Energi

Based on Government Regulation No 70 of 2009 on Energy Conservation,the implementation comprises four stages, as follows :

- Energy supply
- Energi business
- Energi use
- Energi conservation

Conservation of energy can be implemented beginning from its sources to its use. Detailed activities of conservation and steps of energy use as seen in Figure 2.10.

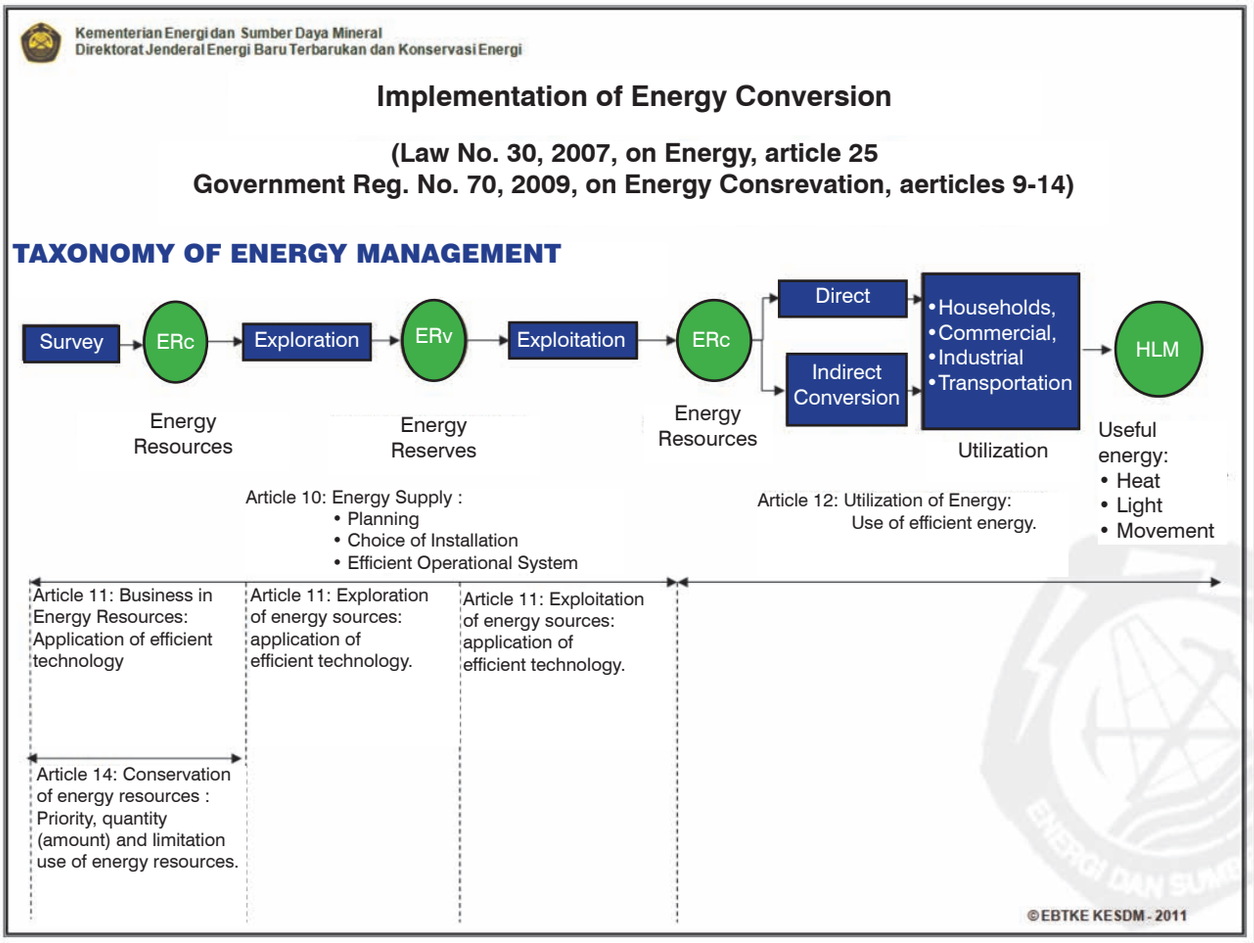


Figure 2.10
Implementation of Energy Conversion

3 THE CLEAN ENERGY INITIATIVE: REDUCING EMISSION FROM FOSSIL FUEL BURNING (REFF-BURN)

Energy is one of main source of green house emission and the effect of global climate change in addition to forestry and waste. Based on Second National Communication (SNC) published in 2009, forestry is the biggest source of national green house gasses with a total of about 1.232 million tons of CO2 from use of areas, change of its use, use of peat areas, followed by green house emission from energy of at least 302 million ton CO2. However, increase of law enforcement upon forestry activities and increase of energy consumption for development, energy will become the sektor biggest national contributor of green houses gasses by 2030.

As part of Indonesia commitment to mitigate green house gasses, the President of RI in his attendance in G20 in Pittsburgh, the US, and in COP 15 UNFCCC in Kopenhagen Denmark, has proposed national target of reducing green house gasses for 26% as of business-as-usual in 2020 with national effort then to reduce greenhouse gasses to 41% of the scenario business-as-usual with international support.To achieve the target, trhe government plans to issue Presidential Regulations relatingf to National Actions to Decrease Green Houses Gas – RAN- GRK. The RAN-GRK is consists of national strategies to decrease green housed gas from development of buildings. Target of energy in this sector of around 5.13% by 2020 ir equivalent to 30 million tons of CO2.

In addition to development of new and renewable enrgy and implementation of conservation, fossil enrgy industry also takes the role in decreasing green house gas through clean energy. The efforts, however is not integrated, partially done and not in goiod coordination, especially to achieve mitigation of climate change. Ministry of Energy and Mineral Resources (EMR) has developed Clean Energy Initiative

as an integrated efforts in Reduscing Emission from Fossil Fuel Burning (REFF-Burn). Clean Energy Initiative is arranged to respond double challenge, namely energy security issue and environmenttal issue.

as seen n in Figure 3.1. Energy security stresses upon development of Pro-Job, Pro-Poor, and Pro Growth oriented. Environment issue stresses on development of environment oriented. The clean energy initiative results in more supply of energy With less carbon emission, in other words, more energy, less carbon. Within national context,REFF-Burn will become Nationally Appropriate Mitigation Actions (NAMAs) for

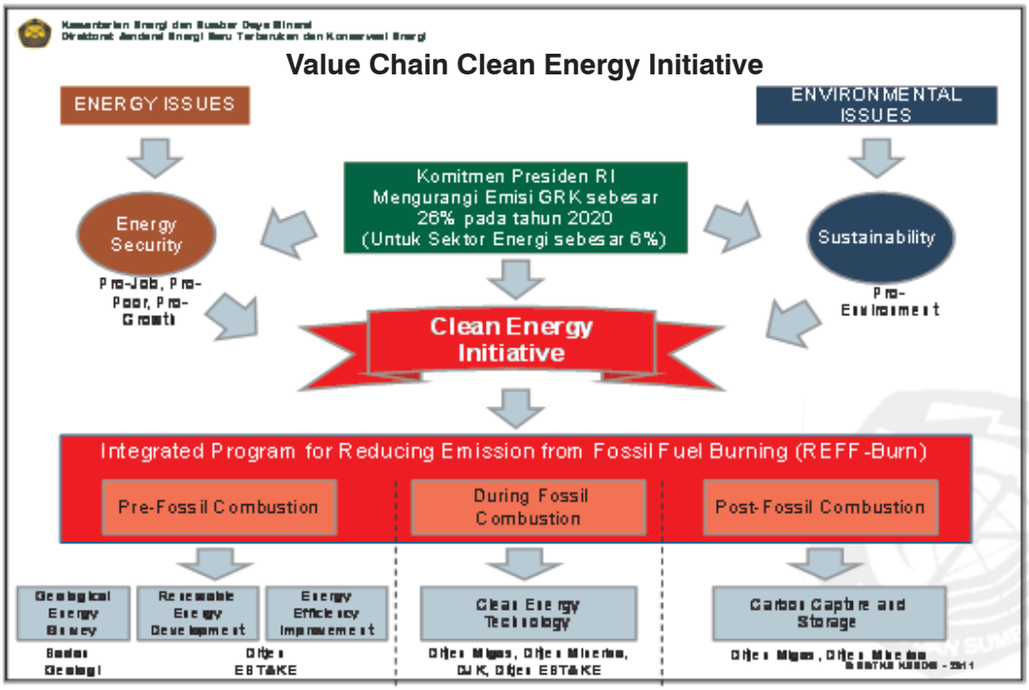


Figure 3.1 Value Chain Clean Energy Initiative

energy sector, as part of RAN GRK.

REFF-Burn technology to mitigate greenhouse gas in energy sector comprises 3 steps:

1. Pre-Combustion, reduce fossil fuel that results in greenhouse gas such as :
   - Energy efficiency technology
   - New energy technology (geothermal, bioenergy, hydro, solar, wind,and ocean)
   - Reduction of fugitive emission

2. During Combustion, greenhouse gas avoidance in fossil fuel application such as:
   - Clean Coal Technology (a.l. supercritical, IGCC)
   - Clean Fuel Technology
   - Flared Gas Reduction Technology
   - Application of Clean Energy (households, comermercial, transportation, and industry)

3. Post Combustion, greenhouse gas reduction in application of fossil fuel such as:
   - Carbon Capture and Storage (CCS)
   - Algae
   - Post mining reclamation
   - Utilization of CO2

Clean Energy Mechanism inisiative (REFF-Burn) is appropriate in Kyoto Protocol (Clean Development Mechanism / CDM), and Post Kyoto Protocol (Bilateral Offset Mechanism / BOM).

Implementation of Clean Energy Initiative consists of the following means :

a. a. Legal basis and enforcement of related regulations to implement the clean energy in every energy sub sector

b. Fiscal instrument, such as incentive and disincentiive, especially for stakeholders, public and private sector to involve stakeholders in clean energy implementation.

c. Fiscal instrument, application of clean energy and the program can be costly, and often not interesting to private investors. The government should develop more attractive fiscal mechanism, such as low interest loan and funding accessible to private investors.

d. Institutional instrument such as,enhance coordination and cooperation with related agencies, to develop clean energy initiative among energy stakeholders, and other parties interested in climate change.

According to Nationally Appropriate Mitigation Actions (NAMAs) for energy sector, REFF-Burn funding may be acquired from 3 mechanisms:

1. National funding (government budget) from central and local budget, private sector funding, national funding such as PT Sarana Multi Infrastruktur (SMI), PT Indonesia Green Investment (PT IGI).

2. Support from internasional funding, bilateral and multilateral such as :
   - Clean Technology Fund (CTF) of Worldbank
   - Climate Change Program Loan (CCPL) supported by Worldbank, AFD, JICA
   - Indonesia's Climate Change Trust Funds (ICCTF) coordinasikan by Bappenas and UNDP and others
   - Emission Reduction Investment Programme (ERI) through bilateral cooperation between Ministry of Environment (KLH) and KFW.

3. Clean Energy Mechanism for REFF-Burn for Kyoto Protocol
   - Through Clean Development Mechanism (CDM)
   - Other than Kyoto Protocol through Bilateral Offset Mechanism (BOM)

4 OPPORTUNITY AND CHALLENGE IN NEW AND RENEWABLE ENERGY, AND CONSERVATION

4.1 Investment in New and Renewable Energy, and Conservation

4.1.1 Investment Opportunity in New Energy

4.1.1.1 Coal Liquefaction

The current reserve of coal in Indonesia is about 60 billion tons available over the country. Out of the total reserve, 85% is brown coal (lignit) or low rank coal with 30% water content, low calorie and low sale price. Quality coal known as Black Coal is mostly for export.

4.1.1.2 Coal Bed Methane (CBM)

The needs of gas fuel from natural gas is very high and continues to rise in line with government policy to reduce subsidized oil fuel. Domestioc use of natural gas is handicapped by insufficient supply since most of it is allocated for export. To substitue lack of natural gas, CBM takes the role to complete national supply of gas.Huge CBM reserve is potential for development of new Energy replacing natural gas as fuel for electricity generation.Business opportunity in CBM is interesting for investors due to its advantages. CBM potential in Indonesia is very big and has not been explored at alarge scale.CBM ields in Indonesia better technical advantage for development. CBM reserve is located at the depth of only 500-1000 meter below surface and onshore that in effect the cost of production is relatively lower compared to that of conventional gas. CBM technology is similar to that of natural gas which is available by local staff.

CBM belongs to sweet gas with its content of 95%, less carbon dioxide or nitrogen. CBM does not contain hydrogen sulfide (H2S) nor sulphur although originated from high sulphur coal, and it is not dangerous. CBM is of high quality similar to refined natural gas to fulfil marketing quality standard. CBM as new electric fuel is relatively cheap and environmentally friendly. As coal does not belong to clean energy, development of CBM is quite strategic for future energy supply and its Reserve is abundant.

4.1.1.3 Gasified Coal

Gasified coal is an energy source as a result of gasification process. Coal gasification technology is a global popular technology becuse of its high efficiency and environmentally friendly. Coal gasification is a conversion process of solid coal to become a mixed product of synthetic gas (syngas) consisting carbon monooxide (CO) and hydrogen (H2), with or without any mixture such as air, vapor-air or axygen-vapor. Synthetic gas can be used for a number of purposes, such as electricity generation, gas fuel in industry, transportation (hydrogen) and variety of chemicals. One interesting method is its use as gas recovery

Coal gasification is prospective to replace fossil fuel in the future as gas fuel or liquid fuel. Coal gasification process is one effort to use low quality coal using clean coal technology to produce gas with low emission.

Coal gasification is potential as alternative energy generator as global coal prices are relatively stable and safe in shipment and storage. The other advantage of low calorie coal (about 4,500 kkal) is potential for producing synthetic gas. In Indonesia low rank coal potential is around 58.6% and gasification of low ank coal is environmentally friendly.

Based on Government Regulation No. 5 of 2006 on National Energy Policy, utilization share of low rank coal will be increased from 15.7% to 33% by 2025. as primary alternative energy in Indonesia by 2025. It is therefore important to develop environmentally riendly electric generation through clean coal technology, among others gasified coal technology. Besides, to support the vision of 25/25 of the Directorate General for New ann Renewable Energy and Conservation that in 2025 new and renewable energy is expected to contribute around 25% of total national energy mix. The renwables includes gasified coal and is expected to contribute around 0.65% of the total energy needs or around 18,5 million BOE. Gasified coal

Potential of coal resources is 104,8 billion tons, total reserve 20,98 billion tons and production 0,254 billion tons. Most coal reserve located in Kalimantan (61%) Sumatera sebesar 38%, and in other locations. Types of coal are lignite (58.6%), sub-bituminous 26.6%,

Table 4.1
Development Phase of Hydrogen Energy

	2011-2015	2015-2020	2020-2025
Market		1000 MW on grid	4000 on grid
Investment and rate		2600 million $; 2,6 ribu$/kWh; 0,06 $/kWh (base year $ 2010)	10.400 million $; 2,6 ribu $/kWh; 0,06 $/kWh (base year $ 2010)
Product		PLTN 1000 MW	PLTN 4000 MW
Tecnology		Proven Technology	Proven Technology
R&D	PLTN Feasibility Study	Infrastructure and implementation of PLTN project	PLTN generation and operation system

bituminous 14.4% and anthracite 0.4%. The vast coal reserve in Indonesia is used for gas fuel and electricity generation through coal gasification. Coal gasification in Indonesia is in its resaerch and development stage, among others by Puslitbang Tekmira–ESDM and BPPTeknologi centers of other countries.

4.1.1.4 Investment in Nuclear Energy (PLTN)

World potential of PLTN is 16% of energy sources, with high technology, safety, economical, environmentally friendly, and feasible alternative energy to be included in Long Range Energy Plan for Indonesia to back up sustainable development. Present uranium exploration is made as fuel, especially for electric generation. In Indonesia, nuclear energy has not been developed at maximum capacity.

Two potential locations of uranium have exsplored: in Kalan of West Kalimantan, of 34.112 tons, and in Kawat of East Kalimantan, of 10,000 tons. Total of the two amounts enable to generate 1000 MWe nuclear electric power (PLTN) for 170 years, or 4000 MWe of PLTN for 40 years. There are a lot other places in Indonesia (Sabang to Merauke) with big potentials. They need development exploration of uranium minerals and other nuclkear power in other parts of Indonesia to identify national long period uranium energy reserve.

4.1.1.5 Investment in Hydrogen

Hydrogen is a diatomic gas which is easily flammable and the lightest chemical element. At standard temperature and pressure, hydrogen is colorless, odorless, non-metal, of single valensce. Hydrogen is commonly produced in industry of various compound. hydrokarbon is similar to methane

Hydrogen energy is a source of clean energy, a compond which is not dangerous because it is easily vaporized, with slower combustion reaction than gasoline. Hydrogen fuel does not contribute to any green house gas.

Hydrogen energy may be developed by using coal gasificatoon technology. Since coal reserve is abundant in Indonesia, and mostly consists of low rank coal. To opiomise use of coal, it is important to develop clean coal technology using coal gasification technology. In Indonesia, coal gasification technology is devloped to produce hydrogen fuel, because it is a clean energy, environmentally friendly, does not emit CO2. By 2025, it is expected that it contribute 0.21% in national energy mix or equivalent to 6 million barrel oil. If applied as transportation fuel, a plant that can produce 257,000 tons of H2 gas capacity should be developed.

According to Achiar Oemry, researcher of Physics Research Center of Indonesian Center of Knowledge (LIPI), hydrogen price of around USD3.5 per kilogram. One kilogram of hydrogen equivalent to 4 litres benzene. In the long run, the hydrogen price will be decreased to USD1.5 which means hydrogin price is not equivalent to price of premim grade of USD1 now in international market. Development of hydrogen energy as seen in Table 4.2 below.

Gasification technology to produce hydrogen by 2025 is expected to contribute 0.21% of national energy mix. A plant should be built that can produce 17,113.3 tons of hydrogen at the average per year and enable to give positive effect in sustainable development by reducing emission of 299,953.2 tons of CO2 at the

Table 4.2
Development Phase of Hydrogen Energy

	2011-2015	2015-2020	2020-2025
Market	10.000 ton untuk transportasi	100.000 ton untuk transportasi	257.000 ton untuk transportasi
Investment and rate	133,23 Million USD, harga gas H2 3,5 USD/kg, harga batubara 50 USD/ton	1.199 USD, harga gas H2 3,5 USD/kg, harga batubara 50 USD/ton	2.091,8 Million USD, harga gas H2 1,5 USD/kg, harga batubara 50 USD/ton
Product	Bahan bakar gas H2	Bahan bakar gas H2	Bahan bakar gas H2
Tecnology	Fluidized Bed	Fluidized Bed	Fluidized Bed
R&D	Survey lapangan, Feasibility study, demo plant, sistem kontrol, perpipaan, proses	Heat exchanger, mekanika fluida	Sistem plant produksi

average per year as well as employment opportunity that reduces unemployment.

Funding for development of gasification technology is expected not only from the government bul also private sectors and cooperatives. The government direct contribution includes subsidy for tariff and investment loan through feed in tariff and incentive funding. Whereas private sectors and cooperatives enable to contribute in capital expenditure (investment) in the development of gasification technology producving hydrogen. Total investment achieve around USD228.2 million per year.

4.1.2 Investment in Renewable Energy

4.1.2.1 Geothermal

Geothermal can be used directly or non-directly. Direct application of geothermal for drying farm products, sterilising the media for fungi cultivation, tourist hot water bathing. Whereas indirect application as heat vapor which can be converted into electric power. Geothermal sources are obtained using geological, Geochemical and geophysic technologies. Geothermal drilling technique is adapted from oil and gas industry. Geothermal electric generation system uses highly pressurized water vapor available from underground reservoir heated by magma around it.

Geothermal fluid lifted to the surface contains heat to generate elctricity. The conversion from heat to electricity is made using a geothermal conversion system. Temperature of geothermal fluid achieves over 225° C. Geothermal power cycle has been used by a number of countries to generate electric power. In the last recent years technology development enables to aplply geothermal fluid with moderate temperature around 150- 225 C to generate electric power. Geothermal electric generator (PLTP) is similar to Steam Electric Generator (PLTU), the difference is the latter using steam from boiler. When geothermal fluid appears steam, then it can be transferred to the turbine whch converts geothermal power to kinetic energy to generate electric power. In Indonesia, dry steam electric generation (PLTP), is used in PLTP Kamojang (of Pertamina) and in Darajat field (of Amoseas Ltd). The two fields produce dry steam which the reservoir temperature achieves 240o Celsius.

The pressurised steam is transferred to steam turbine and generate electric power, similar to PLTU. Electric generator using wet steam should use a separator to separate steam from water. The steam is transfered to the turbine to to move the genaretor and the water is injected to the reservoir through injection well.

PLTP is available in small capacity such as in a location where heat reservoir is relatively small which posseses high temperature to generate small electric power of 1-5 MW.

PLTP is available and built at a request of a particular capacity. Small scale PLTP can be built using a modular system to minimise development cost. When constructed next to a well the overall project can have minimum environmental effect.

Geothermal is a big potential energy for electric generation in Indonesia. Compared to other energy sources, geothermal posseses better advantages and feasible for enhancement :

- Geothermal potential is of first priority in Indonesia of the world geothermal resources and can attract investment, human resources and technology development.
- National human resources competence and technical capability of over 25 years in geothermal development is an important factor in enhancing geothermal application in Indonesia.
- Geothermal resources is a renewable energy and its use is sustainable and as a substitute of fossil energy for national energy security.
- Global pressure on environment impact has resulted in the development use of renewable energy, one of which is geothermal energy.World committment is related to Kyoto Protocol to reduce CO2 emmission encourages geothermal electric generation to reduce significant emmission until 2020. In addition, development of geothermal electric generation enables to receive carbon credit fund.
- Geothermal location enables to be developed as national tourist resorts and education facilities. Remaining steam or heat obtained from geothermal enables to be used for heating swimming pool and other attractions for tourists.

