

INDONESIA

(UPDATED 2011)

1. GENERAL INFORMATION

1.1. COUNTRY OVERVIEW

1.1.1. GOVERNMENTAL SYSTEM

As in other democratic countries, the Republic of Indonesia applies the Trias Politica that recognizes the separation of the legislative, executive and judicial bodies. The legislative authority is under the People's Consultative Assembly (MPR) that consists of two bodies namely the Parliament composed of members of political parties (DPR), and the Regional Representative Council (DPD) composed of representatives from each province in Indonesia. Each province is represented by 4 delegates that are elected by the people in the respective region.

The People's Consultative Assembly (MPR) is the highest state institution. Upon the Amendment of the 1945 Constitution, the membership of the MPR starting the period of 1999-2004, was amended to include not only the members of the parliament (DPR) but also the members of the DPD. Formerly the MPR consisted of the parliament members and group representatives. Currently, the MPR has 550 members from the parliament and 128 members from the Regional Representative Council (DPD). The parliament members and the DPD members are elected every five years. Since 2004, the MPR has become a bi-chamber parliament with the DPD as second chamber.

The executive institution is centralized under the president, vice president, and the cabinet of ministers. The cabinet is a presidential cabinet in which the ministers report to the president and do not represent the political parties. Presidential election is also held every five years. Since 2004, president of the Republic of Indonesia is elected through direct election by the people.

The judicial institution - since the reform era and upon the amendment of the 1945 Constitution - is administered by the Supreme Court including the administration of the judges.

1.1.2. GEOGRAPHY AND CLIMATE

Indonesia is one of the largest archipelagos in the world that has 17,508 islands, situated between 6 degrees northern latitude and 11 degrees southern latitude and spreading from 97 degrees to 141 degrees eastern longitude and it is located between two continents – Asia and Australia/Oceania. This strategic position greatly influences the country's culture, social, politics and economy.

Stretching along 3,977 miles between the Indian Ocean and the Pacific Ocean. Indonesia has a total area of 1.9 million square miles (4,92 million square kilometres) including the ocean. The water area is about two-third of total area.

The five large islands of Indonesia are: Sumatra covering 473.606 square km, Java with 132.107 square km, Kalimantan (the third largest island in the world) with an area of 539.460 square km, Sulawesi with 189.216 square km, and Papua with an area of 421.981 square km. Indonesia has 33 provinces (including 2 Special Territories of Nanggroe Aceh Darussalam and Yogyakarta) and one Special Capital Region of Jakarta (DKI).

The islands of Indonesia were formed in the Palaeocene age (70 million years BC); Eocene age (30 million years BC); Oligocene age (25 million years BC), Miocene age (12 million years BC), and Pleistocene age (4 million years BC). The Australian and Pacific tectonic plate have a great effect on the change of the islands. The Australian plate changes slowly with an upward movement into the small plates of the Pacific plate that moves southward. Between these lines, the islands of Indonesia are stretched out.

This makes Indonesia as one of the most changing geological area in the world. There are 400 volcanic mountains – which 100 of them are active- that dot the islands of Indonesia. Every day Indonesia experiences three vibrations, at least one earthquake a day and one volcanic eruption in a year.

Most of the islands are hot and humid throughout the year. Temperature ranges from 27.6° to 36.8° C during the day and from 14.6° to 24.6° C during the night. Humidity ranges from 63% to 83%. Rain falls primarily from December to March, when the winter monsoon dominates. Only western Java and the Lesser Sunda Islands have a dry season, from June to September.

Like in many rainy tropical areas, soils are predominantly infertile in Indonesia because of leaching. However, the soils of Java and adjacent islands such as Bali are more fertile. Soil nutrients are replenished by frequent volcanic eruptions, and the lava's alkalinity is conducive to plant growth. Java alone is home to 112 volcanoes, fifteen of which are still active.

Forests cover more than half of Indonesia's land area, which is mostly mountainous.



Figure 1. Map of Indonesia

1.1.3. DEMOGRAPHY

TABLE 1. POPULATION INFORMATION

	2000	2005	2006	2007	2008	2009	2010*	2006 to 2010
Population (millions)	206.3	220.6	223	224.67	227.34	229.96	237.6	1.3
Population density (inhabitants/km ²)	113.9	121.7	123.1	124.02	125.49	126.94	131.2	
Urban population (% of total)	42	48.1	49.2					
Land Area(1000 km ²)	1811.6							

Source: Statistic Centre Board

* Based on National Census 2010

The results of the 2010 National Population Census also shows that Java and Madura Islands, which accounts for 7% of the total area, is resided by