4.1.2.2. Stream Water and Waterfall

Micro Hydro Electric Generator (PLTMH) is an example of run off river electric generation using water diverted from other direction to the other side of river and drop it back to the same river from which the water is obtained. Through a sspecial pipe the stream water then is used to move the turbine and turn the generator. The higher the head water the more hydro power obtained to convert into electric power.

Table 4.3 Development Plan for Geothermal Electric Generation

Year	Unit	2010	2011	2012	2013	2014	2015	2020	2025
Capacity	MW	1.189	1.209	1.374	1.814	3.351	4.051	7.788	12.332
Production	GWh	9.303	9.445	10.684	14.105	26.057	31.500	54.578	86.423
Investment	Million $	279	996	1.666	2.467	2.417	4.572	7.788	11.099
Production cost	Million $	857	1.250	1.644	2.038	2.431	2.825	4.366	6.050
Emmision reduction	Ton of CO2	991.620	1.447.450	1.903.281	2.359.111	2.814.942	3.270.772	6.129.156	9.705.284
Eletrifed houses	Units	924.778	940.333	1.068.667	1.410.889	2.606.333	3.150.778	6.057.333	9.591.556

Source : RIPEBAT 2010 - 2025

PLTMH is a primary source of electric power and popular to supply electricity for remote areas and villages which own hydro power. PLTMH technology has been mastered by local manpower and most the engines and installtion facilities are produced by domestic manufacturers. Compared to other electric generators using renewable energy, PLTHM is built and managed in a sustainable manner by the local inhabitants. Development cost of PLTMH electricity is very low that can be sold to PLN or other users at competitive price. PLTHM using run off river system with capacity less than 10MW can be sold to PLN, which is stipulated in ESDM Ministry Regulation No 31 Tahun 2009, on electricity purchasing price by PT PLN (Persero) from small and medium scale Electric Generators using renewable energy, or from remainder electricity. The policy is meant to encourage private sectors to supply electricity. to enhance potential in national electric power. Law No 30 Tahun 2007 on Energy states that Business in electric generation using renewable energy Ia given incentive by government.

PLTMH technoloogy is the primary technology in electric generation especially for areas with hydro resources. Base price for PLTMH electric generation is quite competitive compared to that of other generators. Moreover, PLTMH technology has been mastered byt local experts and local manufacturer and their costs is very competitive compared to imported products. Local turbine manufacturer supplies low head turbines (turbin propeller) and pelton turbinies with capacity of between 100 W to 1 MW.

PLTMH is initially used to supply electricity of remote areas which have not covered by PLN. The funding in generally from the government, bilateral aids or donor agencies. When price of oil fuels increased, PLTHM was built by private plantations to replace fossil fuel electric generator. Tyhen the government opened an opportunity for private sector to sell electricity to PLN, and from that time on, a number of investors built PLTMH and sell the electricity to PLN.

Compared to other electric generators using renewable energy technology, PLTMH has the benefit as follows:

- Hydro resources make use of hydrology cycle from solar energy which do not emit CO2 and other dangerous gasses in the atmosphere.
- Electric generator using run off river system uses no dam which results in flood, and is more environmentally friendly as well as acceptable to the public as primary electric generator.
- PLTMH needs continuous water debit along throughout the year coming from the forests that development of PLTHM on river bank motivates local inhabitants to preserve the forests.
- PLTMH technology is mastered by local human resources, from the planning, fabfication of parts, installion operations to the maintance.
- Potential of hydro energy has resulted that Indonesia as the development center of PLTMH, and attraction for investment, technology, human resources, and world policy in renewable energy.
- Indonesia has a long history in using hydro power, human resource capability and manufacture of PLTHM turbines has been recognized by donor countries to give training and supply engine and parts to other developing countries.arbon credit funding in line with Kyoto Protocol.

4.1.2.3. Bioenergy

Biofuel is produced from bio resources. Biofuels are classified in three types, namely biodiesel, bioethanol, and bio-oil (pure pkant oil). Biodiesel has been developed in advance. In fact development of biofuel to replace fossil fuel begins with biodiesel.

Biodiesel is meant to replace automotive diesel oil and industriel diesel oil. Biodiesel specification is made similar to that of automotive diesel oil that enables to be used purely or as a a mixture. Bio oil is

Table 4.4 Development Plan Micro Hydro Electric Power (PLTMH)

Year	Unit	2010	2011	2012	2013	2014	2015	2020	2025
Capacity	MW	245	279	314	348	383	417	760	1.425
Production	GWh	1.717	1.958	2.199	2.440	2.681	2.922	5.326	9.986
Investment	Million $	735	699	785	696	765	834	1.140	1.781
Production cost	Million $	258	294	330	366	402	438	533	749
Emmision reduction	Ton of CO2	192.815	219.888	246.961	274.033	301.106	328.179	598.120	1.121.475
Eletrifed houses	units	1.470.000	1.674.000	1.884.000	2.088.000	2.298.000	2.502.000	4.560.000	8.550.000

Source : RIPEBAT 2010 - 2025

used as biokerosene and marine fuel oil. Palm trees is a productive plant for biodiesel at capacity of 4000 liter per hectar per year if the plantatio is well managed. Palm oil is produced more depending on maturity of the seeds.The more mature the seeds the more the oil is produced.

Jatropha curcas L, is in fact not economically valuable type of plant. The choice of Jatropha is on the ground of recommendation of its ability to grow in marginal soil, which is used to be unproductive. The advantage of Jatropha is its maximum age of up to 50 years and does need much water. Rainwater s the least needed than other plants producing biofuel

Bioetanol is ethanol produced from biomass replacing benzene as alternative fuel. Pure ethanol is easily flammable and contains high net heat caloric of 21 MJ/liter or equivalent to 2/3 net heat caloric of benzenen. Absolut or pure (dry) ethanol may completely dissolve to benzene at any mixture.

Development of biofuels begins with academic and research activities by the academics and research centres. Development of biofuels is then adopted as a national program base on Presidential Instruction No. 1, 2006, concerning Accelaration Efforts to Supply and Use of Biofuels as Alternative Fuels. This legal basis imposes all related ministries and local government to support and involve in development of biofuels.

Based on the instruction, every stakeholders has carried out a number activities such as development of plantation producing raw materials of biofuels, production equipment, as well as testing of biofuels. Biofuels production has become a national movement. Initial motivation of biuofuels development is an effort in the increase diversification of domestic fuel supply security. When fossil fuel price is getting higher, motivation in using lower price fuels becomes larger.

The higher fossil fuel price has encouraged industrial sector and electric generators to start using low price fuels. A number of stakeholders have paid attention on development of other biofuels in Indonesia, in addition to biodiesel. The main idea is that not only does transportaion sector which need fuel diversification, biofuels needed by other sectors not necessarily biodiesel.

Supplyn and use of electric energy in Indonesia dominated by fossil fuels achieves 95.9% of the total energy supply. The ESDM Ministerial Regulation No. 31 of 2009 states purchasing prices of energy using new and renewable energy from small and medium enterprises and from remainder of electricity by PLN.

Biomass energy is one priority of electric power as its potential is abundant and the technology is available in market, and environmentally friendly. Asdvanced countries which do not have natural resources such as the US, Japan have used biomass as electric power. Technology of using waste for electric power (biopower) can be applied as follows:

Direct combustion of biomass in a boiler produces steam to move steam engine or steam turbine, wich results in axis energy to generate electric power. Wood with water content of 12% possess calorific value of around 13.8 MJ/kg. The technology of electric power being developed now is called cogeneration which is a process of heat and electric generation at the same time using turbines or steam engine.Steam turbine is commonly used for large scale electric generation. Whereas steam engine is appriopriate for small scale electric generation from 25 s/d 300 kW. Almost all agricultural and plantataion wastes can be used to produce energy through direct combustion

Biomass gasification takes place in a high temperature room with low axygen content will produce flammable gas. Typical capacity of an electric generator using gasification system around 100 kW. To produce an alactric power of 1 kWh needs biomass at the average of 2,4 kg. Biomass gasification system is specific in types and sizes of biomass. Biomass easily used for gasification for electric generator of 100 kW includes wood charcoal and charcoal from coconut shell Hull of rice is basically applicable for fuel using gasifiction system but uses different design system. Electric generator for capacity of up to 50 kW generally uses dual fuel system such as in diesel engine generator.

Biomass fermentation. Biogas is a colorless and flammable gas that is produced from an anaerobic

fermentation (with no oxygen) process of biomass waste supported by methane bacteris.Biogas consists of 60% methane and 0,6 liter kerosene. Biogas energy system is suitable for animal husbandry areas that produces livestock waste.

In addition to producing energy, biogass system can minimise unpleasant odor, spread of diseseas and produce byproducts as biological fertilizers. Biogas can be used for cooking or electric generation using gas generating engine.

ESDM Ministerial Regulation No. 31 of 2009 on use of waste as biomassa to become electric power through the process of direct combustion or through gasification process of methane is one management of city waste and produce electric power for the city. The parties are promoting pure plant oil (PPO) as alternative fuel Diesel engines. The argument is backed up by economic reasons that production process of PPO is cheaper than biodiesel.

In electric generation sub sector, PPO is expected to become alternative chep fuel, particularly for diesel electric generation in remote or isolated areas. PPO is also expected to replace kerosene for households use.

4.1.2.4 Solar Power

Solar power electric generation (PLTS) is electric genertor that can be applied in all areas. Installation, operations and maintenance of PLTS is relatively easy and can be adopted by the public.

The main market handicap of PLTS is investment cost per Watt for power generation and the solar panel is still imported.

PLTS grid connected is a technology that grows very high in the world. The 50% growth per year in 2000, installed PLTS capacity at the amount of 160MW and becomes 7.800 MW in 2007. Power capacity per unit of PLTS instalation is usually only of several kW until 10 kW, but at the moment installed PLTS has achieved 20 MW, and a report of 800 installation with power of more than 200kW was noted.

PLTS isolated grid with power less than 1 kW also grows fast, Although not as fast as PLTS grid connected. This system is used to supply electricity in areas that are not connected to national electric transmission network such as isolated community, communication infrastructure, signal light, and so forth. A report on installation of PLTS isolated grid in the world of over 2.700 MW. PLTS grid is a system used a lot in Indonesia, with capacity of households scale Known as SHS, or for village scale known as PLTSTerpusat (centered).

Capacity of solar module for electric generation is expressed in Watt-peak (Wp). Efficiency of solar module with mono-crystals silicon cell may achieve 17%, polycrystalline silicon at lower efficiency of (15%), and amorphous silicon of 10%.

In general there are three alternative scheme of implementation of PLTS, namely : PLTS Photovoltaic Solar Home System, PLTS Terpusat (central), and Hybrid PLTS Using other electric power. SHS is a system of small scale using solar module of 50-100 Wp (Watt Peak) and generates daily electricity of 150-400 Wh. As daily power of Solar Home System is relatvely small, this system is recommended for DC (Direct Current) which is used for load, such as LED light.

PLTS is a technology of electric power generation applied to any areas. Installtion, operations, and maintenance of PLTS is very easy and done by the public.

Market demand for PLTS is very high because of its advantages not owned by other system, among others as follows :

- PLTS technology is easily understood and accepted by the public and installed by local producer and operated by users and local maintenance, so it is quite strategic for development of PLTS. An easy maintenance and relatively free from cost of operation.
- PLTS is environmentally friendly and does not emit gas, not noisy, operates in room temperature, and free of risk,safety and environment.
- Solar power is available in any locations on earth surface, at a huge amount and does not exert social conflict when use of solar power.
- Sets of equipment of PLTS is available in market and come with a number of options of power, prices and quality.

4.1.2.5. Wind Power (PLTB)

Wind mill is the beginning of conversion engine of wind power to become axis energy. Wind mill is used by human since 200 BC for rice grinding and water pumping. Development of aerodynamic technology in aircraft industry, gives contribution on design evolution of wind mill become wind turbine. Turbine blade design similar to aircraft wings, that the number of turbine blades is not the same as that of traditional wind mill. As a result the construction of wind turbine is much lighter, efficient, cheap, with better capacity. Wind turbine is classified into two main categories, namely Horizontal axis turbine, and vertical axis turbine. Horizintal axis turbine is most commonly used at the present time, One of which is HAWT propeller type. Vertical axis turbine such as Savonius and Darrieus, are rarely used for wind power.

PLTB is wind power electric generation belonging to renewable energy which grows fast in several advanced countries. Private investment growth of

PLTB is encouraged by policy of feed in tariff which is interesting to investors. Although investment cost per generated power is relatively high, cost of electric production is competitive compared to other electric generation system.

- Wind energy originates from movement of air because of change of air temperature by heat of solar radiation. Wind energy is more secure the whole time than other Sources of energy.
- PLTB technology develops very fast, in several countries, investment cost of PLTB gets cheaper so that PLTB electric power is much competitive.
- PLTB is renewable electric genearation system which receives priority funding from credit carbon, in line with Kyoto Protocol.

Table 4.5 Development Plan of Solar Power Electric Generation (PLTS)

Year	Units	2010	2011	2012	2013	2014	2015	2020	2025
Capacity	MW	25	35	45	55	65	75	324	580
Production	GWh	44	61	79	96	114	131	568	1016
Investment	Million $	225	315	360	440	455	525	1620	1740
Production cost	Million $	31	43	55	67	80	92	284	305
Emmision reduction	Ton of CO2	19.675	27.545	35.415	43.285	51.155	59.025	254.988	456.460
Eletrifed houses	Units	125.000	175.000	225.000	275.000	325.000	375.000	1.620.000	2.900.000

Source : RIPEBAT 2010 - 2025

4.1.3 Investment Opportunity in Energy Conservation

Investment opportunuty in energy conservation includes energy conservation services and fabrication of efficiency energy sets of equipment.

1. Energy Conservation Services

Government Regulations No 70 of 2009 states that application of energy management for users of 6000 TOE or more per year. In Indonesia there are 659 industries consuming energy of 6.000 TOE or more mostly located in Jawa. Partnership program in energy audit continues to go and increase each year. To encourage mandatory application and result of partnership audit program, a professional energy conservation service is needed such as Energy Service Company (ESCO).

After implementation of energy audit, users of energy will make effort to use energy as efficient as possible. Energy efficiency is generally obtained from recommendation of energy efficiency of low cost management. An opportunity to achieve a better energy efficiency when the recommendation of medium cost dan high cost is implemented. A coordination with national banks (supported by Bank Indonesia) to provide funding for more actvities in energy conservation through ESCO will receive certification from the Directorate General for New and Renewable Energy and Conservation.

2. Manufacture of Equipment for Energy Efficiency

Energy Efficiency for Industrial Sector

Energy connservation technology has been applied in industries can be classified into two,namely equipment efficiency and process efficiency. Cost of equipmeny efficiency is relatively higher, but cost of energy needed in operations much lower. Efficient equipment mostly used in industries such as: Restructuring of engines in Waste Heat Recovery (WHR)boiler, variable speed drive, high COP Chiller and high efficient motor.

Table 4.6 Development Plan of Wind Power Electric Generation(PLTB)

Year	Units	2010	2011	2012	2013	2014	2015	2020	2025
Capacity	MW	4	11	18	26	33	40	128	256
Production	GWh	11	29	48	67	86	105	336	673
Investment	Million $	20	56	92	128	164	200	512	768
Production cost	Million $	5	15	24	34	43	53	135	202
Emmision reduction	Ton of CO2	3.148	8.814	14.481	20.147	25.814	31.480	100.736	201.472
Eletrifed houses	Units	20.000	55.000	90.000	130.000	165.000	200.000	640.000	1.280.000

Source : RIPEBAT 2010 - 2025

Energy Efficiency in Commercial Buidling Sector

A lot of technology equipment has been used in commercial buildings, such as PLC lights (to replace light bulbs), high COP chiller and variable speed drive used for blower and fan. Business opportunity in energy efficiency in commercial buildings using energy efficiency equipment is till promising such as:

- Application of electronic ballast, replacing electro magnetic ballast
- High efficieny TL lights
- Using split AC of COP over 3,5
- Replacing chiller COP of below 4, and
- High efficiency motor

Energy Efficiency in Transportation Sector

Potential of energy conservation in transportation is quite high of around 35%. Energy conservation opportunity is uses of energy effciciency technology and enhancement of means and infrastructures of public transportation.

Energy Efficiency in Households Sector

Statistical data shows energy use by households achieves 13,17% of the total end use. Energy efficiency then should be made priority in this sector. Around 47% of households energy use originates from oil fuel. The remaining is mostly energy used for households electric equipment such as airconditioner, lights, TV sets, refrigerators, fans, water pump,electric iron.

3. Enhancement of Capacity Building in Energy Conservation

National conservation target of 33,85% by 2025 needs support of technology, infrastructures, funding, and appropriate qualified human resources. Total number of experts in energy conservation in Indonesia is quite limited that there is a need of upgrading of capacity building manager in energy, auditor in energy, and a scout for energy efficiency.

4. Test Lab for High Energy Efficiency

One of energy conservation agenda is a labelling of energy efficiency to equipment used by all sectors.

Table 4.7
Partnership Program foir Energy Conservation

SECTOR	2003	2004	2006	2007	2009	2010
FUNDING	(PT. PLN)	(PT. PLN)	Rp. 2,4 Billion (APBN)	Rp. 25 Billion (APBN)	Rp. 4 Billion (APBN)	Rp. 20 Billion (APBN)
PARTICIPANT	5 industry and 6 buiding	3 industry and 6 buiding	21 industry and 11 buiding	138 industry and 62 buiding	16 industry and 24 buiding	55 industry and 105 buiding
TOTAL POTENTIAL	78,4 GWh = Rp. 50,8 Billion = 70,6 Kilo Ton CO2	14, 8 GWh = Rp. 6,9 Billion = 13,32 Kilo Ton CO2	40,7 GWh = Rp. 40,4 Billion = 36,6 Kilo Ton CO2	519 GWh = Rp. 289 Billion = 467.1 Kilo Ton CO2	34 GWh = Rp. 23,8 Billion = 30 Kilo Ton CO2	-
TOTAL ENERGY SAVING OFTAINED	34,4 GWh = Rp. 22,2 Billion = 40 Kilo Ton CO2	14,1 GWh = Rp. 8,2 Billion = 12,7 Kilo Ton CO2	30,1 GWh = Rp. 19,9 Billion = 27,1 Kilo Ton CO2	307 GWh = Rp. 168, 8 Billion = 276,3 Kilo Ton CO2	Akan dilaksanakan Tahun 2010	-

4.2 Investment Challenge in New and Renewable Energy and Conservation

4.2.1 Investment Challenge in New Energy

4.2.1.1 Liquified Coal Energy

Brown coal will be developed as alternative energy to replace crude oil. The government of Japan and businessmen whonare interested in brown coal is making cooperation with Center for Development and Application Technology (BPPT) to realize developmen of brown coal. On behalf of Japanese government, NEDO (similar to BPPT specially manage energy, while the participating company in the project is Nissho Iwai Corporation. PT. Tambang Batubara Bukit Asam (government owned coal company) is planning to develop liquified coal refinery in South Sumatera with investment of US$5.2 billion.

South Africa's Sasol Limited, the biggest producer of synthetic oil In the world, started negotiation for development of liquified coal refinery valued at US$ 10 billion in cooperation with PT Pertamina and PT. Tambang Batubara Bukit Asam. At the beginning of 2010 an MOU between Indonesian Government and Sasol to start a feasibility study of the refinery development. When the project realized as planned Sasol will produce a clean fuel of high quality at 80,000 barrels per day, even an estimated production capacity of 1.1 million barrel oil equivelant (BOE) per day. When the plan continued, the construction will be finalised by the end of 2014 and production by 2015.

There are 4 potential locations to develop liquified coal refinery namely Musi Banyuasin (South Sumatera) which owns reserve of 2,9 billion tons of coal, and Berau (East Kalimantan) with reserve of 3 billion tons of coal.

4.2.1.2 Coal Bed Methane (CBM)

- BThere are no government regulations relating to GMB, therefore no investor interested in developing CBM fields.
- Commercial period production of CBM is relative longer but shorter in production than that of conventional natural gas.
- Development of CBM in liquid (LNG) is handicapped by unavailability of LNG refinery to convert CBM into LNG.
- Calorific value of CBM is lower than LNG. One qubic foot LNG produces 1000-1.100 BTU (British Thermal Unit) equivalent to 250 kilo calorie, while CBM around 900-950 BTU, so the selling price of CBM a bit lower than LNG, which effects in low interest to developers.
- Initially CBM is produced by engineering the coal as a reservoir so that enough room is obtained for the gas to exist.The engineering process started by dewatering that a change in mechanical balance takes place. When the pressure gets down coal gas exists from the coal Matrix. CBM then flows through cleats of coal goes to the well. The dewatering process results in water waste which needs a special drainage reservoir because it pollutes the environment.

4.2.1.3 Investment Challenge in Gasified Coal

- Coal gasification technology is a relatively new technology that it needs big investment in its development of around 1,500-2,000 USD/kW.
- There is not assesment and directive from the government as to apply gasification technology as primary option.
- Although this technology is quite popular in the world, a promotion on the advantages of this technology by research center has not been released so far.
- Then government has not imposed a policy on the implementation of development project in gasified coal industry.
- A structure of user and operator of gasified coal industry has not been established.

4.2.1.4 Investment challenge nuclear energy

- The government has not imposed a policy on the implementation of nuclear power electric generation (PLTN)
- A structure of ownership as operator (agency) of PLTN has not been established.
- Minimum public acceptance on use of PLTN.
- Initial investment is relatively higher than that of Conventional electric generation.
- Minimum public awareness on the importance of “green energy”.

4.2.1.5 Investment challenge in Hydrogen

- There are no regulations and standardization available in use of hydrogen especially for transportation.
- No available identification and accsess to develop hydrogen energy for transportation sector.
- Although hydrogen is a clean energy, the production cost remains high.
- High investment is still needed for development.
- Production of hydrogen fuel from coal gasification needs big investment in development.
- No regulations and directives available from the government of using hydrogen gas as alternative of oil fuel.
- Storage method of hydrogen gas needs different construction of fuel tank As a gas, hydrogen is a compound of light gases And easily vaporized. Hydrogen vaporized 4 times easier than methane and 10 times faster than gasoline. As a results, the storage tank should be constructed from specual metal.
- Method of storage of liquified hydrogen is Rather complex. The storage tank should be completely air tight, but enables to keep hydrogen at liquid temperature of – 253C. To keep at low temperature, a special method. A method which should be practical and efficient for development.

4.2.2 Investment Challenge in Renewable Energy

4.2.2.1 Challenge Investment in Geothermal Power

Investment Challenge in Geothermal Constraints in geothermal development include:

1. Geothermal investment requires a high funding and technology and owns a high risk.
2. Geothermal potential is located in protected and conserved areas. Based on Law No. 41 of 1991 on Forestry and Government Regulation No. 68.of

1998 on Natural Conservation and Sustained Areas, states that:
   a. No geothermal operations allowed in conserved areas/ forests.
   b. Geothermal operations in protected forests needs licence in a long and uncertain period of time. of new infrastructure.
3. No standard Power Purchasing Agreement (PPA) available from PT. PLN (Persero) before tender offer that arrange the terms and conditions after FS.
4. Data of geothermal work areas from tender of Initial survey is not bankable and a possible re-survey should be made by business operators.
5. No certain period of time and cost available in licencing process and recommendation which include:
   a. Recommendation Letter of Analysis Impact of Environment (AMDAL) by the Governor (for example Wayang Windu Field)
   b. Licence Use of Underground Water and Surface Water (for example Dieng Field)
   c. Licence of Work Areas fro the Governor/ Regent (for example Bedugul Field, Bali)
   d. Licence of Use Work Areas (for example Kamojang Field)
   e. Liucence of Entry Forest Areas for Exoloration and Exploitation (for example Kamojang Field
   f. Licence of Trees Felling from Forestry Sgency (for example Wayang Windu Field)
6. Local government is not ready to carry out tender process such as funding, loical regulations, and the manpower

To solve the problems The government has made necessary steps to accelerate development of geothermal in Indonesia, such as follows:
1. The government issues ESDM Regulations No. 02/2011 on the assignment of PT PLN (Persero) to purchase electric power with basic prices from geothermal generator.
2. To find solutions of problems in geothermal potential available in areas of protected forests and conservation forests, a number of steps have made, such as:
   a. Inventory of geothermal potential in Indonesia, of which 70% located in forests area which consits of :
      - Distribution of potential point from the Geological Agency: protected forest 17% & conservation forest 16 %
      - Potential capacity: protected forest 23% & conservation forest 21%
   b. A coordination between DJEBTKE and Directorate General of Protection Forest and Nature Conservation (PHKA) to propose a revision of Government Regulations (PP) 68/1998 that geothermal as a service environmentand to become renewables, geothermal should keep the eco-environment.
3. To reslove delay in signing PPA, a standard PPA which includes terms and conditions for agreement signing in the nerar future. The standard PPA between PT PLN and operators is not quite completed with several term and conditions approved by both parties
4. To accelerate obtaining a licence or recommendation, a solution is sought, namely a standard operating procedure (SOP) of licencing in a presidential instructions which give assignment to the Governor, Regent, or Mayor in his authority to provide appropriate length of time and cost for licencing in local areas.
5. To improve competence and capability of human resources in guidance and supervision in geothermal business, the government provides regular but continous short training, workshop, seminar involving the local government and related agencies.

4.2.2.2 Run off and Run down River

Microhydro Electric Generation (PLTMH) is a primary technology of elctric power, in spite of its investment development relatively slow compared to that using fossil energy. In 1970, hydro energy was in its highest position in energy mix for electric power, however in the following years, PLTMH has been left behind that using fossil energy. When fossil energy price was low and subsidy for energy unproporsional, hydro energy was not competitive in its application against fossil energy. In the present condition price of fossil fuel is getting higher and that results in going back to use hydro power.

There are, however, a number of handicaps faced by private investors to invest in micro hydro development. Some of them as described below:
- A national policy energy pricing is needed to

protect investment in PLTMH development against price fluctuation of of fossil fuel price.

- In addition to fair price, a scheme of purchase security from the government is needed in order to avoid oligopoly practices (a few buyers) which is not healthy or fair. The security of purchase is required by investors such as banks and other financial institutions.
- Business development in microhydro energy is quite influenced by social condition, politics, safe areas, consistent policy and law enforcement, which eventually will influence the risks that would be taken by creditors and results in loan interest to be paid by investors.
- Although local production of PLTMH turbines is recognized of high value, its capacity below 1 MW. Research and development of turbines should therefore be supported to enhance capability of turbine manufacture of over 500kW.
- Potential of microhydro energy is generally located in forest areas which have no transportation infrastructures which results in big investment and not feasible for development.
- PLTMH using hydro power from the forests which are under control of the government or traditional community often results in slow development of PLTHM due to obtaining licences from different agencies.
- An intermediary house or agency is needed to find solutions so that development and investment of PLTMH run as smooth as possible.
- Sustainability of PLTMH is very dependent upon availability of hydro power (water), therefore a policy in water management and space arrangement are urgently needed in order to secure availability of water.

4.2.2.3 Bioenergy

Biofuel is expected to give a meaningful contribution to secure domestic supply of energy 5% of the total national energy-mix by 2025. To realize the target particularly needs very large areas. Trade-off between energy and food are related to limitation of areas.

Use of areas for biofuel production at large scale is very competitive to using the areas largely for food availability in the long run.

In the framework of areas enlargement, the target areas stipulated in Biofuel Blueprint until 2010 minimum 5,25 million hectares for palm trees, 1,5 million hectares for jatropha, 1,5 million hectares for cassava, and 750 thousand hectares for sugar canes, in unused areas. In vew of development areas for biofuel recently, it is possible that the development of areas for biofuel is achieved. It is to be noted that biofuel ia a commodity that is influenced by both domestic and international market. Indonesia crude palm oil (CPO) production is the second largest after Malaysia. Palmtrees as a productive oil producing plants that it becomes potential for international supply of fuel.

World production of CPO is expected to raise twice to meet the need of biofue. FAO predict that growth of CPO for energy by 3.2% per year by 2050, whereas that for food only 1,5% per year.

Palm trees grow in tropical areas, which among the tropical countries, Indonesia owns potential capacity for broadening the largest areas. As a result, more request for CPO is coming to Indonesia. It is estimated that Indonesia will be the biggest producer of CPO in the world. Demand for CPO for energy is a potential for areas development of CPO plantation.

It is then estimated that industrial operators tend to view international market attraction as the ground to enlarge palm trees plantation seem to go beyond the target stipulated in the biofuels Blueprint. The tendency has been monitored now. The area of plem trees is estimated to achieve 13.75 million hectares by 2020. Based on proposals of new development of Plam trees plantation by local government (Pemda) in Indonesia, a total of 20 million hactares has been allocated for palm trees.

The figure is much bigger than target of enlargement areas for biofuel as in biofuel Blueprint BBN of 1.5 million hectares in 2010.In the meantime, the cost for development of biomass and biogas is relatively high, and the technology has also to be developed. Public awareness to make benefit of biogas is still very low.

4.2.2.4 Solar Power

Solar power generation (PLTS) is applicable over areas that need electric power and sets of equipment of solar power are easily available in market, easy intallation, and not difficult in operation by common peopla.Because of its high, contribution in use of solar electric generation (PLTS) for national electric power is till very low. Although electricity generated by PLTS includes scheme of electric generation using renewable energywhich receives incentive for sale to PLN, the price is set below the basic solar power production

cost. As a result the above mentioned government policy will not encourage investment growth in PLTS business. The other handicaps in PLTS business described as follows:

- Investment cost for PLTS business is relatively high whereas the poor in remote areas do not have cash for investment in PLTS. An appropriate scheme of loan is therefore needed;
- The public has the opinion that solar power (PLTS) sets of equipment is an import product, whereas the solar panel has not been commercially manufactured in Indonesia.

The growth of solar panel, therefore, has become strategic for development of solar power (PLTS);

- Solar power sets of equipment are available in market, but the quality is not yet monitored that a lot of low quality solar panel are available but dissatisfactory to consumers. Besides destroying the image of solar power, availability of cheap solar panel but with high quality in market results in unhealthy competition among producers of solar panel in market nowadays.
- Government grant of solar power units to the needy has distorted commercialization of solar power industry;
- There has not been an attractive policy of "Feed in Tariff" for a scheme of solar power (PLTS) if interconnected to PLN transmission network.

4.2.2.5 Wind Power

Electric generation using wind power (PLTB) includes electric generation system using renewable energi which grows fast and becomes primary choice to achieve a mandatory of using wind power. Renewable wind turbine is a new technoilogy Indonesia. considered as new energy. Proactive role of the government is a lot needed to commercialize the new technology of wind power electric generation (PLTB). Modern technology of wind turbine is not completely mastered. An intensive research is needed to develop wind power turbines which is suitable for potential of wind power available and the condition in Indonesia. Manufacturing capacity of local industry to produce large wind power turbine is still limited, a policy of pull demand from the government is needed so that local manufacturers develop capacity of production. Purchasing price of PLN as arranged by ESDM Ministerial Regulation No 31 of 2009 on purchasing price of electric power by PT PLN (Persero) not competitive to business in wind power for electric generation.

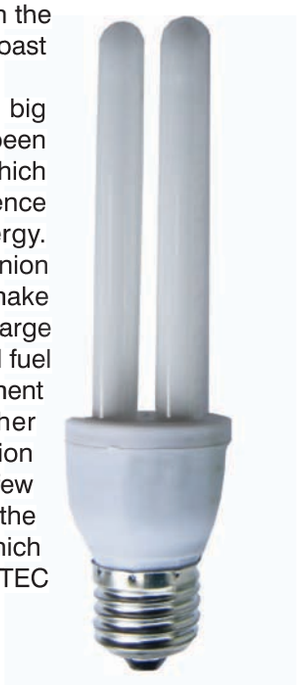
- Map of wind potential and comprehensive data is not available;
- No private sectors interested in wind power (PLTB) investment;
- No meaningful incentivefor development of industry related to use of wind power;
- No incentive mechanism available for users of renewable energy particularly PLTB;
- Investment for development of PLTB relatively high (price of energy is high) compared to investment in conventional electric generation ;
- No sufficient institutions nor uniformity of policy inter ministries for management and application of PLTB;
- Not enough socialization to the public on the application of PLTB.

4.2.2.6 Investment Challenge for Movement and Temperature Difference of Sea Waters

- Using dam to generate tidal energy needs very high funding although cost of operation is low. As a result, scheme of tidal energy generation may not exert benefit for years and investors are reluctant to participate in such a project.
- Building a dam in an upstream will bring significant effect on the water in reservoir particularly on the ecosystem. Some countries are reluctant to give approval to build a tidal reservoir. According to research made at locations of tidal energy generation, result shows that tidal reservoir built on upstream areas exert strong impact on the environment similar to giant reservoirs. Building huge tidal facilities will change in and out stream of sea waters in the upstream areas and change hydrology and salinity, and possibly influence sea animals as they live in the upstream areas.
- Efficiency in the change of waves movement to generate electricity is still very low. The power of sea water generally is at very low speed. Electric generators available commonly operate at high speed, and the turbines need a constant and soft flow.
- Materials for sets of wave energy equipment whic can stand damage caused by storm and corrosion by salty water is relatively

unavailable and very expensive.

- Possible failure comes from the bearings or welding connection damage on the construction.
- Wave farm may result in removal of commercial fishermen and change feeding pattern in coast areas, and possible danger on navigation. Sets of equipment for wave energy catch up, close to the coast is potential to produce sound pollution. Whereas sets of equipment in offshore areas may exert important danger of navigation.An intensive discussion with agencies related to these problems is needed in order to minimize unwanted effects. Experience from offshore oil and gas industries such as exploration, is a useful input in planning wave energy catch up.
- Low eficiency of OTEC system will give economic implication and environmental impact that should be taken into account. The other problem comes from fluid work or refrigerant used in a closed system which is potential in a leakage. OTEC plant also needs an amount of chlor to prevent fouling in the heat exchanger of which sea water passes on. When the amount of chlor and refrigerant escape from the system is too much, sea creatures next to the plant will be effected. This problem will eventually exert serious social impact when the location of the plant close to the coast where the inhabitants reside.
- OTEC electric generator needs big initial investment. Efforts have been made to develop heat engines which cost less which can exploit difference of temperature to supply energy. OTEC researchers have the opinion that private sectors reluctant to make initial big investment to develop large scale plant, unless price of fossil fuel gets much higher or local government gives fiscal incentives .Another factor that blocks commercialisation of OTEC is there are only a few locations in tropical area next to the coast and depth of sea water, which are feasible for development of OTEC electric power.



4.2.3 Investment Challenge in Energy Conservation

1. Implementation Regulation of Government Regulation (PP) No 70 tahun 2009 on Energy Conservation Is not ready.
2. High investment to implement energy conservation.
3. Energy conservation is not yet an important issue for most energy users.
4. Incentive and funding for energy conservation is quite limited.
5. Energy price is not yet able to encourage end users to save energy.
6. Operation areas of energy conservation is under a control of several ministries to come to a conclution.
7. End users' knowledge of of policy, regulations and program of energy conservation are quite limited.
8. Investment feasibility in Energy Conservation to decrase production and operational price is not understandable by stakeholders.
9. Technical information on Energy Conservation is not effective and its application is not commonly diseminated well.
10. Technical information of "one stop access" on Energy Conservation, is not yet available.

4.3 Development Program of New and Renewable Energy and Conservation

4.3.1 Development Program of New Energy

4.3.1.1 Coal Bed Methane (CBM)

Development of CBM is planned to start in 2011 at the amount of 4,25 MMSCfD or equivalent to 10,6 MW in 5 work areas, as seen in Table 4.8 below.

Table 4.8
Production of CBM in 2011

Work areas	MMSCfD	Equivalent to (MW)
GMB Tanjung Enim	1	2,5
GMB Sangatta I	1	2,5
GMB Sekayu	1	2,5
GMB Barito Banjar II	0,25	0,625
GMB Pulang Pisau	1	2,5
Total	**4,25**	**10,6**

The next development of CBM is planned in 2015 and is expected to produce 500 MMSCfD, in 2020 around 1.000 MMSCfD, and 2025 approximately 1.500 MMSCfD. Every 1 MMSCfD equivalent to 2,5 MW, so in 2025 production of CBM achieves 1.500 MMSCfD equivalent to 3.750 MW.

Development of Gasified Coal Electric Generation becomes a priority by PT PLN (Persero) to increase supply of national electricity, as seen in Table 4.9.

Investment needed to develop gasified coal electric generation, as seen in Table 4.10

Table 4.9
Development Program of New and Renewable Energy (EBT), Small Scale Gasified Coal Electric Generation

No	EBT electric generation	Units	Year									
			2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
1	PLT Gasified Coal		15	15	15	15	25	25	25	30	30	195

Source: RUPTL PT PLN (Persero) 2010-2019

Table 4.10
Development Cost EBT Small Scale Gasified Coal Electric Generation (PLT)

No	EBT electric generation	Asumsi Investasi US$/kW	Year									
			2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
1	PLT Gasified Coal	2000	30	30	30	30	50	50	50	60	60	390

Source: RUPTL PT PLN (Persero) 2010-2019

4.3.1.3 Nuclear

One location for development of nuclear energy electric generation (PLTN) is in Provinsi Bangka Belitung. Development of PLTN in Bangka Belitung is carried out on the grounds as follows:

a. Topofigureical condition and soil structure which support development of PLTN. Bangka Belitung is known as one of province less influenced by tectonic movement which causes earth quakes. The development of PLTN in this area minimise the risks of earth quakes.
b. The interest of the public and local government (Pemda) to establish Bangka Belitung as storage of energy, particularly electric power.Bangka Belitung local government's interest for the storage of electric power is due to potential area for PLTN in in Indonesia is to meet the needs of electric power for Jawa-Bali dan Sumatera.
c. Support of the public in Bangka Belitung to establish the first location of PLTN in Indonesia. The local government and public of Bangka Belitung highly support the area as location of PLTN in Indonesia. This condition may change in the future in line with change of social-politics in this area. However, the success in the development and operation of PLTN is estimated to minimise the change as mentioned above.

4.3.2 Development Program in Renewable Energy

4.3.2.1 Development Program of Geothermal

In the framework to utilise geothermal for as source of energy, The government is planning to assign 9 new geothermal work areas (WKP) with potential of 1.334Mwe.

Table 4.11
Plan of New Nuclear Work Areas (WKP) in 2011

No	Work areas	Province	Potential (MW)
1	Bonjol	Sumatera Barat	200
2	Danau Ranau	Sumsel - Lampung	210
3	Mataloko	NTT	63
4	Ciremei	Jawa Barat	150
5	Gn. Endut	Banten	80
6	Sembalun	NTB	120
7	Wai Ratai	Lampung	194
8	Simbolon Samosir	Sumatera Utara	225
9	Telomoyo	Jawa Tengah	92
Total			**1334**

Development priority of geothermal is meant to enforce national electric power supply, with investment by PT PLN (Persero) and offer to private sector through purchase of electric power scheme (IPP), as seen in Table 4.11 and Table 4.12.

Development Program of New and Renewable Energy, and Conservation

Table 4.12
Development Program of Geothermal Electric Generation (PLTP) in Indonesia

	Name of Generator	Units	2011	2012	2013	2014	2015	2016	2017	2018	2019
PLN - Sistem Sumatera											
On Going Projects											
	Ulubelu #1, 2	MW	55	55	-	-	-	-	-	-	-
	Hululais #1, 2 (FTP 2)	MW	-	-	55	55	-	-	-	-	-
	Sungai Penuh (FTP 2)	MW	-	-	55	55	-	-	-	-	-
PLN - Sistem Sulut Gorontalo											
Project on Going											
	Lahendong IV	MW	20	-	-	-	-	-	-	-	-
IPP - Sistem Jawa Bali											
Planned Project											
	Program Percepatan Tahap 2	MW	-	175	415	1380	-	-	-	-	-
	Baru	MW	-	-	10	-	30	220	330	325	370
IPP - Sistem Sumatera											
Planned Project											
	Ulubelu #3,4 (FTP 2)	MW	-	-	55	55	-	-	-	-	-
	Lumut Balai (FTP 2)	MW	-	-	110	110	-	-	-	-	-
	Seulawah (FTP 2)	MW	-	-	-	55	-	-	-	-	-
	Sarulla I (FTP 2)	MW	-	-	220	110	-	-	-	-	-
	Rajabasa (FTP 2)	MW	-	-	-	220	-	-	-	-	-
	Muara Laboh (FTP 2)	MW	-	-	-	220	-	-	-	-	-
	Rantau Dedap (FTP 2)	MW	-	-	-	220	-	-	-	-	-
	Sarulla II (FTP 2)	MW	-	-	-	110	-	-	-	-	-
	Wai Ratai	MW	-	-	-	-	-	-	-	-	55
	Pusuk Bukit	MW	-	-	-	-	-	-	-	55	55
	Sorik Merapi (FTP 2)	MW	-	-	-	55	-	-	-	-	-
	Sipaholon	MW	-	-	-		-	-	-	-	55
	G. Talang	MW	-	-	-	-	-	-	-	20	-
	Suoh Sekincau	MW	-	-	-	-	-	-	-	55	55
	Danau Ranau	MW	-	-	-	-	-	-	-	-	110
IPP - Sistem Sulut Gorontalo											
Planned Project											
	Lahendong V (FTP 2)	MW	-	-	20	-	-	-	-	-	-
	Lahendong VI (FTP 2)	MW	-	-	20	-	-	-	-	-	-

Source: RUPTL PT PLN (Persero) 2010-2019

Table 4.13
Development Program of PLTP (geothermal)-IPP (by private sectors) in Indonesia (1/2)

Name of Generator		Capaciy (MW)	Year of Operation
	Planned Project		
	PLTP Cibuni	10	2014
	PLTP Dieng	1 x 55,0	2013
		1 x 60	2014
		2 x 55	2018-2019
	PLTP Ungaran	1 x 55,0	2014
		1 x 30	2015
	PLTP Rawa Dano	1 x 110,0	2014
	PLTP Tangkuban Perahu I	2 x 55	2014
	PLTP Tangkuban Perahu II	2 x 30	2014
	PLTP Patuha	3 x 60	2013-2014
	PLTP Bedugul	1 x 10,0	2013
		3 x 55	2016-2018
	PLTP Kamojang	1 x 60	2013
		1 x 40	2013
	PLTP Salak	1 x 40	2013
	PLTP Darajat	2 x 55	2012, 2013
	PLTP Wayang Windu	1 x 120	2012
		1 x 120	2014
		1 x 50	2018
	PLTP Karaha Bodas	1 x 30	2013
		2 x 55	2014
	PLTP Guci	1 x 55,0	2014
		1 x 55,0	2017
	PLTP Ijen	2 x 55	2014
	PLTP Wilis/Ngebel	1 x 55,0	2013
		2 x 55	2014
	PLTP Batu Kuwung	1 x 55,0	2019
		1 x 110,0	2020
	PLTP Endut	2 x 110,0	2019-2020
	PLTP Mangunan	1 x 30	2019
		1 x 55,0	2020
	PLTP Baturaden	2 x 110,0	2014
	PLTP Arjuno Welirang	2 x 55	2018-2019
	PLTP Iyang Argopuro	1 x 55,0	2014
		2 x 110,0	2016, 2017

Table 4.13
Development Program of PLTP(geothermal)- IPP (by private sectors) in Indonesia (2/2)

Name of generator		Capacity (MW)	Year of Operation
	PLTP Citaman Karang	1 x 10,0	2019
		1 x 10,0	2020
	PLTP Gn Papandayan	2 x 55	2018-2019
	PLTP Tampomas	1 x 45	2014
	PLTP Cisolok-Sukarame	1 x 50	2014
		2 x 55	2017-2018
Planned Project-advanced			
	PLTP Atadei (FTP2)	1 x 5,0	2014
	PLTP Bora (FTP2)	1 x 5,0	2014
	PLTP Danau Ranau	2 x 55	2018, 2019
	PLTP G. Talang	1 x 20,0	2018

Source: RUPTL PT PLN (Persero) 2010-2019

4.3.2.2 Development Program Run off Energy dan Run down, Solar and Wind Power

Energy program of hydro power, solar power and wind power is focussed on acceleration of national electrification which is at present (2010) ratio of alectrification is only 67.15%.

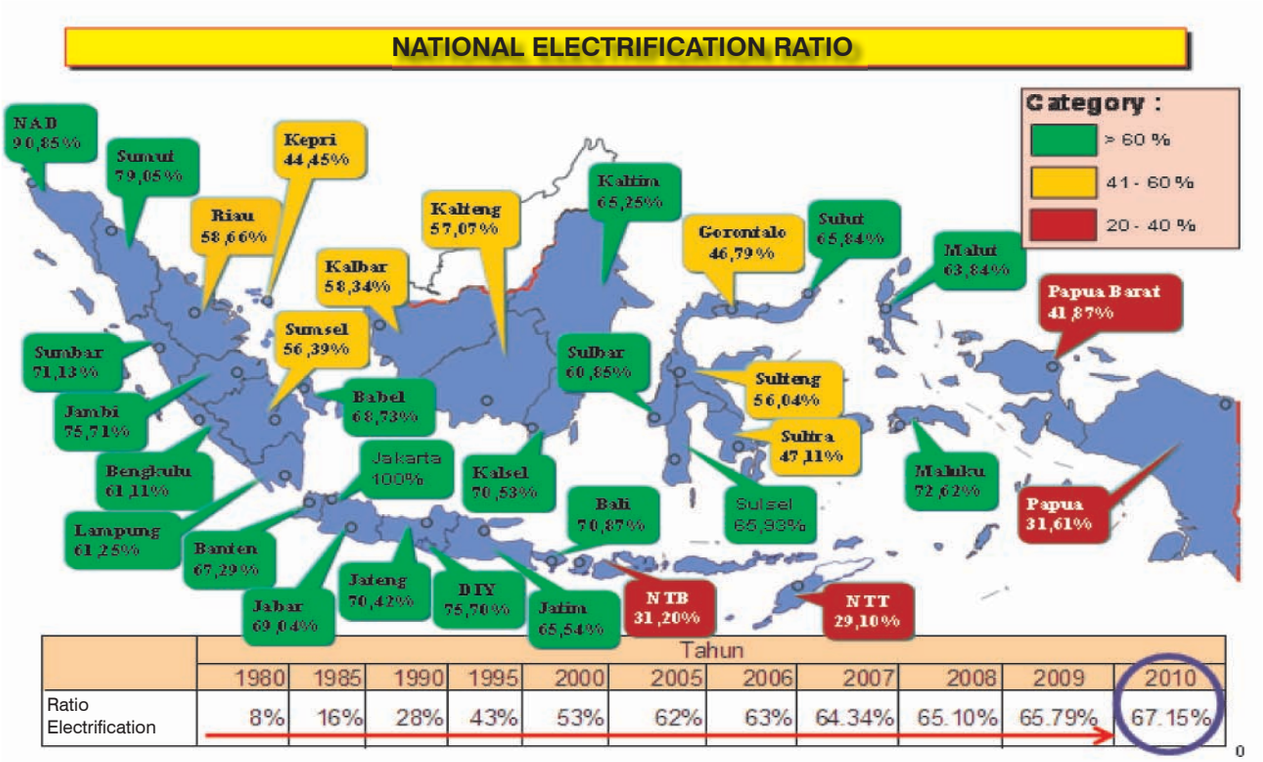


Figure 4.1
National Electrification Ratio

In general, around 32,85% of community who have not received electricity is in the villages, in isolated areas or in remote areas which are not able to receive electric power supplied by PLN electric network because of their economic condition.

Therefore, PT PLN (Persero) is focussing on development of medium scale renewable electric power (EBT), as seen in Table 4.14

Table 4.14
Development Plan of Run off and Run Down Hydro, Solar and Wind Power

No	EBT generator	Units	Year									
			2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
1	PLT Surya	MWp	5	5	10	15	30	30	30	30	30	185
2	PLT Bayu	MW	5	5	8	8	8	10	10	10	10	74
3	PLTMH	MW	21	53	110	140	116	120	125	135	140	960

Source: RUPTL PT PLN (Persero) 2010-2019

Investment needed in renewable energy development as seen in Table 4.15 below.

Table 4.15
Development Cost of Run off and Run Down Hydro, Solar and Wind Power

No	EBT generator	Assumsption of Investment USD/kW	Year									
			2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
1	PLT Surya	5000	25	25	50	75	150	150	150	150	150	925
2	PLT Bayu	3000	15	15	24	24	24	30	30	30	30	222
3	PLTMH	2400	50	127	264	336	278	288	300	324	336	2304

Source: RUPTL PT PLN (Persero) 2010-2019

Development investment of small and medium scale run off and run down hydro, by PT PLN (Persero) is also offered to private sectors using Independent Power Purchase (IPP) mechanism, as seen in Table 4.16 and Table 4.17

Development Program of New and Renewable Energy, and Conservation

Table 4.16 (1/2)
Development Program of Hydro Power (PLTA) in Indonesia

	Name of Generator	Units	2011	2012	2013	2014	2015	2016	2017	2018	2019
PLN - Jawa Bali											
Plan											
	Kesamben	MW	-	-	-	-	-	-	37	-	-
	Kalikonto 2	MW	-	-	-	-	-	62	-	-	-
PLN - Sistem Sumatera											
Plan											
	Peusangan 1-2	MW	-	-	86	-	-	-	-	-	-
	Asahan III (FTP 2)	MW	-	-	174	-	-	-	-	-	-
	Marangin	MW	-	-	-	-	-	175	175	-	-
PLN - Sistem Kalimantan Barat											
Plan											
	Nanga Pinoh	MW	-	-	-	-	-	-	-	98	-
PLN - Sistem Kalselteng Kaltim											
Plan											
	Kusan		-	-	-	-	65	-	-	-	-
PLN - Sistem Sulsel											
Plan											
	Bakaru II	MW	-	-	-	-	-	-	-	-	126
	Poko	MW	-	-	-	-	-	-	-	-	117
IPP - Jawa Bali											
	Rajamandala	MW	-	-	-	47	-	-	-	-	-
	Jatigede	MW	-	-	-	110	-	-	-	-	-
IPP - Sistem Sumatera											
Plan											
	Wampu	MW						45			
	Lawe Mamas	MW						60	30		
	Asahan #4,5	MW						60			
	Simpang Aur	MW				29					
IPP - Sistem Sulut Gorontalo											
Plan											
	Sawangan	MW	-	-	-	-	16	-	-	-	-

Source: RUPTL PT PLN (Persero) 2010-2019

Table 4.16 (2/2)
Development Program of PLTA in Indonesia

	Name of Generator	Units	2011	2012	2013	2014	2015	2016	2017	2018	2019
IPP - Sistem Sulsel											
On Going Project											
	Poso (transfer to the south)	MW	145	-	-	-	-	-	-	-	-
Plan											
	Bonto Batu	MW	-	-	-	-	-	100	-	-	-
	Malea	MW	-	-	-	-	-	90	-	-	-

Source: RUPTL PT PLN (Persero) 2010-2019

Table 4.17 (1/2)
Development Program of PLTM - IPP (by private sectors)

Name of Generator		Capacity (MW)	Year of Operation
on Going Project			
	PLTM Hutaraja	2 x 2,3	2010
	PLTM Manggani	1 x 1,1	2010
	PLTM Parlilitan	3 x 2,5	2010
	PLTM Ranteballa	2 x 1,2	2010
	PLTM Silau 2	3 x 2,5	2010
	PLTM Goal	2 x 0,8	2011
	PLTM Lebong	4 x 3,0	2011
	PLTM Manipi/Tangka I	1 x 3,5	2011
	PLTM Manipi/Tangka II	1 x 6,5	2011
	PLTM Manna	2 x 2,0	2011
	PLTM Parluasan	2 x 2,1	2011
Project Plan			
	PLTM Bambalo III	1 x 2,3	2013
	PLTM Batubota	1 x 2,5	2013
	PLTM Bayang	2 x 3,0	2012
	PLTM Belengan	1 x 1,2	2013
	PLTM Biak I	1 x 1,5	2013
	PLTM Biak II	1 x 1,3	2013
	PLTM Biak III	1 x 1,2	2013
	PLTM Bunta	1 x 2,5	2014
	PLTM Duminanga	1 x 0,5	2013
	PLTM Fatimah	1 x 1,4	2012
	PLTM Gumanti	2 x 5,0	2012
	PLTM Guning Tujuh	2 x 4,0	2012
	PLTM Guntung	1 x 0,6	2012

Table 4.17 (2/2)
Development Program of PLTM IPP (by private sectors)

Name of Generator		Capacity (MW)	Year of Operation
	PLTM Hek	1 x 2,5	2012
	PLTM Ibu	1 x 1,0	2012
	PLTM Kambahan	1 x 1,5	2012
	PLTM Kambaniru	1 x 2,0	2012
	PLTM Karai-1	1 x 10,0	2013
	PLTM Karai-12	1 x 6,0	2013
	PLTM Karai-7	1 x 6,7	2013
	PLTM Kokok Putih	1 x 3,8	2011
	PLTM Kotaraya	1 x 0,8	2013
	PLTM Lambangan	1 x 3,2	2014
	PLTM Lubuk Gadang	1 x 4,0	2012
	PLTM Mampueno/Sakita	1 x 1,2	2013
	PLTM Milangodaa I	1 x 0,7	2013
	PLTM Muara Sako	1 x 2,5	2012
	PLTM Ngaoli	1 x 2,0	2012
	PLTM Pakkat	2 x 5,0	2012
	PLTM Pekasalo	1 x 1,2	2013
	PLTM Sawidago I	1 x 2,0	2015
Planned Project-advanced			
	PLTM Sikarban	1 x 1,4	2012
	PLTM Sinamar	2 x 5,0	2012
	PLTM Sumpur	1 x 2,0	2012
	PLTM Tarabintang	2 x 5,0	2012
	PLTM Tarusan	1 x 3,0	2012
	PLTM Telun Berasap	2 x 3,0	2012
	PLTM Wai Nibe	4 x 1,3	2012-2017
	PLTM Wai Tina	2 x 1,5	2012-2018
	PLTM Wanokaka	1 x 1,6	2011
	PLTM Wawopada	1 x 3,6	2013

Source: RUPTL PT PLN (Persero) 2010-2019

4.3.2.3 Bioenergy

4.3.2.3.1 Biomass Electric Energy

Bioenergi for power supply includes the followings:

1. City waste electric power,
2. Agricultural industry waste electric generator,
3. Sugar industry waste electric generator

Development of cvity waste is in line with condition and location of End Relocation of Waste (TPA) as seen in Table 4.18.

Table 4.18 (1/2)
Development of City Waste PLT

No	Name of City	Population	Potential of Waste (ton/day)	Name of TPA
1	DKI Jakarta	9.703.000	8.733	Bandar Gebang Sumur Batu
2	Batam	636.729	450	Telaga Punggur
3	Kota Semarang	1.495.000	1.345	Jatibarang
4	Kota Palembang	1.301.000	1.171	Sukawinata Karya Jaya
5	Kota Surabaya	2.847.000	2.562	Benowo
6	Kota Padang	758.000	682	Air Dingin
7	Kota Pontianak	490.000	340	Batu Layang
8	Kota Medan	2.014.000	1.812	Namo Bintang Terjun
9	Kota Bogor	3.600.000	3.240	Galuga
10	Kota Malang	846.000	761	Supit Urang
11	Kota Depok	1.352.000	1.217	Cipayung
12	Kota Jogya, Sleman, Bantu;	2.408.000	2.000	Ngablak-Piyung
13	Kota Jambi	437.170	100	Talang Gulo
14	Kota Samarinda	550.000	400	Bukit Pinang
15	Kab. Bogor	3.600.000	3.240	Pondok Rajeg
16	Kab. Tangerang	3.048.000	2.743	Jatiwaringin
17	Kota Sukabumi	2.210.000	1.989	Cigundul
18	Kab. Garut	2.050.000	1.844	Basir Bajing
19	Bali	1.896.000	445	Sarbagita Singaraja
20	Kota Madiun	679.841	612	Winongo
21	Kab. Jember	2.346.000	2.112	Pakusari
22	Kab. Cianjur	1.958.000	1.762	Pasir Sembung Pasir Bungur
23	Kab. Malang	2.469.000	2.222	Talang Agung Randu Agung
24	Kab. Sidoarjo	1.742.000	1.568	Desa Kupang
25	Kota Balikpapan	495.314	400	Manggar

Table 4.18 (2/2)
Development of City Waste Electric Power

No	Name of City	Population	Potential of Waste (ton/day)	Name of TPA
26	Kab. Banyuwangi	1.670.000	1.503	Bulusan Rogojambi
27	Kota Bandung	2.349.000	2.114	Leuwi Gajah
28	Kota & Kab. Tegal	3.910.000	3.519	Sarimukti
29	Kota & Kab. Cirebon	2.236.000	2.012	
30	Kota Tangerang	1.502.000	1.352	Rawakucing
31	Kab. Purwakarta	-		Ciwarung
32	Surakarta, Klaten & Boyolali	2.719.000	2.447	
33	Kota & Kab. Tegal	1.650.000	1.485	
34	Kota & Kab. Pasuruan	1.350.000	1.215	
35	Kota & Kab. Probolinggo	1.450.000	1.300	
36	Kota & Kab. Kediri	1.360.000	1.224	
37	Kota Pakanbaru	670.000	603	
38	Kota Bandar Lampung	782.000	703	
39	Kota Makasar	1.143.000	1029	

Development of electric generation using bagasse (sugar cane) is adapted to the condition and loication of th sugar plant, as seen in Table 4.19

Table 4.19 (1/3)
Development of Sugar Industry Waste PLT

Area	Name of Sugar Company	Capacity (ton/day)
SUMATERA UTARA		
1	PG. Kwala Madu, Binjai	3,941
2	PG. Sei Semayang, Deli Serdang	3,998
SUMATERA SELATAN		
3	PG. Cinta Manis, Ogan Komering Ilir	5,023
LAMPUNG		
4	PG. Bunga Mayang, Lampung Utara	5,979
5	PG. Gunung Madu, Lampung Tengah	11,432
6	PG. Gula Putih Mataram, Lampung Tengah	12,124
7	PG. Sweet Indo Lampung, Lampung Utara	10,539
JAWA BARAT		
8	PG. Kadipaten, Majalengka	1,171

Table 4.19 (2/3)
Development of Sugar Industry Waste PLT

Area	Name of Sugar Company	Capacity (ton/day)
9	PG. Jatiwangi, Majalengka	1,050
10	PG. Gempol, Cirebon	1,200
11	PG. Sindanglaut, Cirebon	1,780
12	PG. Karang Suwung, Cirebon	1,334
13	PG. Tersana Baru, Cirebon	3,015
14	PG. Jatitujuh, Majalengka	4,045
15	PG. Subang, Subang	2,852
JAWA TENGAH		
16	PG. Banjaratma, Brebes	2,000
17	PG. Jatibarang, Brebes	2,000
18	PG. Pangka, Tegal	1,772
19	PG. Sourceharjo, Pemalang	1,798
20	PG. Sragi, Pekalongan	3,184
21	PG. Cepiring, Kendal	1,750
22	PG. Rendeng, Kudus	2,520
23	PG. Mojo, Sragen	2,726
24	PG. Tasikmadu, Karanganyar	3,218
25	PG. Colomadu, Karanganyar	1,300
26	PG. Ceperbaru, Klaten	1,350
27	PG. Gondangbaru, Klaten	1,452
28	PG. Kalibagor, Banyumas	1,250
29	PG. Pakisbaru, Pati	2,765
30	PG. Trangkil, Pati	3,267
31	PG. Madukismo, Bantul	3,100
JAWA TIMUR		
32	PG. Krian, Sidoarjo	1,500
33	PG. Watutulis, Sidoarjo	2,085
34	PG. Tulangan, Sidoarjo	1,287
35	PG. Krembong, Sidoarjo	1,446
36	PG. Gempolperet, Mojokerto	5,742
37	PG. Jombangbaru, Jombang,	2,187
38	PG. Cukir, Jombang	2,897
39	PG. Lestari, Nganjuk	3,529
40	PG. Merican, Kediri	2,515
41	PG. Pesantren Baru, Kediri	5,607
42	PG. Ngadirejo, Kediri	5,615

Table 4.19 (3/3)
Development of Sugar Industry Waste PLT

Area	Name of Sugar Company	Capacity (ton/day)
43	PG. Mojopanggung,Tulungagung	2,521
44	PG. Sudono, Ngawi	2,289
45	PG. Purwodadi, Magetan	1,946
46	PG. Rejosari, Magetan	1,814
47	PG. Pagottan, Madiun	2,084
48	PG. Kanigoro, Madiun	1,729
49	PG. Kedawung, Pasuruan	2,194
50	PG. Wonolangan, Probolinggo	1,199
51	PG. Gending, Probolinggo	1,305
52	PG. Pajarakan, Probolinggo	1,117
53	PG. Jatiroto, Lumajang	5,762
54	PG. Semboro, Jember	4,515
55	PG. Pe Maas, Situbondo	838
56	PG. Wringinanom, Situbondo	1,084
57	PG. Olean, Situbondo	963
58	PG. Panji, Situbondo	1,573
59	PG. Asembagus, Situbondo	2,365
60	PG. Prajekan, Bondowoso	2,532
61	PG. Rejoagung Baru, Malang	3,900
62	PG. Kreber Baru,Malang	7,000
63	PG. Candi,Sidoarjo	1,700
64	PT. Tri Guna Gina, Malang	3,698
KALIMANTAN SELATAN		
65	PG. Pelaihari, Tanah Laut	3,862
SULAWESI UTARA		
66	PG. Tolangohula Gorontalo	8,000
SULAWESI SELATAN		
67	PG. Bone, Bone	2,194
68	PG. Camming, Bone	2,517
69	PG. Takalar, Takalar	2,842
Total		**212888**

Development of biodiesel, bioetanol and pure bio oil, based on ESDM Ministerial Regulation No 32 of 2008 on mandatory minimum use, as seen below:

Table 4.20
Stages of Mandatory Minimum Use of Biodiesel

Types of Sector	January 2010	January 2015	January 2020	January 2025	Explanation
Households					Not approved at the moment
PSO Transportation	2,5%	5%	10%	20%	Of the total needs
Non PSO Transportation	3%	7%	10%	20%	
Industrial and Commercial	5%	10%	15%	20%	Of the total needs
Electric Generator	1%	10%	15%	20%	Of the total needs

Table 4.21
Stages for Mandatory Minimum Use of Bioetanol

Types of Sector	January 2010	January 2015	January 2020	January 2025	Explanation
Households					Not approved at the moment
PSO Transportation	3%	5%	10%	20%	Of the total needs
Non PSO Transportation	7%	10%	12%	15%	
Industrial and Commercial	7%	10%	12%	15%	Of the total needs
Electric Generator					Not approved at the moment

Table 4.22
Stages for Mandatory Minimum Use of Pure Bio Oil

Types of Sector		January 2010	January 2015	January 2020	January 2025	Explanation
Households						Not decided at the moment
Industrial and Transportation (Low and medium Speed engine)	Industrial	1%	3%	5%	10%	
	Marine	1%	3%	5%	10%	
Pembangkit listrik		1%	5%	7%	10%	Of the total needs

Biomass and Biofuel Electric Power Generation is also developed by PT PLN (Persero) as seen in Table 4.23, which needs investment funding as in Table 4.24

Table 4.23
Development Program of Renewable Energy for Small Scale Electric Generation Using Biomass and Biofuel

No	EBT Generator	Units	Year									
			2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
1	Biomass PLT	MW	10	10	10	10	25	25	25	25	40	180
2	Biofuel PLT	MW	0,5	2,0	2,0	2,0	3,0	5,0	5,0	10,0	10,0	40

Source: RUPTL PT PLN (Persero) 2010-2019

Table 4.24
Development Cost for Small Scale Biomass and Biofuel Electric Power

No	EBT Generator	Investment Assumptions US$/kW	Year									
			2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
1	PLT Biomass	2500	25	25	25	25	63	63	63	63	100	452
2	PLT Biofuel	2500	1	5	5	5	8	13	13	25	25	100

Source: RUPTL PT PLN (Persero) 2010-2019

4.3.2.6 Movement Energy and Difference of Ocean Temperature

Since until the present time, development of ocdean energy remains a research and development program and pilot project, the development plan will focus on small scale energy in local ereas or remote islands which are not accessible for PLN distribution networks nor affordable funding economically using fossil fuel, in remote areas so that energy price is competitive or cheap.

Development of Ocean Electric Generation is also developed by PLN as seen in Table 4.20, with investment needed as in Table 4.21.

Table 4.25
EBT Plant Development Program for Small Scale in Ocean PLT

No	EBT Generator	Units	Year									
			2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
1	PLT Kelautan	MW	0,0	0,2	0,3	0,5	1,0	1,5	2,0	2,0	2,5	10

Source: RUPTL PT PLN (Persero) 2010-2019

Table 4.26
Cost Development of Small Scale Generation EBT in Ocean PLT

No	EBT Generator	Investment Assumptions US$/kW	Year									
			2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
1	PLT Kelautan	6000	0	1	2	3	6	9	12	12	15	60

Source: RUPTL PT PLN (Persero) 2010-2019

4.3.3 Energy Conservation Program

Industrial Sector

To achieve energy efficiency in industrial sector of 20%, the government has developed a number of programs to increase energy efficiency through implementation Energy Management System.

Monitoring and Evaluation of Energy Management is designed that every industry should implement Energy Managemnet in each companies in good governance. Manpower planning, with Mnager Certification and Energy Auditor, as part of implementation in Energy Management, should be carried out by stages with the emphasis on and begins with insdustry using big consumption of energy. By the end of 2015, it is expected that consumption of energy by all industries achieves over or equivalent to 6.000 TOE/ year, has implemented

Energy Management, as stipulated in Government Regulation (PP) No. 70 of 2009. It is expected that by the end of 2025 energy efficiency achieves 308.032 thousand TOE.

Table 4.27
Efficiency Energy Through Monitoring and Assessment
Implementation on Energy Management in Industrial Sector

Industrial Sub Sektor	2011	2012	2013	2014	2015	2016 - 2020	2021 - 2025
Food and Drink	658	1.029	1.268	1.641	2.082	6.618	6.618
Tobacco	-	63	63	223	319	429	429
Textile	4.743	6.253	7.385	8.763	10.613	19.777	59.611
Ready-made wear	830	1.490	2.003	2.385	2.440	4.066	12.329
Animal skin wear	182	290	299	335	649	1021	3.071
Wood product other than furniture	186	308	400	765	1.130	1.833	4.326
Paper and Paper products	653	1.863	2.187	2.748	3.169	5.612	17.904
Print Media products	-	-	-	119	166	276	863
Coal and nuclear fuel	-	-	-	-	19	148	148
Chemicals	3.209	4.030	4.419	4.604	4.812	9.106	30.679
Rubber and plastic products	685	1.034	2.094	2.795	3.230	5.650	17.864
Mineral products other than steel iron	1.817	3.790	4.293	4.848	5.304	27.014	43.782
Steel iron raw materials	10.606	11.383	12.554	13.223	13.793	25.940	74.330
Factory made steel products other than machinery	395	629	662	770	1.053	1.742	5.244
Machineries and equipment	-	127	152	261	487	675	1739
Stationeries and computers	-	-	-	-	-	-	-
Electric machineries	203	309	318	490	605	983	2.951
Radio, television and communction equipments	-	-	-	173	214	304	833
Medicines	-	-	-	-	-	-	-
Vehicles, trailer and semi trailer	923	1.178	1.187	1.573	1.922	3.306	10.274
Other transportation equipment	801	852	8.61	1.087	1.172	2.056	6.618
Furniture and manufacture	1.227	1.232	1.240	1.294	1.406	2.543	8.421
Accumulation of Energy Efficiency	27.118	35.860	41.383	48.097	54.586	119.100	308.032

(dalam Ribu TOE)

Development Program of New and Renewable Energy, and Conservation

To choose business operator as participant of Energy Management Program is based on average amount energy energy consumption in each sub sector of industry. Yearly number of participants is monitored in line with implementation schedule as planned. Target efficiency energy for each sub sector perd year as seen in Table 4.27.

Energy consumption by industry below 6.000 TOE per year is liable for Partnership Program in Energy Conservation Implementation included in Energy Audit and technical guidance free of charge.

Partnership program of 375 members until 2015 and 50 industries in the next years is expected to raduce energy consumption in industry of 40.217 thousand TOE by end of 2025.

Detailed program of Energy Conservation to achieve energy efficiency as seen in Table 4.28.

Table 4.28
Annual Energy Efficiency through Partnership Program Energy Conservation Implementation in Industrial Sector

(Thousand TOE)

Industrial Sub Sektor	2011	2012	2013	2014	2015	2016 - 2020	2021 - 2025
Food and Drink products	-	-	-	-	-	481	4.086
Tobacco	-	-	-	-	-	30	117
Textile	-	-	-	-	823	5.435	11.218
Ready to wear	87	189	299	299	299	1.406	2.338
Animal skin wear	-	38	90	145	145	708	1.221
Wood products other than Furniture	-	-	-	-	-	1.606	2.075
Paper and paper products	-	-	-	-	-	864	1.337
Products of print media	-	-	-	-	-	765	1.247
Coal and nuclear fuel	-	-	-	-	-	-	-
Chemicals	-	-	-	-	-	2.536	3.552
Rubber and plastic products	-	-	-	-	-	2.250	4.185
Mineral products except steel	-	-	-	-	-	229	1.314
Steel raw materials	-	-	-	-	-	1.065	1.708
Factory steel products, except machineries	43	108	218	218	218	797	1.088
Machineries and equipment	114	114	114	114	114	445	612
Stationeries and computer	-	-	-	-	-	-	-
Electric machineries	-	-	-	-	-	671	1.383
Radio, television and communication equipment	43	99	99	99	99	478	784
Medicines	-	-	-	-	-	-	-
Vehicles, trailer and semi trailer	-	90	234	234	234	842	1.148
Other transportaton	-	36	94	94	94	362	497
Furniture and manufacture	-	-	-	-	-	253	327
Accumulation of Energy Efficiency	287	674	1148	1.203	2.026	21.223	40.217

To choose business operator as participant of Energy Management Program is based on average amount of energy consumption in each sub sector of industry. Yearly number of participants is monitored in line with implementation schedule as planned. The program is especially meant for government owned facilities and local government enterprises, as support of application of Presidential Instruction No. 2 Tahun 2008 on Energy and Water Efficiency. Using the program ini, the amount of energy efficiency per year can be achieved by each sub industrial sector, as Table 4.28.

20,64% equivalent to 28.185.920 TOE, as seen in Table 4.29.

Energy efficiency for industry producing equipments is included in Mandatory Standard of Energy Efficiency program and Energy Efficiency Label, so that they are encouraged to produce equipments with high energy efficiency. In his program every producer and importer is supposed to attach energy efficviency label on all house holds equipments by the end of 2012. Labelling Program of Energy Effeciency on Households sets of equipment is carried out by steps, beginning with sets of equipment using a lot of energy.

Table 4.29 (1/2)
Achievement of Energy Efficiency in Industrial Sector

(thousand TOE)

Industrial Sub Sector		2011	2012	2013	2014	2015	2016 - 2020	2021 - 2025
Food and drink products	%	0,088%	0,134%	0,162%	0,202%	0,246%	0,563%	0,880%
	TOE	60.907	95.166	117.269	151.755	192.59	581.936	1.198.757
Tobacco	%	0,000%	0,008%	0,008%	0,018%	0,023%	0,032%	0,047%
	TOE	-	5.822	5.822	14.773	19.181	29.906	59.648
Textile	%	0,636%	0,824%	0,955%	1104%	1289%	2159%	3977%
	TOE	438.699	578.399	683.085	810.579	981.657	2.050.801	5.588.897
Ready to wear	%	0,111%	0,194%	0,253%	0,294%	0,300%	0,472%	0,839%
	TOE	76.749	137.813	185.245	220.593	225.683	437.794	1.151.354
Animal skin wear	%	0,024%	0,043%	0,050%	0,058%	0,090%	0,149%	0,251%
	TOE	16.856	30.4	35.923	43.345	72.324	144.916	343.772
Ood products except Furniture	%	0,025%	0,040%	0,051%	0,090%	0,127%	0,272%	0,435%
	TOE	17.166	28.498	36.993	70.758	104.496	283.704	599.588
Paper and paper products	%	0,088%	0,238%	0,276%	0,336%	0,378%	0,587%	1096%
	TOE	60.382	172.358	202.3	254.227	293.146	549.831	1.540.455
Products of print media	%	0,000%	0,000%	0,000%	0,013%	0,018%	0,073%	0,115%
	TOE	-	-	-	10.967	15.395	83.27	166.18
Coal and nuclear Raw materials	%	0,000%	0,000%	0,000%	0,000%	0,002%	0,010%	0,010%
	TOE	-	-	-	-	1.792	11.793	11.793
Chemicals	%	0,430%	0,553%	0,578%	0,609%	0,641%	1072%	1973%
	TOE	296.839	372.749	408.757	435.513	465.212	995.247	2.748.359
Rubber and plastic goods	%	0,092%	0,135%	0,258%	0,334%	0,377%	0,672%	1236%
	TOE	63.378	95.65	193.65	258.556	298.789	661.229	1.757.762

Development Program of New and Renewable Energy, and Conservation

Table 4.29 (2/2)
Achievement of Energy Efficiency in Industrial Sector

(thousand TOE)

Industrial Sub Sector		2011	2012	2013	2014	2015	2016 - 2020	2021 - 2025
Mineral produks other than steel	%	0,244%	0,489%	0,548%	0,607%	0,653%	2039%	2751%
	TOE	168.033	350.525	397.089	448.425	490.608	2.193.190	3.578.812
Steel raw material	%	1422%	1519%	1654%	1726%	1783%	2618%	4565%
	TOE	980.989	1.052.873	1.161.178	1.223.116	1.275.822	2.301.136	6.090.406
Manufactured steel other than machineries	%	0,059%	0,096%	0,113%	0,124%	0,152%	0,233%	0,384%
	TOE	40.517	68.212	81.382	91.237	117.563	215.948	510.335
Machineries and equipment	%	0,015%	0,031%	0,034%	0,046%	0,068%	0,101%	0,150%
	TOE	10.5	22.201	24.542	34.68	55.59	95.817	191.358
Stationeries and computer	%	0,000%	0,000%	0,000%	0,000%	0,000%	0,000%	0,000%
	TOE	-	-	-	-	-	-	-
Electric machineries	%	0,027%	0,040%	0,042%	0,060%	0,071%	0,138%	0,245%
	TOE	18.782	28.618	29.447	45.358	55.917	137.387	345.309
Radio, television and communication equipment	%	0,006%	0,013%	0,013%	0,031%	0,036%	0,065%	0,0949%
	TOE	4.015	9.199	9.199	25.176	28.992	65.38	121.179
Medicines	%	0,000%	0,000%	0,000%	0,000%	0,000%	0,000%	0,000%
	TOE	-	-	-	-	-	-	-
Vehicles, trailer and semi trailer	%	0,124%	0,156%	0,173%	0,215%	0,250%	0,376%	0,666%
	TOE	85.417	108.978	123.135	158.921	191.172	345.761	910.282
Other transportaton	%	0,108%	0,119%	0,127%	0,151%	0,160%	0,233%	0,420%
	TOE	74.852	82.293	89.112	109.977	117.863	207.274	571.834
Furniture and manufacture	%	0,165%	0,165%	0,166%	0,172%	0,183%	0,271%	0,508%
	TOE	113.538	113.936	114.686	119.648	130.064	237.968	699.84
Accumulation of Energy Efficiency	%	3,66%	4,78%	5,46%	6,19%	6,85%	12,13%	20,64%
	TOE	2.527.620	3.354.320	3.898.815	4.527.692	5.133.856	11.630.290	28.185.920

Implementation of Standard Program Mandatory of Energy Efficiency Planning for new plants, will be effective 2012. When new equipments replaced in old plants, effcient equipments should be used and be effective by 2016. Mandatory of using effciency process with standard requirements will be effective by 2021.

Commercial Sector

Monitoring and Evaluation of Energy Management is also designed for use in building development in each companies. Manpower planning, with Manager Certification and Energy Auditor, as part of implementation in Energy Management for building development, should be carried out by stages with the emphasis on and begins with insdustry using big consumption of energy.

To create Energy Manager and Auditor of 60 persons in each company, by the end of 2015, its expected that building that consume >6,000 TOE per year has implemented Energy Management, as stipulated in Government Regulation No. 70, 2009. Choice of companies to be the participant of Energy Management is based on average consumption of energy by each commercial sub sector. Every year the number of participants is adapted to the schedule implementation as planned. The amount of energy

efficiency for each commercial sub sector as seen in Table 4.25 below. It is expected that by 2025 energy efficiency in commercial sector achieves 3,483.60 thousand TOE.

Buildings that consume energy below 6.000 TOE per year, is liable to receive Partnership Program Implementation of Energy Conservation in the form

Table 4.30
Energy efficiency through Monitoring Program and Evaluation Implementation of Energy Management in Commercial Sector

(thousand TOE)

Types of buildings	2011	2012	2013	2014	2015	2016-2020	2021-2025	2026-2030
Apartements	-	-	-	-	-	-	-	-
Assembly halls	-	-	-	-	-	-	-	-
Hotels	-	15,91	15,91	103,97	205,37	205,37	205,37	205,37
Government offices	19,61	19,61	19,61	80,92	180,01	180,01	180,01	180,01
Private offices	299,58	345,62	345,62	393,60	595,81	2.229,78	2.229,78	2.229,78
Shopping Mals	-	106,48	112,49	137,28	163,95	868,43	868,43	868,43
Houses	-	-	-	-	-	-	-	-
Private Hospitals	-	-	-	-	-	-	-	-
Government hospitals	-	-	-	-	-	-	-	-
Supermarkets	-	-	-	-	-	-	-	-
Accumulation of Energy Efficiency	**319,19**	**487,62**	**493,63**	**715,77**	**1.145,14**	**3.483,60**	**3.483,60**	**3.483,60**

of energy audit and technical guidance, free of charge. The appliucation of partnership program for 325 buildings by 2015 and 45 others in the years to come, are expected to reduce energy consumption by groups of buildings mentioned above at 17.876,20 thousand TOE by 2025.

The choice of business organizations as an object or participant of partnership program is based on average amount of energy consumption of each type of buildings. The number of participants is adapted to the implementation of schedule as planned.

The amount of energy efficiency through Partnership Program for each type of buildings as seen in Table 4.31 below.

Development Program of New and Renewable Energy, and Conservation

Table 4.31
Energy Efficiency through Partnership Program
Implementation of Energy Conservation in Commercial Sector

(thousand TOE)

Types of buildings	2011	2012	2013	2014	2015	2016-2020	2021-2025	2026-2030
Apartements	21,96	21,96	37,59	46,48	72,93	417,86	631,17	948,61
Assembly halls	16,52	16,52	16,52	48,81	142,29	332,42	332,42	332,42
Hotels		63,64	72,59	160,65	160,65	1.001,45	1.556,26	1.556,26
Government offices		8,81	43,31	43,31	43,31	1.025,06	2.255,66	2.255,66
Private offices		368,44	482,69	574,68	673,65	4.103,07	5.288,44	7.184,50
Shopping Mals	117,22	117,22	260,70	301,41	345,21	3.592,72	4.462,67	4.462,67
Houses			12,79	12,79	22,66	47,68	47,68	47,68
Private Hospitals			11,56	36,44	48,48	86,63	231,57	231,57
Government hospitals	7,33	7,33	21,78	38,80	101,89	292,84	292,84	292,84
Supermarkets	13,58	13,58	19,91	35,79	46,55	262,71	563,99	563,99
Accumulation of Energy Efficiency	**176,61**	**617,50**	**979,45**	**1.299,16**	**1,657.64**	**11.166,94**	**15.662,69**	**17.876,20**

Implementation Program for Mandatory Standard of Energy Efficiency Plan for buildings, will be applied beginning 2012. A change of sets of equipment for old buildings, is mandatory for energy efficiency. This requirement will be effective by 2016.

Stages achievement of energy efficiency target in commercial sector as resumed in Table 4.32.

Table 4.32
Achievement Target of Energy Efficiency in Commercial Sector

Types of buildings		2011	2012	2013	2014	2015	2016 - 2020	2021 - 2025
Apartements	%	0,04%	0,04%	0,06%	0,07%	0,10%	0,36%	0,46%
	TOE	1.32	1.32	2.132	2.561	3.747	13.516	17.330
Assembly halls	%	0,03%	0,03%	0,03%	0,07%	0,18%	0,32%	0,32%
	TOE	993	993	993	2.552	6.745	12.130	12.130
Hotels	%	0,00%	0,12%	0,13%	0,24%	0,36%	1,00%	1,26%
	TOE	-	4.445	4.910	9.160	13.709	37.521	47.440
Government offices	%	0,03%	0,04%	0,09%	0,17%	0,29%	1,03%	1,61%
	TOE	1.179	1.671	3.463	6.422	10.867	38.671	60.674
Private offices	%	0,55%	1,11%	1,26%	1,44%	1,68%	7,18%	8,36%
	TOE	20.582	41.670	47.603	54.358	63.429	270.604	314.842
Shopping Mals	%	0,19%	0,34%	0,54%	0,59%	0,65%	2,39%	2,81%
	TOE	7.047	12.996	20.447	22.412	24.377	90.219	105.773
Houses	%	0,00%	0,00%	0,02%	0,02%	0,03%	0,05%	0,05%
	TOE	-	-	664	664	1.107	1.815	1.815
Private Hospitals	%	0,00%	0,00%	0,02%	0,05%	0,06%	0,09%	0,16%
	TOE	-	-	600	1.801	2.341	3.422	6.013
Government hospitals	%	0,01%	0,01%	0,01%	0,01%	0,06%	0,08%	0,08%
	TOE	441	441	441	441	2.322	3.152	3.152
Supermarkets	%	0,02%	0,02%	0,03%	0,05%	0,06%	0,23%	0,37%
	TOE	816	816	1.145	1.911	2.394	8.643	13.950
Accumulation of Energy Efficiency	%	0,86%	1,71%	2,19%	2,71%	3,48%	12,73%	15,48%
	TOE	32.378	64.352	82.398	102.282	131.038	479.692	583.120

Development Program of New and Renewable Energy, and Conservation

Transportation Sector

The needs of public mass transportation, which is safe, comfortable and fast, is expected to change the passengers' option using personal cars to Mass Public Transportation. The target composition of passengers using personal cars and mass transportation (currently 80% by 20%) to become 40% by 60% is expected to achieve oil fuel efficiency at 13.940.507 TOE, by 2025, as seen in Table 4.33 below

Change of freight transportation from trucks to railways is one important step to implement in transportation sector. This step enables to save around 50% of energy needs of freight tranportation by trucks, because intensity of energy for transportation by trucks has come 2 times compared to transportation by railways.

A campaign of vehicles maintenance and driving with energy efficiency and clean environment to the public through media is one periodic step that should be done, so that disciplines in traffic is increased. Use

Table 4.33
Energy Efficiency through Change of Using Personal Cars to Mass Public Transportation

Year	Energy Efficiency			Composition(%)	
	Kilo Liter	TOE	% Konsumsi Sektor	Mobil Pribadi	Transportasi Umum
2011	431.289,20	353.664,53	1,29	78,79	21,21
2012	1.294.185,82	1.061.232,37	3,64	75,93	24,07
2013	1.987.275,96	1.629.566,29	5,26	73,18	26,82
2014	2.325.817,81	1.907.170,61	5,80	71,33	28,67
2015	3.331.683,64	2.731.980,59	7,81	68,40	31,60
2016	4.246.488,19	3.482.120,32	9,37	65,25	34,75
2017	5.195.094,84	4.259.977,77	10,78	62,36	37,64
2018	6.044.225,17	4.956.264,64	11,80	60,26	39,74
2019	6.983.344,00	5.726.342,08	12,83	58,10	41,90
2020	8.028.558,69	6.583.418,12	13,87	56,29	43,71
2021	9.141.819,62	7.496.292,09	14,86	54,46	45,54
2022	10.847.897,91	8.895.276,28	16,58	51,26	48,74
2023	12.728.116,78	10.437.055,76	18,30	48,38	51,62
2024	14.677.248,17	12.035.343,50	19,85	45,31	54,69
2025	17.000.618,88	13.940.507,48	21,62	42,35	57,65

As seen in Table 4.28, using change of passengers, results in energy efficiency, by stages, in transportation sector, and achioeves 21.62% by 2025. Using ITS-Intelligent Transpotrt Syatem or ATCS – Area Traffic Control System , including Road Pricing Tariff, it is expected to enable to run the traffic smoother and prevent traffic jam, as well as reduce fuel consumption.

of hybrid energy vehicles, which is efficient in energy use of 40% should be facilitated by special arrangement of import duty.

Table 4.34
Sample of Energy Intensity for Freight Transportation : Trucks vs Railway

Description		Amount	Units
Truck			
	Jakarta to Surabaya	800	Km
	Freight capacity	30	Ton
	Use of fuels per liter	3	Km
	Total consumption of fuels	267	Liter
	Energy Intensity	8,89	Liter/Ton.Km
Railway			
	Jakarta to Surabaya	800	Km
	Freight capacity, 15 wagons per series of @40 ton	600	Ton
	Use of fuel per liter	0,33	Km
	Total consumption of fuel	2.4	Liter
	Energy intensity for railway	4,00	Liter/Ton.Km
Energy Efficiency		4,89	Liter/Ton.Km
		55.00%	**%**

Other ways of fuel efficiency that should be made includes, among others, the application of "Road Pricing Tariff", Energy Efficiency Label for vehicles, use of "non-motorized transportation" and the application of Parking Management. It is expected that means of fuel efficiency as mentioned above will result in fuel efficiency around 5%. By the end of 2025 it is expected that transportation sector contributes energy efficiency by 24,62% or equivalent to 15.874.902 TOE, as seen in Table 4.35 below.

Table 4.35 (1/2)
Achievement Target of Energy Efficiency in Transportation Sector

No	Program of Energy Efficiency		Achievement Target of Energy Efficiency						
			2011	2012	2013	2014	2015	2016-2020	2021-2025
1	Change of personal cars to mass public transportation	%	1,29	3,64	5,26	5,80	7,81	13,87	21,62
		TOE	353.665	1.061.232	1.629.566	1.907.171	2.731.981	6.583.418	13.940.507
2	Application of traffic manajemen and energy efficiency technology for vehicles								
	Optimism of using railways for freight								

Development Program of New and Renewable Energy, and Conservation

Table 4.35 (2/2)
Achievement Target of Energy Efficiency in Transportation Sector

No	Program of Energy Efficiency		Achievement Target of Energy Efficiency						
			2011	2012	2013	2014	2015	2016-2020	2021-2025
	Increase of publuc disciplines in traffic								
	Application of Road Pricing Tariff								
	Application of Energy Efficiency lable on vehicles								
	Use of “non-motorized transportation								
	Application of Parking Management System								
	Use of Efficient Energy Technology vehicles								
		%	0,25	0,50	0,75	1,00	1,50	2,00	3,00
		TOE	68.588	145.708	232.257	329.097	524.633	949.172	1.934.394
Accumulation of Energy Efficiency		%	1,54	4,14	6,01	6,80	9,31	15,87	24,62
		TOE	422.252	1.206.941	1.861.823	2.236.268	3.256.614	7.532.590	15.874.902

Households Sector

Program Campaign of Energy Efficiency through public service advertisements is an effective use to be aware of and create energy efficiency culture in households sector. Giving tips and tricks of how to apply energy efficiency and information on how to choose equipments with high energy efficiency is useful in energy use in households sector.

Through program standard equipment and labelling of energy effivciency can encourage availability of efficient equipments, as well as easy to choose energy efficient equipments needed by the public. Public will be informed of how to use each equipments and gradually label for efficient energy equipments.

Demand Siude Management Program for PLN customers which provides credit facilities for effcient energy households equipments wilkl also support use of efficient equipments and leave uneffcient equipments. Payment by installment through discounted electric bill is expected not to increase the amount of the bill, isntead by total consumption of decreasing electricity as a result of use of effcient equipments.

Using energy saver sets of equipment is expected to achieve more energy efficiency, gradually by 26,87% or equivalent to 2326.949 TOE, in households sector by 2025, as seen in Table 4.36 below.

Table 4.36
Achievement Target of Energy Efficiency for Households Sector

No	Programs of Energy Efficiency		Achievement Target of Energy Efficiency						
			2011	2012	2013	2014	2015	2016-2020	2021-2025
1	Change of use Saving energy Cooking stove	%	0,95%	0,95%	0,95%	1,91%	2,86%	3,81%	0,00%
	Effiency in use of Kerosine	TOE	109,84	109,84	109,84	219,69	329,53	439,38	
2	Change of use LPG efficiency stove	%	0,12%	0,12%	0,25%	0,25%	0,25%	0,00%	0,00%
	LPG efficiency	TOE	14,27	14,27	28,54	28,54	28,54		
3	Increase awareness of energy efficiency	%	0,001%	0,001%	0,001%	0,001%	0,001%	0,005%	0,005%
	Energi efficiency	TOE	86	86	86	86	86	428	428
4	Change of energy Efficiency lights	%	0,89%	1,36%	0,67%	0,33%	0,18%	1,07%	0,51%
	Electricity efficiency	TOE	143.821	219.157	107.866	53.933	29.664	172.100	82.749
5	Change of electronic Ballast	%	0,02%	0,02%	0,02%	0,02%	0,03%	0,12%	0,03%
	Electricity efficiency	TOE	2.989	3.287	3.616	3.978	4.376	19.590	
6	Change of Energy Efficiency fridge	%	0,13%	0,14%	0,15%	0,17%	0,18%	0,61%	0,32%
	Electricity efficiency	TOE	20.343	22.442	24.614	26.786	28.958	98.055	51.071
7	Change of Energy Efficiency air con	%	0,13%	0,14%	0,15%	0,17%	0,18%	0,61%	0,32%
	Electricity efficiency	TOE	20.343	22.442	24.614	26.786	28.958	98.055	51.071
8	Change of energy Efficiency TV sets	(%)	0,03%	0,04%	0,05%	0,06%	0,08%	3,43%	2,07%
	Electricity efficiency	(TOE)	5.411	6.993	8.077	9.322	12.877	552.253	333.314
Total energy efficiency per year		(%)	2,27%	2,78%	2,25%	2,91%	3,76%	9,65%	3,25%
		(TOE)	193.116	274.531	169.011	121.138	105.276	940.921	522.956
Accumulation of Energy efficiency		%	2,27%	5,05%	7,30%	10,21%	13,97%	23,62%	26,87%
		TOE	193.116	467.647	636.657	757.796	863.071	1.803.993	2.326.949

5 PROCEDURES AND ARRANGEMENT IN INVESTMENT

5.1 Procedures and Arrangement of Business Licencing in Geothermal

Geothermal business process is arranged in stages which include initial survey, appointment of work areas (WKP), exploration tender, feasibility study, exploitation and utilisation.

a. Initial survey includes data collection, analysis and data presentation on geological, geolhysical and geochemical condition, to estimate location, resources and work areas of geothermal.

- Sales promotion in various national or international forums.

b. Governors, Regents, Mayors or other parties may propose a work area for initial survey. work areas based on assessment and analysis of initial survey data and exploration and basic price data as a result of initial work areas survey.

c. Work areas offerd by the Minister, Governor or Regent (Bupati)/ Mayor (Walikota) to business operators are conducted by inviting tenders

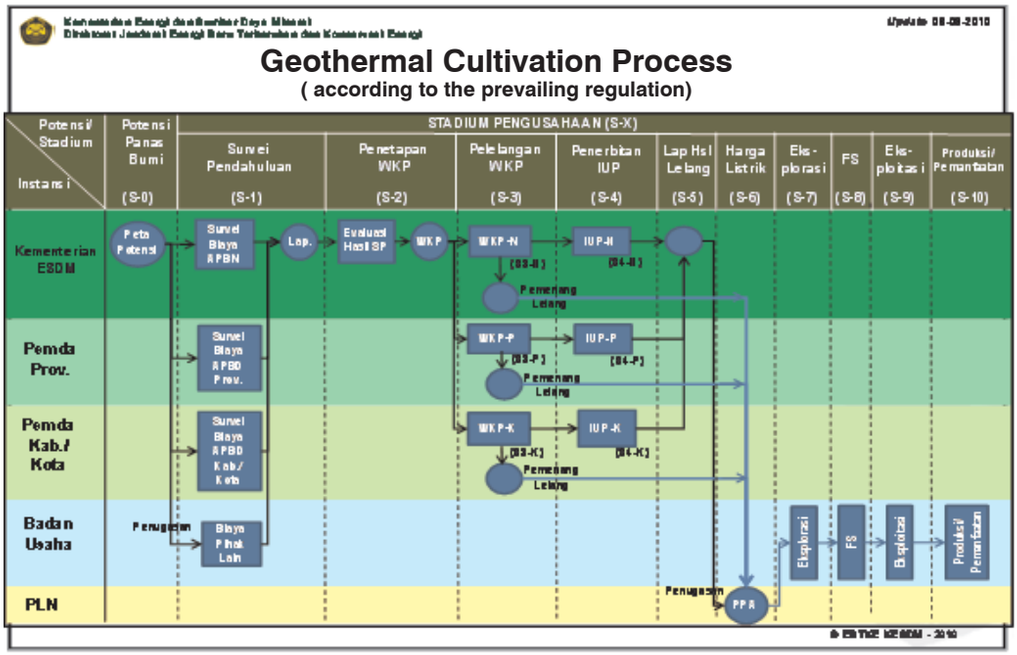


Figure 5.1.
Geothermal Cultivation Process

Implementation of initial survey is coordinated by ESDM Minister, governor, regent (bupati) or mayor (walikota) based on their authority. The minister commonly determines initial survey to other parties by giving offer through:

- Print and elctronic media and the others, or through print or electronic media and others. Work areas coordinator tender set up consists of representatives of ESDM Miinistry, and related agencies. Local government (Pemda) and other represettatives will make assessment on incoming tenders consisting of two stages.

1. The first assessment is based on administrative, technical and financial capability.
   - Administrative evaluation, includes documents such as:
     a. Letter of Application for a licence (IUP) to the Minister, Governor, Regent(Bupati)/Mayor (Walikota) according their authorization
     b. Company Identity
     c. Company Profile
     d. Company Tax Number (NPWP)
     e. Statement of capability of purchase basic data of work areas or bonus
     f. Statement of capability of purchase compensation data except initial survey made by other parties
   - Technical evaluation includes company past performance, qualification of man power, project organization structure, and work plan. Work program evaluation includes:
     a. Business pattern of total project
     b. Exploration schedule,feasibikity study, construction and development and exploration.
     c. Technical plan of exploration, feasibiklity study, constrution and development, exsploitation, and utilization
     d. Electricity pricing
     e. Notice of intend development
     f. Plan of development (POD) of steam field which includes Production well, injection well, and well for development, cost plan
     g. Development capacity
     h. Development stages geothermal electric generation
     i. Capacity of geothermal electric power to be developed
   - Financial Evaluation includes :
     a. Company financial health
     b. Sources of funding for project development
     c. Tender guaranty of minimum 2,5% of exploration budget plan of first year to be submitted by local bank for the Committee Tender of Work Areas
     d. Placement fund of USD 10,000,000 as guaranty for implementation exploration in Government Bank for 2 standard exploration wells or exploitation in:
        - an escrow account on behalf of the company, Minister, Governor, or Regent as assignedbased on finance regulations.
        - Standby loan
        - Uunderwritten credit facility

2. The second evaluation based on steam price or The lowest electric power price related to technical evaluation of work performance and financial of first stage evaluation.

d. Exploration includes geological, geophysical, geochemical research, drilling test, and drilling well expoloration to obtain and add information on geological condition to discover estimate geothermal potential.

e. Feasibikity study means business in geothermal mining to obtain detail information all aspects related to determine feasibility business in geothermal mining, including drilling, well delneation or study of total reserve for exploitation. The studi includes:
   - Decision of feasible mining reserve in all Work Areas
   - The application of appropriate technology for exploiration and steam capture from production well
   - Location of production well
   - Plan of production well and injection
   - Plan of tubing in production well
   - Plan of short and long term production capacity
   - Electric power generationsystem and/or direct use system
   - Conservation and geothermal power sustainability
   - Plan of work health and safety an environment protection of geothermal mining.
   - Post mining plan

f. Exploitation is a series of operations in work areas including well drilling, development and well reinjection, fields facilities and production operations of geothermal energy.

g. Geothermal energy can be utilized direcly or indirectly. Direct use is geothermal fluid for non-electric purposes, both for the need of the public and the operator. Whereas indirect use is for electric power generation, both for the need of the public and the operator.

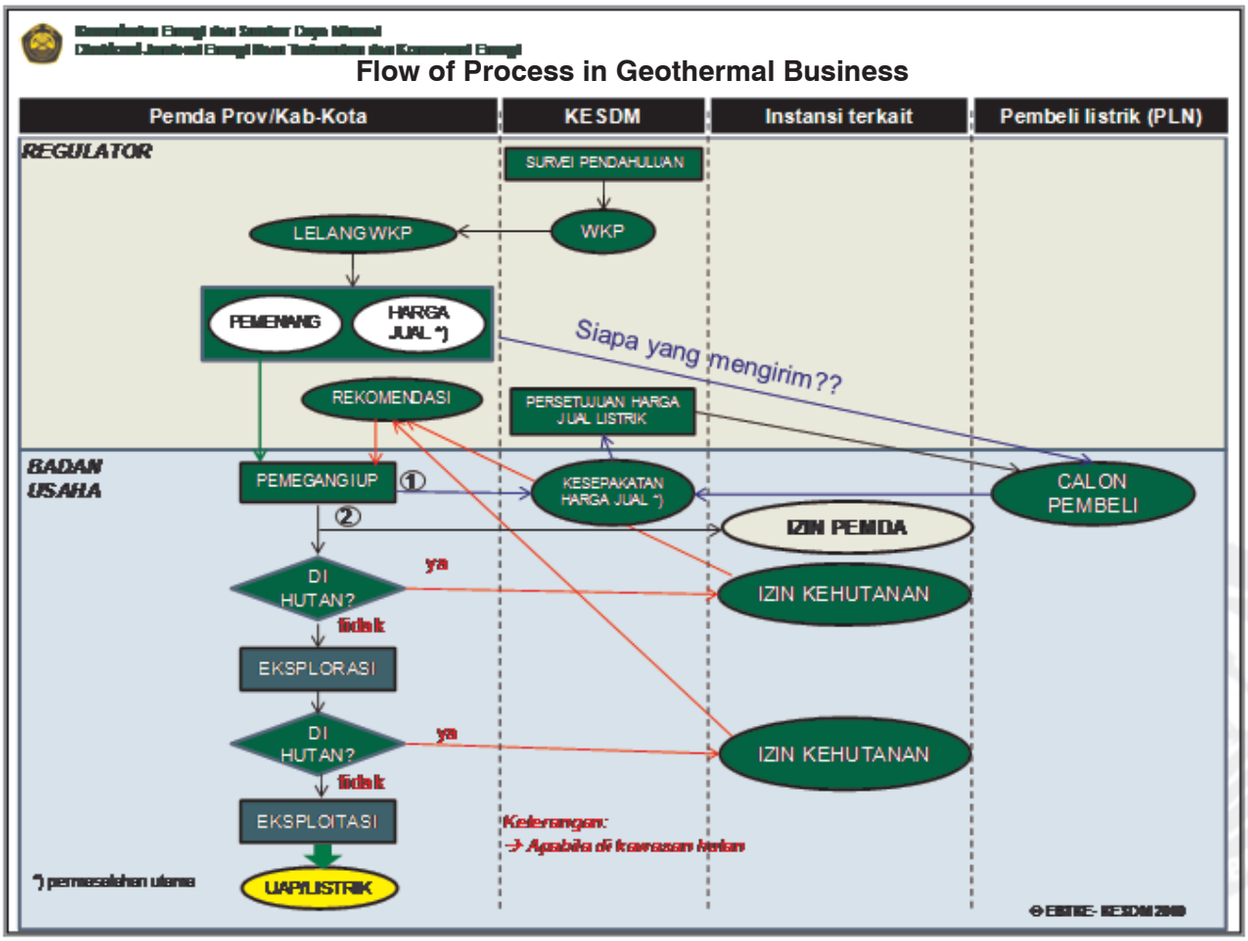


Figure 5.2.
Flow of Process in Geothermal Business

5.2 Procedures and Arrangement of Business Licencing in Biofuels

Procedures and arrangement of licencing in biofuel business are conducted as follows :

1. Business operators apply for a licence to The ESDM Minister through the Director General of New and Renewable Energy and Conservation (EBTKE) completed with administrive and technical requirements. The application will be followed up for consideration. Should the requirements uncompleted, the application will be returned. Another application may be made for further process.
2. An assessment will be made by the Directorat General of EBTKE upon administrative and technical requirements.
3. Business operators should give presentation for claification of data provided in administrative and technical requirements and performance of the company.
4. Location observation is needed to check and verify administrative data and information as part of business plan.
5. The Directorate General of EBTKE finalise verification and investigation for approval (or refusal) and provision of business licence.
6. On behalf of the ESDM Minister, the Directorate General of EBTKE will present business licence for up to 20 years fot geothermal business ventures.

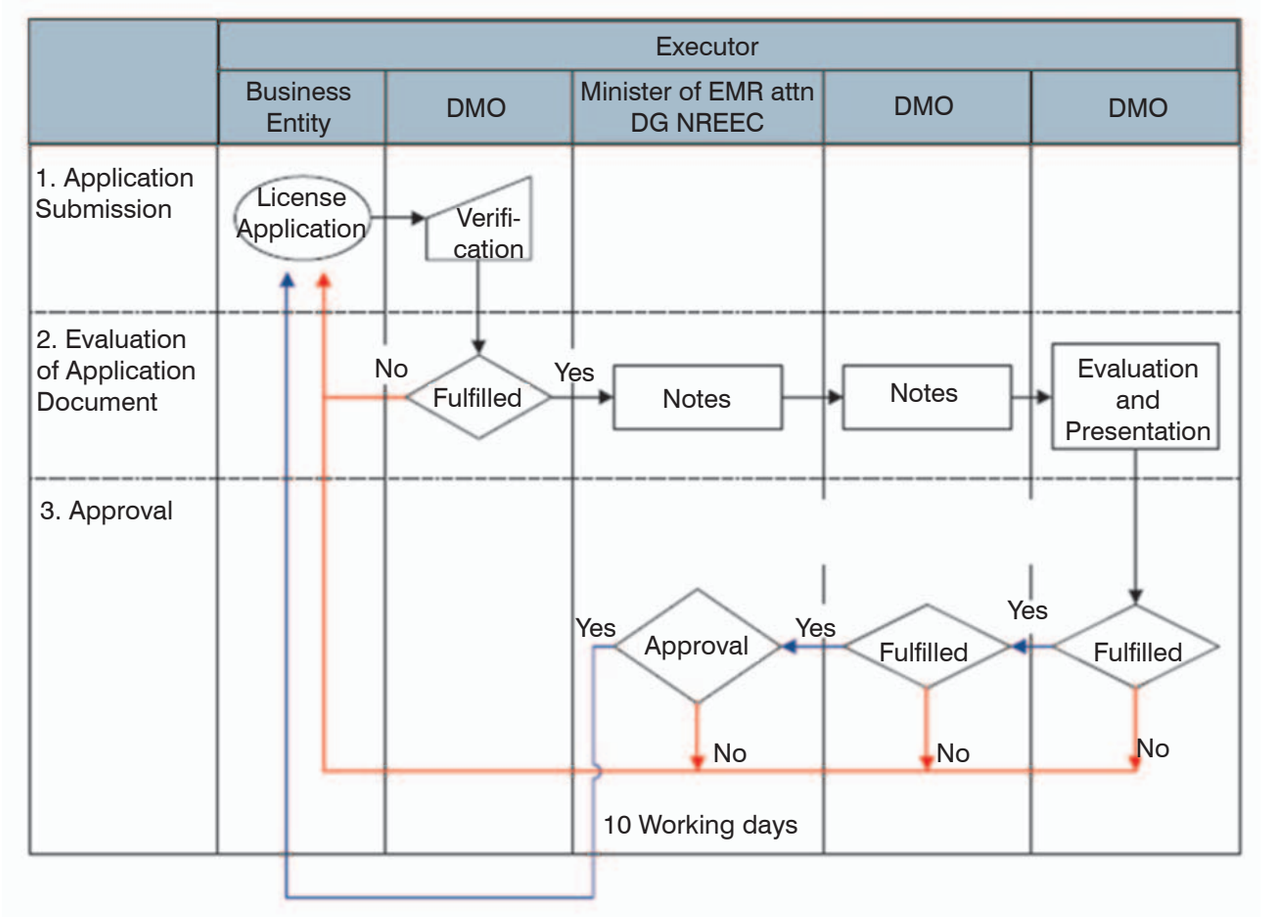


Figure 5.3.
Procedures and Issues of Business Licencing

Procedures and Arrangement of Business Licencing in Biofuels

Administrative requirement :

- Certificate of company establishment inluding lines of business in energy authorized by agency concerne
- Company Profile
- Company Tax Number NPWP
- Letter of Company Registration TDP
- Letter of Current Company Domicile
- Letter of Company Capability to comply with law and regulations

Technical requirements :

- Raw materials sources of biofuel as alternative fuel For business
- Standars and quality (specifications) of biofuel as alternative fuel for trade
- Name and brand name of biofuel as alternative fuel for retail sale;
- Information on business feasibility;
- Written statement on capability of supply of biofuels as alternativie fuels;
- Written statement on capability To complay with aspects of work health and safety and environment management;

Requirements of Business Operators

On behalf of ESDM Ministry, the Director General for EBT gives written notice to buisiness operators that do not carry out biofuel operations:

- Operators should be responsible to supply sale of biofuels to agents and end users with standard and quality (specifications) as required;
- Set biofuels prices at economically appropriate level;
- Provision of facilities and equipments for operations of Biofuelas appropriate alternative fuels;
- Responsible for accuracy and system use of equipments, and standard in compliance with regulations;
- Application of brandnames of biofuel for retail trade;
- Primary supply for domestic demand;;
- Submission of reports to the Director General EBT on implementation of business in biofuel as alternative fuels including retail prices, once every 3 months, or as needed.

Sanctions

Temporary licence of biofuels refining (Pasal 1266 KUH Perdata), could be cancelled if:

- the Directr General of EBT (for ESDM Ministry) notices to business operators for violations on one of requirements provided in the licence
- Direktur Jenderal atas nama Menteri memberikan teguran tertulis kepada Badan Usaha Pemegang Izin Usaha Niaga Bahan Bakar Minyak yang tidak melaksanakan kewajiban penggunaan Bahan Bakar Nabati (Biofuel) sebagai Bahan Bakar Lain

Format of letter of licencing for application of business in biofuels as seen below..

Company letterhead

Letter number :
Enclosure : 1
Subject : Application of business licence in biofuel as alternative fuel

Excellency,
Minister, Eenergy and Mineral Resources
for Director General for New and Renewable Energy and Conservation
Jl. H.R. Rasuna Said Kav. B5 Kuningan
Jakarta 12910

Dear Sirs/ Madam,
With reference to ESDM Ministerial Regulation No 32 of 2008, dated 26 September 2008, concerning Supply, Utilization, and Business in Biofuel as Alternative Fuel, we are pleased to apply for Business Licence in Biofuel as Alternative Fuel with details information as follows :

1. Name of company :
2. Director :
3. Lines of business :
4. Office address :
5. Factory address :

Attached please find :

A. Adminstrative data

a. Certificate of Company Establishment as approved by authorize agencies
b. Company Profile
c. Company Tax Number (NPWP);
d. Letter of Registration (TDP)
e. Current Letter of Company Domicile
f. Letter of Committment to comply current law and regulations
g. Letter of Committment and Readiness for Inspection by Director General of New and Renewable Energy and Conservation

B. Technical Data

a. Sources of raw materials of biofuel as alternative fuel for business
b. Standard and quality (specifications) of biofuel as alternative fuel for trade
c. Name and brand name of biofuel as alternative fuel for retail sale
d. Information on Feasibility in Business
e. Letter of capability to supply biofuel as alternative fuel
f. Letter of capability to comply with aspects of work safety and health and environment management

Looking forwards to Excellency attention to the application and thank you for the cooperation.

Yours sincerely,

…….
Director.....

5.3 Procedures and Arrangement of Business Licencing in Various Renewable Energy for Electric Generation

Business mechanism in renewable energy for electricity generation is arranged based on regulations for electric power. Purchase of electric power and renewable energy produced by private sector is carried out by directb tender based on Government Regulation No 10 of 1989, on Supply and Use of Electric Power, as modified by Government Ragulation No 03 of 2005 and Government Regulation No 26 of 2006.

Based on ESDM Ministerial Regulation No 01 of 2006, modified by ESDM Ministerial Regulation No 04 of 2007, the process of directr tender begins with purchase proposal of electric power through direct tender to PT PLN (Persero) by cooperatives and other business operators. After proposal evaluation, an initial agreement between two Parties, PT PLN (Persero) then proposes purchase of electric power through direct tender to the Minister via Director General for Electricity and Energy Use, to obtain agreement. After the Minister approval is obtained, PT PLN (Persero) offers a direct tender and PPA negotiation to developer. Then the developer submit application for temporary business licence in electric generation for the public (IUKU) to the ESDM minister. After a Power Purchase Agreement (PPA) between PT PLN (Persero) and developer is given, application of corporate approval should be submitted to BUMN (state enterprise agency) Minister. Agreement of selling price of electric power is submitted to ESDM Minister for approval.

After issuance of temporary IUKU, agreed selling price by EMR (ESDM) Minister, and Corporate Approval by BUMN Minister, PT PLN (Persero) and developer sign a contract of Power Purchase Agreement (PPA). The whole process should be finalised in 110 days. After the signing of the contract the developer submitd applcation for IUKU to ESDM Minister completed with required documents.

Diagram of procedures for direct tender of electric power trade, as stipulated in ESDM Ministerial Regulation No 01 of 2006 then modified in ESDM Ministerial Regulation No 04 of 2007), as seen in the figure below:

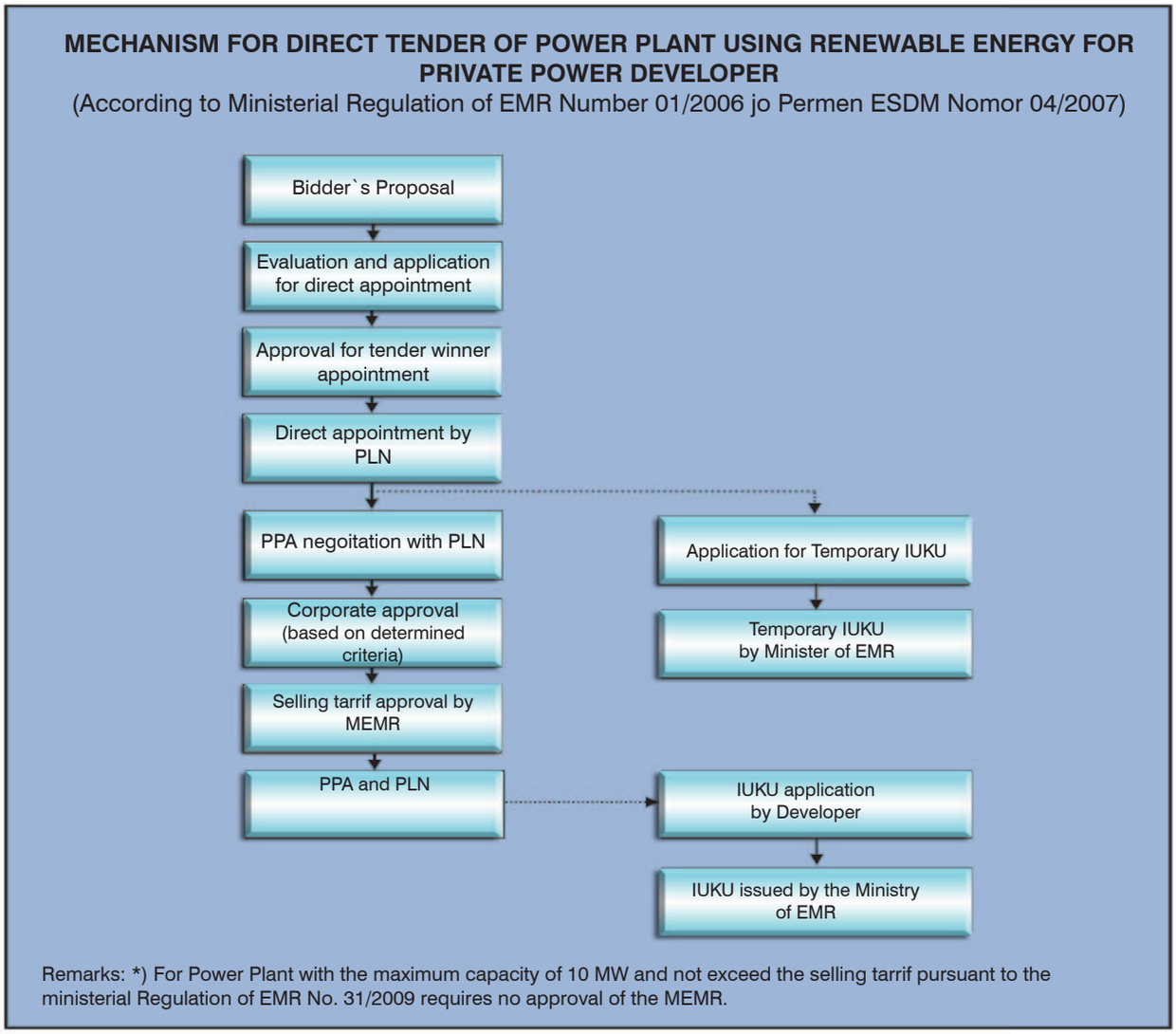


Figure 5.4.
Direct Tender Procedures for Private Sectors

Procedures of Licence Application

In general, application of Business Licence for Electric Power Generation for the (IUKU) and Business Licence for Electric Generation for Own Needs (IUKS), should be completed with administratve and technical documents. Administrative requirements include:

- Company Identity;
- Company Establishmen Licence;
- Company Profile;
- Tax Number (NPWP);
- Financial closing.

Technical requirements include:

- Feasibility Study;
- Location of installation and situation layout (with figures);
- Single line diagram;
- Types and capacity of business;
- Description (with figures) of areas and Planning of electric power supply;
- Development schedule ;
- Schedule of operations;
- Other Licences dan requirements related to

Procedures and Licencing Arrangement of Various Renewable Energy (for electric power generation)

Current regulations

As stipulated in Section 6 article (14) of Government Regulation Mentioned above, arrangement of licencing is determined by The Minister, Governor or Mayor/Chief of village in his authority. The arrangement licencing for business in electric power is the authority of the Minister, as stipulated by ESDM Ministerial Regulations No 0010/2005 on the arrangement business licencing for electric generation in provincial areas connected to national transmission network as arranged in ESDM Ministerial Regulation mentioned above. Process of business licencing in electric power supply is made through two stages namely issue of temporary IUKU and permanent IUKU.

Temporary IUKU: through regular tender, or direct tender offered by PT PLN (Persero), to operators, are liable to apply for temporary IUKU licence to ESDM Minister. The application should be completed with administrative and technical documents. The administrative documents include:

1. Identity of business operators
2. Company establishmen licence/ certificate;
3. Company Profile;
4. Company Tax Number (NPWP).

Technical requirements include:

1. Initial feasibility study;
2. Types and capacity of generator;
3. Schedule of development;
4. Letter of Appointment (as winner of tender) or direct tender, from PKUK or PIUKU

Process of IUKU issue is given to business operators when they have signed the Power Purchase Agreement in electric power generation and have shown financial closing to develop facilities for electric power generation. As soon as the requirements fullfilled, business operators submit application for IUKU issue to ESDM Minister completed with administrative and technical documents. Administrative documents include:

1. Identity of business operator;
2. Establishment licence of company;
3. Company Profile;
4. Company Tax Number (NPWP);
5. Financial closing

Technical requirements include:

1. Feasibility study;
2. Location of installation and layout (figure situasi);
3. Single line diagram (diagram satu garis);
4. Types and capacity of business operation;
5. Desrcription/layout of areas and Business Plan of Supply of Electric power;
6. Schedule and Plan of development operation;
7. Agreement on selling price of electric power and provision of Network system;
8. Other licences and requirements such as Analysis of Environmental Impact (AMDAL, UKL & UPL), Licence for Building Settlement, Licence for Investment.

Purchase price of renewable electric power (up to 10 MW) by PT. PLN (Persero) from Small and Medium Scale Electric Generator, is arranged in ESDM Ministerial Regulation No 31 of 2009. The arrangement is described as follows :

1) The duty of PT. PLN (Persero) to purchase renewable electric power of up to 10 MW, from small scale government enterprises, private enterprises, cooperatives dan local community firms, in order to secure local electric power supply
2) Purchase price of electric power is arranged as follows:
   a. Rp 656/kWh X F, if connected to medium power current transmission;
   b. Rp 1.004/kWh X F, if connected to low power current transmission.
3) F means incentive element related to location of purchase by PT PLN (Persero) as detailed below:
   a. Jawa and Bali areas, F = 1 ;
   b. Sumatera and Sulawesi areas, F = 1,2;
   c. Kalimantan, Nusa Tenggara Barat, Nusa Tenggara Timur, F = 1,3;
   d. Maluku dan Papua areas , F = 1.5

Format Application of Temporary and Permanent IUKU as shown below

SAMPLE APPLICATION LETTER OF
TEMPORARY LICENCE (IUKU)

Date .....

Our ref : .....
Subject : .....
.....

Excellency
Minister of Energy and Mineral Resources
for Director General for New and Renewable Energy and Conservation
Jl. Gatot Subroto
Jakarta Selatan

With reference to EMR (ESDM) Regulation No. 5, 2005, on Licencing Procedures of Electric Power, of Provincial Networks or National Distribution Networks, we are pleased to apply for a temporary licence in business investment in electricity generation for public interest (IUKU) for sale to PT PLN.

a. Attached please find documents required
b. Certificate of Company Establishment
c. Company Profile
d. Company Tax Number (NPWP)
e. Preliminary Feasibility Study
f. Type and Capacity of Generator and Transmission
g. Schedule of Development
h. Letter of Approval/Appointment as Direct Tender Winner from PKUK or PIUKU as buyer of electricity or transmission hire.

Looking forwards to hearing from Excellency,
we remain,

Yours truly,

..... (name)
CEO of .....

- Copies to : EMR (ESDM) Minister
- Enclosures : 8

Procedures and Licencing Arrangement of Various Renewable Energy (for electric power generation)

FORM FOR IUKU APPLICATION

Number : .....
Enclosure : .....
Subject : application for Public Use Electric Power Business License (IUKU)

HE Minister of energy and Mineral Resources
Attn Director General for Electricity
Jl. H.R. Rasuna Said Blok X-2 Kav 7 & 8 Kuningan
Jakarta

Pursuant to the Regulation of the Minister of Energy and Mineral Resources Number 0010 of 2005 on Licensing Procedure for Cross-Provinces Electric Power Business or National Transmission Grid Connected, we are pleased to submit to Your Excellency an application for Electric Power Business License for Public Use (IUKU) integrated/power generation/ Transmission Business/Distribution Business to meet electric power demand to be sold to PT PLN (Persero)/ PT…/general public/specific customer …*) and complemented by the following document:

a. company establishment deed;
b. profile of the company;
c. Taxpayer Registration Number (NPWP)
d. Funding ability;
e. Feasibility study;
f. Installation location including lay-out (situation figure);
g. Single line diagram
h. Type and capacity of business
i. Description/figure of business area and Electric Power supply Business Plan;
j. Schedule of construction and operation plan;
k. Approval of power selling tariff or grid lease; and
l. Permits and other requirements including among others Environmental Impact Analysis (AMDAL) or Environmental Management Efforts (UKL) and Environmental Monitoring Effort (UPL), Building Construction License, and Capital Investment License issued by the authorized government agencies.

Thank you for Your Excellency's attention.

Applicant
A Duty stamp Rp6,000.00
(sign and be stamped)

full name
Title

CC: HE Minister of energy and Mineral Resources

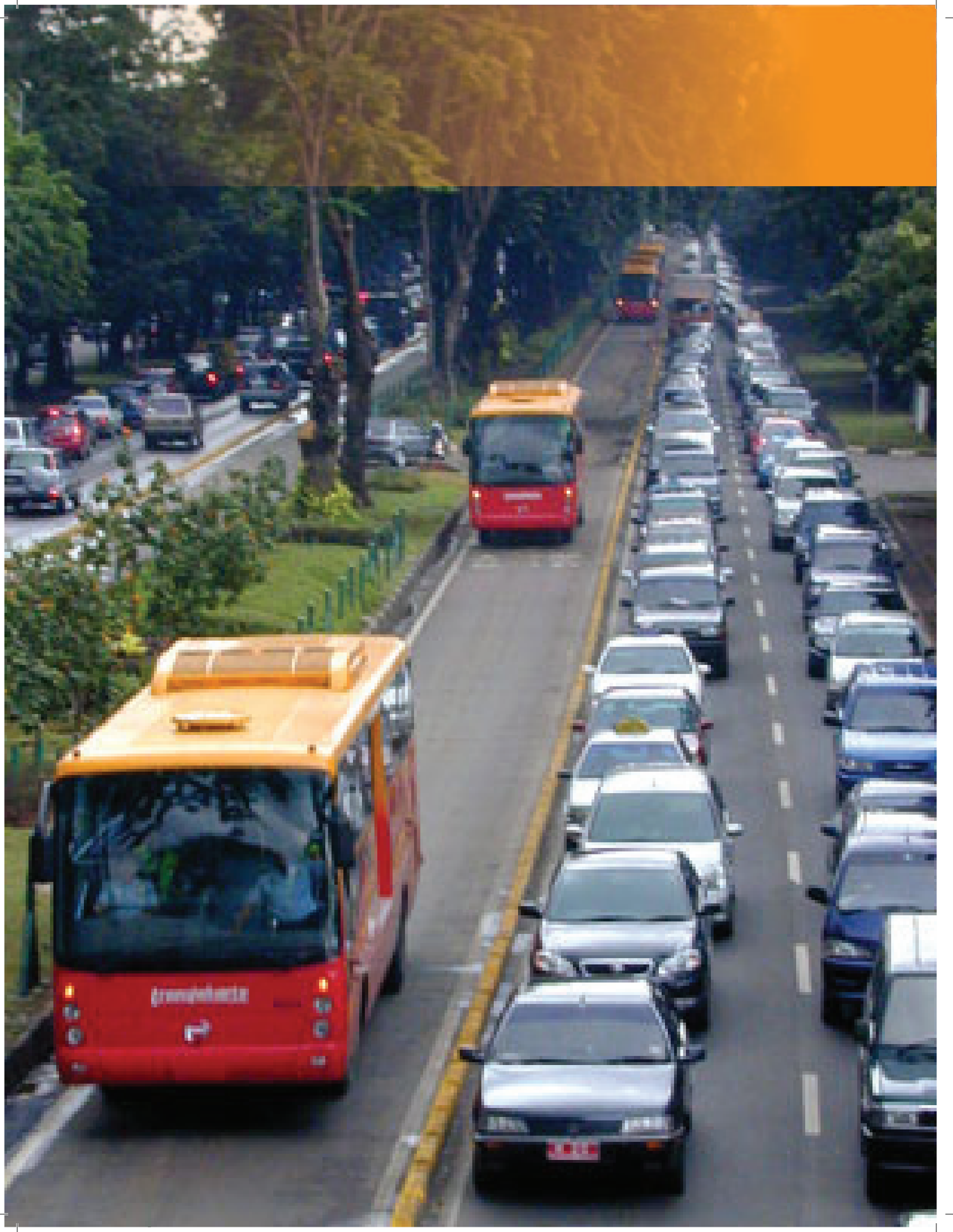
*) please cross-out unnecessary item (s).

The Law No 30 of 2009, on Electric Power, private sector is given the opportunity to make business in electric power supply for both the public as well as their own needs based on business licence in electric power generation. The Law also provides authority to central and local government (governors, mayors, chief of village) to give licence in electric power generation. The Government Regulation No. 3 of 2005 (replacement of Government Regulation No. 10 of 1989) on electric power generation for the public, explains details as follows:

a. Mayors/Chief of village (Bupati/Walikota), give licence for electric power generation (including facilities) in his own areas of authority but not connected to National Transmission Network.

b. Governors give licence for electric power generation (including facilities) in his own areas of authority, which is not connected to National Transmission Network.

c. Minister gives licence for electric power generation (including facilities) in his own areas of authority, which is not connected or connected to National Transmission Network.



MINISTRY OF ENERGY AND MINERAL RESOURCES
REPUBLIC OF INDONESIA

CURRENT ISSUES AND SOLUTIONS

status 4 February 2011

MINISTRY OF ENERGY AND MINERAL RESOURCES
Jakarta, February 2011

CURRENT ISSUES AND SOLUTIONS

Oil and Gas Sub-Sector

Status 4 February 2011

Investment Opportunity	Current Issues	Related Regulations	Stages of Giving Solutions	Explanation
Plan of Work Areas: • Seismic Surveys • Analysis of Natural Resources Economy	Supply and quality of incomplete seismic survey data (as limited government budget for surveys)	EMR (ESDM) Ministerial Regulations No. 028, 2006, concerning Guidelines and Procedures in General Surveys of Upstream Oil and Gas Business	• Revision of Law No. 22, 2001 on Oil and Gas proposing clausul 'Depetion Premium' , or 'using PNBP funding' of Revision of Law No. 20, 1997 on PNBP • Company surveys to be multiplied	As stipulated in Prolegnas of 2011
Production Sharing Contract • Exploration • Production • Field Devellopment	Applixcation of cabotage principles for upstream segment operations	Law No 17 of 2008, on Voyage, parafigure 341s confrimed use of foreign ships needed for offshore upstream operations	Revision of Law No. 17, 2008, on Voyage handed over to Parliament (DPR) by the President	On April 18, 2011, Connection (Perhubungan) Ministerial Regulation, No. PM 48, 2011, was imposed upon, relating to procedures and arrangement of licence for utilization of foreign vessels for other purposes, but excluding transportation of passengers and freight as part of domestic transportation by sea.
	Overlap use of areas, mainly for forestry : • Licence for use of forestry areas • Acceptance of contracs on use forestry areas before Law No. 41, 1999	• Law No. 41, 1999 on Forestry, does not arrange continuous licence in use of forestry areas overlapped with current space arrangement before the said Law above mentioned. • Government Regulations No. 26, 2007, on Space Arrangement.	Coordination among Ministries (EMR, Forestry, Polotics and Security) to revise Law No. 41, 1999 on forestry	Proposal to add new parafigure in Law 41/1999, stating all existing business licences or contract agreement in energy and mining before Law 41/1999 remains in force, until business licence put into effect and requirement to use work areas from Ministry of Forestry.

Oil and Gas Sub-Sector

Investment Opportunity	Current Issues	Related Regulations	Stages of Giving Solutions	Explanation
Oil and gas refinery	Oil and gas refinery needs a big funding but small profit, therefore an incentive is needed	Law 62/ 2008 on income tax in Investment for certain business and/or certain areas	Proposal on additional incentives by EMR Ministry to Ministry of Finance (Results meeting among Ministries have approved the proposal)	Proposal for incentives oil and gas refinery: value added tax, witholding tax, custom duty, local tax and other contributions, was approved in Ministries meeting
Development of Floating Storage Reghasification Unit	Investment in domestic is costly because of distance location supply and demand.	Law No. 62/2008 on income tax for investment in certain business and/or certain areas	Discussed in the meeting of Ministry of Coordinating Economic Affairs for income tax included in Government Regulation No. 62, 2008, and approved as results of the meeting.	

CURRENT ISSUES AND SOLUTIONS

Mineral and Coal Subsector

Investment Opportunity	Current Issues	Related Regulations	Stages of Giving Solutions	Explanation
Development of Mineral Processing and Refining Plant	• Development of mineral processing and refining facilities related to energy supply. • Investors worried about secure supply of ores from local IUP	• Law No 4, 2009 on Mineral and Coal Mining, especially on domestic processing and refining • Governemnt Law No. 23, 2011, on mineral and coal mining, obligation to process and refine in the country in 5 years at the latest after issue of Law No.4, 2009	• To coordinate a meeting with DJK, PLN, EBTKE, Pertamina, DF Migas and Local Govt. • To coordinate and cooperate with Local Government	To implement the plan in 2011
Infrastructure of Coal transportation	• Insufficient infrastructure of coal transportation (railways, coal bulk terminal, etc)	• Law No. 23 on Railways • Law No. 3, 1965, on Traffic and Land Transportation • Law No. 17, 2008 on Sea Voyage • ToGovernment Regulation No. 20, 2010 on Transportation on Waters • ToGovernment Regulation No. 56, 2009, on Railways Operations • Government Regulation No,.27, 2009, on Traffic and Railway Transportation	• To coordinate with related Ministries	To implement the plan in 2011

Mineral and Coal Sub-Sector

Investment Opportunity	Current Issues	Related Regulations	Stages of Giving Solutions	Explanation
Increase added value of coal	• No regulations on development of low rank coal • Insufficient supply of coal as raw materials of coal briquettes.	• Law No. 4, 2009, on Mineral and Coal Mining, especially on obligation on processing and refining operations in the country. • Government Rtegulations No.23, 2010, on business in mineral and coal, obligation on domestic processing and refining in 5 years at the latest after issue of Law No 4, 2009.	• To facilitate the interest of foreign investors in cooperation with holders of IUP coal. • Revision of EMR Regulation No 46/2006, on coal briquettes	Sale prices of coal brequettes not competitive

CURRENT ISSUES AND SOLUTIONS

Electric Power Sub-Sector

Investment Opportunity	Current Issues	Related Regulations	Stages of Giving Solutions	Explanation
Electric generation, Transmission and Main electric relay station	Sale prices of electricity does not reflect economic value	Law of Government Budget and Spending (APBN) No. 10, 2010, on APBN 2011, Ministerial ERM (ESDM) Regulation no. 31/2009, on Purchase Prices of Electricity by PT PLN from Electric Generation Using New and Renewable Energy, Small and Medium Scale or Remaining Electric Power, Ministerial ERM (ESDM) Regulation No. 32/2009, on Primary Prices of Electricity by PT PLN from elecric genaration using geotthermal power	Provision of subsidy and review of Basic Tariff of Electricity	Difference between production cost and sale prices of electricity.
	Privaye Sector/IPP requires government guaranty	Presidential Regulation No. 4, 2010, concerning Assignment of PLN in Fast Track 2, Presidential Regulation No 78, 2010 concerning Government-Private Partnership, PMK 260, 2010 related to Implementation Guidelines of Infrastructure Guaranty of KPS Projects	Proposed to be included in KPS project	
	Public propose compensation of the effct of High Voltage Electric Current/Extra High	EMR (ESDM) Ministerial Decision no. 975K/47/ MPE/1999, related to use of land for High Distribution	Regulation (RPP) is on Supply and Use of Electric Power and EMR Regulation on compensation	Harmonisation with Ministry of Legal and Human Rights is plan to finalise in mid 2011
	Supply of land (licence, land price, double land certificaye of ownership)	Law No 41/1999 concerning Forestry, Regulation of Chief BPN (National Center of Land)	Coordination of inter ministries, of State Owned Enterprises, Forestry, EMR (ESDM), BPM, Local Government	Socializing of Regulation on New Free Land, will be implemented 2011
	Guaranty of Primary Energy for Eelectric Generation	Obligation of Domestic Market (DMO) of Coal and Gas	Coordination of PLN, PGN, Pertamina, Minerba, EBTKE (Pabum) and Migas	

New and Renewable Energy Sub-sector

Investment Opportunity	Current Issues	Related Regulations	Stages of Giving Solutions	Explanation
Geothermal	1. Prices of geothermal power	Law No. 27/2003, Law ano. 30/2007, Law No. 30/2009, EMR Ministerial Regulations No. 32/ 2009, EMR Ministerial Regulations No. 02/ 2011	Prices of geothermal power as decided in tender (WKP) based on ERM Minjisterial Regulations No. 02/2011, on assignment to PT PLN to purchase power from Geothermal Electric Power and primary purchase prices by PT PLN from Geothermal Electric Power	
	2. Geothermal potential available in forest conservation	Law No 41/1999, Government Regulation No. 68/1998	Awaiting revision of Government Regulations No. 68, 1998, on natural reserve area and natural sustainable areas to include geothermal subject as part of environment services. Awaiting amendment of Law No. 27, 2003, not to include geothermal as mining operations.	
Biofuels (BBN)	Provision of incentives to BBN business operators	Government Regulations No. 1, 2007; Finance Ministerial Regulations No. 21, 2010; EMR Ministerial Regulations No. 0219 K/12/MEM/2010; Finance Ministerial Regulations No.215/ PMK.03/2010; EMR Ministerial Regulations No. 32, 2009	To rivise EMR Ministerial Regulations No.0219/K/12/ MEM/20100	Ministry of Agriculture; Ministry of Finance
Energy conservation	No banking institutions is interested in funding energy efficiency project.	Law No 30, 2007 on Energy, Government Regulations No.70, 2009 on Energy Conservation	Capacity Building to increase knowledge on energy efficiency	Energy Conservation
Nuclear energy	No government policy and regulations to implement development project of Nuclear Electric Generation	• UU 10/1997, Law No 10, 1997 • UU 30/2007, Law No 30m 2007 • UU 17/2007, Law No 17, 2007 • PP 5/2006. Government Regulation No 5, 2006 • Government Regulation No.43, 2006, on licence for nuclear ractor. • Government Regulation No. 5, 2010 to implement feasibilty study on nuclear electric generation	To plan policy and regulation to implement development of nuclear electric generation	

MINISTRY OF ENERGY AND MINERAL RESOURCES
REPUBLIC OF INDONESIA

ENCLOSURE OF INVESTMENT ISSUES IN EMR SECTOR OF 2011

Status 4 February 2011

MINISTRY OF ENERGY AND MINERAL RESOURCES
Jakarta, February 2011

ENCLOSURE OF INVESTMENT ISSUES IN EMR SECTOR OF 2011

Status 4 February 2011

Oil and Gas Sub-Sector

No	Issues	Explanation
1.	Unavailability and incomplete seismic survey data because government budget for seismic survey is limited.	• Investors are less interested in the offer of oil and gas work areas, possibly because of insufficient quantity and quality of data (G&G) that supports the offer. • EMR (ESDM) Ministerial Regulations No. 028 of 2006, on Guidelines and Procedures of General Surveys in Oil and Gas Upstream Operations, stipulates that in order to support offer of oil and gas work areas, it is important to set up business agencies to carry out the general surveys. • General surveys by business agencies under licence of the EMR (ESDM) Minister, should be made after the agencies write application for a licence to the Director General for Oil and Gas. • To increase the quantity and quality of data that supports the offer of oil and gas work areas considering government limited budget for general surveys, the Minister is excpected to increase the number of agencies to carry out general surveys by providing a faster process of licencing to the agencies. • Considering limited government budget to carry out general surveys, a number of proposals would include the following : - Stipulation on “Depletion Premium” in the revision of Law No. 22, 2001 on oil and gas operations - To revise Law No.20, 1997, on PNBP, that oil and gas subsector is able to use PNBP (of oil and gas)
2	Application of cabotage principles in upstream oil and gas operations	• Law No.17, 2008, on voyage, stipulates that foreign ships are not allowed to transport passengers and/or freights inter islands or inter harbours in Indonesian waters. Foreign ships in domestic operations remain in operations for 3 years since the date application of the said Law • During the 3-year application of Law No. 17, 2008, cabotage principles are not applicable for offshore oil and gas operations because of unavailability/insufficiency of Indonesia offshore vessels that supports oil and gas operations. • The insufficiency of the vessels will effect upstream oil and gas operations, especially in offshore areas. • EMR (ESDM) Ministry has made coordination with Communication Ministry (KeMenhub) to revise Law No. 17, 2008 adding new clause/parafigure that foreign ships with certain specifications remain in operations, as Indonesia ships not yet available. • Revision of Law No 17, 2008 are handed over to the Congress (DPR) by the President and put in priority of Prolegnas 2011. • In the Work Meeting of March 10, 2011, Commission V of the Parliament (DPR) requested the governmeht to change regulations on April 2011 at the latest, related to cabotage principles concerning special utilization of vessels for offshore oil and gas operations, not for other purposes such as passengers and freights. In addition, the Commission is agreeable to further study on whether to amend Law No. 17, 2008, concerning Voyage.

Oil and Gas Sub-Sector

No	Issues	Explanation
		• On April 4, 2011, Government Regulation No, 22, 2011, was enforced, concerning amendment of Government Regulation No. 20, 2010, concrening Freight on Waters. • On April 18, 2011, Connection (Perhubungan) Ministerial Regulation, No. PM 48, 2011, was imposed upon, relating to procedures and arrangement of licence for utilization of foreign vessels for other purposes, but excluding transportation of passengers and freight as part of domestic transportation by sea.
3	Overlap use of areas, especially forest areas	• Law No 41, 1999 on Forestry arranges the use of forest areas, except reserve areas and forest zone of national park . • A number of approved work contracts in oil and gas, before enforcement of Law No 41, 1999, are not able to carry out operations because their work areas (formerly not forbidden forest areas) included in the said Law. • A number of work contracts are delayed in operations, such as: a. Conoco Phillips (Warim work contract) in Taman Nasional Lorenz (as a protected national park); b. PT Chevron Pacific Indonesia (fields in Pematang Bow, Aman, Bekasap South) in Suaka Margasatwa Balai Raja (for animal reserve); c. PT BOB Bumi Siak Pusako-Pertyamina Hulu (CPP work contract) in the areas of Suaka Margasatwa Danau Pulau Besar/Danau Bawah (for animal reserve); d. Pertamina EP Sangatta (Sangatta field) in Taman Nasional Kutai (as a protected national park). • Result of RAKORSUS (special meetings) in POLHUKAM, to amend Law No. 41, 1999, to organize Tim Lintas Sectoral (Inter Sectoral Team) for the arrangement of draft Perpu until February 2011. • As a follow-up of EMR (ESDM) meeting (24 January 2011), proposal draft of Law No. 41, 2004 to include a clause that all business licence/work cooperation contracts, concerning existing oil and gas operations (before Law No. 41, 1999, as amended in Law No. 41, 2004), remains valid until termination of contract and liable for use of work areas from the Ministry of Forestry.

ENCLOSURE OF INVESTMENT ISSUES IN EMR SECTOR OF 2011

Oil and Gas Sub-Sector

No	Issues	Explanation
4	Incentives for Oil Refinery	• Increase of domestic fuel demand and increase of imported fuel is because of no new refineries. • Investors are reluctant to develop new refineries because of big investment, high risks and marginal economy. • The government issued Government Regulation No 62, 2008, on income tax in investment for certain business and/or certain areas: a. Deduction of net income (30%) of total investment is due for 6 years b. Depreciation and amortization is accelerated c. Imposition of value added tax (PPh) on dividend is paid to Foreign Tax (10%) or tariff tax treaty d. Compensation of loss, of over 5 years but less than 10 years provided with certain requirements, remains uneconomical • An additional incentives are proposed, as stated in EMR (ESDM) Letter to Finance Minister No.2843/14/MEM.M/2009 of 10 June 2009, concerning 'Proposal for Additional Incentives for Development of Oil Refineries', such as: a. Capital goods - Free of custom duties or paid by the government - Custom duties are borne by the government if capital goods are imported b. Catalist equipment and spareparts are free from custom duties - Value added tax are borne by the government The proposals of incentives are discussed at inter-ministries meeting and approved the following points: value added tax, withholding tax, custom duty, local tax and other contributions

Oil and Gas Sub-Sector

No	Issues	Explanation
5	Incentives for development of floating storage regasification unit (FSRU)	• Gas fields are commonly located far away from consumers. The use of distribution pipes are unable to meet increasing demand of gas. Liquid natural gas (LNG – frozen gas below 1630C) distribution by vessels is more easily carried out for distant consumer areas. To receive LNG, a receiving gas terminal should be built such as FSRU. FSRU is appropriate for use to meet demand of gas in remote areas. • Investment to develop FSRU is big and mostly use materials from foreign sources (not available in Indonesia). A big investment will certainly effect prices of gas. To decrease investment cost by providing fiscal facilities, will help decrease gas prices for end users. • Development of FSRU will increase domestic use of gas and increase diversification of national energy as well as energy security. • To realize development of FSRU an investment incentive is needed. A proposal for investment incentive (for FSRU) is made by ammendment of Goverment Regulation No.62, 2008, and discussed in Coordinating Ministry for Economic Affairs.

ENCLOSURE OF INVESTMENT ISSUES IN EMR SECTOR OF 2011

Electric Generation Subsector

No	Issues	Explanation
1	Prices of electricity does not reflect economic value	• Current prices of (PLN) electricity is USD 0.824 (8.24 USD cents) per kWH or around IDR735 per kWH, whereas prooduction cost is about IDR1,008 per kWH. • With reference to negotiation between PT PLN and private operators concerning electricity prices, PT PLN tends to stress on low prices (possibly below PLN prices) in order not to exceed basic subsidy given by the government. As a result, pay back period of investment by private sector becomes longer. Eventually, investment in electric generation (and supply of electric power) is not interesting to private sectors. • It is important to differenciate between tariff and sale price. Investors are complaining about uneconomical prices of electric power. A recommendation is suggested that electric power tariff should be adapted to sale prices, especially for well off consumers.
2	Private sectors/Independent Power Producer needs government guaranty	• Investment for electric generation is estimated around IDR80 trillions per year. On the other hand subsidy given to cover operation costs does not make up funding for investment • Acceleration program for 10,000MW electric generation (Phase I) by PLN is mostly funded by loan. Since its launch in 2006, PLN has to make a big loan which is obtained from selling international obligation, and loan from national and international banks. Whereas PLN makes big loans, PLN income has not been well structured, as a result PLN financial statement is not accountable nor satisfactory • Cooperation between PLN and private sectors in electric generation is based on risks that should be borne by both parties in order to secure supply of electricity. To enable PLN take the risks, PLN needs business support from the government because PLN tariff is below economic value. • At present there are three types of government guarantee, acceleration of electric generation Phase 1, Phase 2 and Government-Private Cooperation (KPS) • Director General for Electricity and Energy Development (LPE) in his Notes No. 72/20/600.2/2011, dated 6 January 2011, handed over an EMR (ESDM) letter to Coordinating Ministry for Economic Affairs (Menko Perekonomian), which contains IPP Project of B to B scheme to be included in KPS Project, as a government guaranty.

Electric Generation Subsector

No	Issues	Explanation
3	People demand compensation for the effect of High Voltage Electric Distribution – HVED (SUTT/SUTET)	• Plants grown below HVED (SUTET) areas, high buildings (houses) and Communication Towers, is a potential effect to distribution of electricity. PT PLN, therefore, needs to buy (make free) areas around/below the HVED. • Presently, PT PLN is only able to give compensation, as stipulated in EMR (ESDM) Ministerial Decision No 975, 1999. The compensation is at maximum of 10% of Sale Value of Taxed Object (NJOP), calculated as (10% X NJOP). The compensation is considered not appropriate (nor human). The government, therefore, is planning to give a better compensation for areas tresspassed by HVED. • The government, at the present time, is making a regulation (RPP) relating to business and use of electricity and an EMR (ESDM) Ministerial Regulation concerning compensation.
4	Supply of Land Areas (Licencing, Prices, Double Land Ownersip)	• Licencing process in supply of land areas, by Ministry of Forestry, is too long, as a result it brings effect to development of electric generation. • Agreement of land prices by land owners often arrives in a deadlock (no compromise) and that effects the development of electric generation. • It is important to organize a coordination meeting of inter Ministries comprising of Ministry of State Owned Enterprises (BUMN), EMR (ESDM), National Land Agency (BPN) and Regional Government (Pemda), to set up a regulation about mechanism to free land areas. • A socialization of Regulation on Free Land Areas to the public should be carried out in the near future
5	A guaranty for Primary Energy Supply for Electric Generation	• As no continous guaranty of primary energy supply (coal and gas) for electric generation, resulting in effect to the operations of electric generation such as steam electric generation using coal (PLTU Batubara and high price gas fuels for steam electric generation using gas (PLTGU), because of no supply of gas. • It is important to make a coordination of a number of with a number of agencies including PLN, PGN (for gas), Pertamina (for oil fuels), Minerba (for coal), EBTKE or Pabum (for new and renewable energy) and Migas (for oil and gas fuels), to find a solution on energy sale prices and an obligation for domestic market (DMO) for gas and coal.

ENCLOSURE OF INVESTMENT ISSUES IN EMR SECTOR OF 2011

Mineral and Coal Subsector

No	Issues	Explanation
1	Development of Mineral Processing and Refining Units a. Supply of Energy	• Law No. 4, 2009, on Mineral and Coal Mining, parafigure 102, stipulates an obligation to process and refine mineral and coal in the country, effective the date of issue of the Law. Presently total production of ores have not been processed in the refining unit available in the country, because of limited processing units. It is therefore suggested that new processing units be set up, in work contract areas and in IUP areas over the country. • To operate a processing plant needs a lot of electric power. A number of investors are interested in developing processing and refining plants in several areas, but blocked by supply of electric power. Whereas the investors are not able to set up electric power plant, the government is expected to provide facilities supply of electric power in the areas of processing (refining) units. • An Assessment on Development Plan of Processing Plant has been made for bauxit in West Kalimantan, nickel ores in Southeast Sulawesi, gold and copper in Papua. As a follow up, socialisation on locations of plants in local areas, should be made in cooperation with investors, local government (Pemda) the Directorate General for Electricity, PLN, Pertamina, Directorate General for New and Renewable Energy and Conservation, Directorate General for Oil and Gas and Pemda in 2011, to come to a solution for supply of energy, prior to the deadline stated in Law No 4, 2009
	b. Investors are worried about supply of ores from local IUP contractors	• There are a lot of metal commodities of IUP contractors around the country. All metal ores are to be processed and refined in the country so that they become end products for export. • An EMR (ESDM) Ministerial Regulation No 25, 2008 concerning policy and procedures on limitation of national mineral products, has been issued • EMR (ESDM) Regulations No 34, 2009, concerning limitation on supply of mineral and coal for domestic demand has been issued. • EMR (ESDM) Regulation No. 17, 2010 concerning the setting of primary sale prices of mineral and coal has been issued

Mineral and Coal Subsector

No	Issues	Explanation
2	Insufficient Infrastructure of Coal Transportation in Sumatera and Kalimantan (Railway tracks fo coal transportation)	• Development Project of Railway Transportation and Coal Bulk Terminal is carried out by PT Bukit Asam Transpacific Railway (PT BATR), a joint venture of PTBA (10%) and PT Transpacific railway Infrastructure (80%) and PT China Railway Engineering Corporation (10%) established in 6 August 2008 • By 2014, a target of total PTBA coal (22.7 million tons per year) will be transported by PT KA (state owned railway company) from Tanjung Enim to tarahan Terminal and Kertapati Quay. • Provincial Government of Central Kalimantan and National Planning Agency (Bappenas) are planning to carry out Development Project of Coal Transportation Purukcahu-Bangkuang under scheme between government and private sector (Public Private Partnership - PPP) of 185 km. • Investment value of Purukcahu-Bangkuang railway project estimated at USD1.5 billion initially but now becomes USD2.2 billion. This is due to inclusion of funding for harbour development and water transportation around the project, • Process Exemption of land for the project has been done without problems, except licence use of areas from Ministry of Forestry. • Former Team Work (of Ministry for Internal Affairs) should be reorganized to finalise development of railway project in cooperation with local government (Pemda).
3	No regulation available relating to development of low rank coal	• To decide regulation that arrange production sharing value for the government from low rank coal mining. • To encourage business in low rank coal in the country to meet demand of energy by giving incentives, similar to production sharing value in PKP2B for low rank coal mining. • To increase diversification use of low rank coal by direct combustion, development of coal briqwuettes, coal liquefaction, coal gasification, coal upgrading, taking care of the environment. • To give incentives to investors (for coal processing and refining) to develop UBC, coal liquefaction and gasification, of which the result to be purchase by the government.
	Insuffiucient supply of coal as raw materials for coal brequettes	• EMR (ESDM) Ministerial Regulation No 34, 2009, concerning priority supply of mineral and coal for domestic demand. • To revise composition of domestic sale and export, presently 28 by 72, by stages

ENCLOSURE OF INVESTMENT ISSUES IN EMR SECTOR OF 2011

New and Renewable Energy and Conservation Sub Sector

No	Issues	Explanation
1	Based on Law No 41, 1999 concerning Forestry, and Governement Regulation No. 68, 1998, concerning Protected Natural Areas and Sustainable Natural Areas • Prohibition of geothermal operations in reserve forestry areas • Allowance for geothermal operations in protected forestry areas by licence land use which takes uncertain time	• Inventory of geothermal potential in Indonesia, of 70% located in forest areas, consisting of : a. Distribution potential by Geological Agency: protected forest areas 17%, conservation forest areas 16% b. Potential capacity: protected forest areas 23%, conservation forest areas 21% • EMR (ESDM) Letter No. 6980/20/MEM.E/2010, of 2 November 2010, concerning Acceleration Process of Licence Land Use in Forest Areas for Geothermal Electric Generation Project (PLTP) to Ministry of Forestry • Treply Letter of Ministry of Forestry No. S.600/Menhut-II/2010, of 22 November 2010, that Ministry of Forestry is making revision of Forestry Ministerial Regulation No. P.43/Menhut-II/2008, of 10 July 2008, concerning use of forest other than forestry activities • Licence Land Use needs recommendation from the Governor/ Regent/ Mayor, in accordance to his authority, which takes uncertain time • A coordination has been made between Director General for EBTKE and Directorate General fo Forest Protection and Natural Conservation (PHKA) to revise Government Regulation No. 68, 1998, that geothermal operations as environment services because of renewable enrgy should take care of the environment
2	No Government Policy and Regulation for Implementation of Nuclear Electric Generation (PLTN)	• Implementation of PLTN project development needs a long period of tome, it is important to require government policy for the omplementatyion of the project. • Law no 10/1997, concerning electric generation needs support on use of nuclear energy for peace use and give benefit for wellfare of the people • Urgent issue of regulation on government policy in implementation of development of PLTN • Regulation on supporting industries for development of PLTN project.

New and Renewable Energy and Conservation Sub Sector

No	Issues	Explanation
3	Provision of Incentives for Biofuels Producer	• In addition to provision of incentives to biofuels producer, based on Finance Ministry Regulations No. 215/PMK.03/2010 comcerning value added tax borne by the government for oil fuels, biofuels, LPG container of 3 kg, Pertamina (on behalf of the government) has received a subsidy for every 1 liter of biofuels mixed up to oilfuels. • Issue relating to the amount of subsidy received by biofuels producer is based on price index of biofuels which is the result of biofuels decided by pricing team. The amount of biofuels price index for bioethanol (as published by Argus for ethanol FOB Thailand) similar to the amount based on EMR (ESDM) Ministerial Decision No. 0219K/12/MEM/2010, has not been considered suitable for production cost of ethanol produced in Indonesia, it also excludes transportation cost (from the producer to the consumers).. • Revision of EMR (ESDM) Ministerial Decision No 0219K/12/MEM/2010 under discussion, resulting in the setting of biofuels price index to include production cost and transportation
4	Provision of Incentives for Energy Conservation	• Bank has not been convinced on the cost and benefit of green project including efficiency project and energy conservation, resulting in reluctance of the bank to provide funding. • ESCO is not yet able to give guaranty for energy efficiency obtained from energy efficiency and conservation. This is because competence of ESCO manpower is not satisfactory. Besides, ESCO domestic financial condition is relatively low. • Activities of capacity building to increase understanding on energy efficiency and conservation to the bank ws done in March 2011. To increase competence of ESCO manpower, a standard of competence for energy auditor will published based on EMR (ESDM) Regulation. • Ministry of ESDM in cooperation with Bank Indonesia, Fiscal Policy Agency and Center of Investment is assessing incentive scheme applicable for energy efficiency and conservation. • Ministry of ESDM is setting pilot project funding for energy efficiency and conservation in which the government may provide incentives, energy audit and feasibility study to be imolemented by ESCO in the country. To arrive at energy efficiency including capacity building activities, ESCO may cooperate with foreign ESCO.

For further information, please contact the following government institutions:

- **Directorate General for Oil and Gas :**
  Jl. H.R Rasuna Said Kav. B-5 Kuningan Jakarta 12950, Indonesia
  Telephone : 021-5268910 (hunting) ext. 191, 172, 177
  Fax. : 021-5268980
  www.migas.esdm.go.id

- **Directorate General for Electricity :**
  Jl. H.R Rasuna Said Blok. X-2, Kav. 07-08Kuningan Jakarta 12950, Indonesia
  Telephone : 021-5225180
  Fax. : 021-5256064, 5256066
  www.djlpe.esdm.go.id

- **Directorate General for Minerals and Coal :**
  Jl. Prof. Dr. Supomo No. 10 Jakarta
  Telephone : 021-8307577
  www.djmbp.esdm.go.id

- **Directorate General for New and Renewable Energy and Conservation :**
  Jl. Gatot subroto Kav. 49 Jakarta 12950
  Telephone : 021-52602024
  www.ebtke.esdm.go.id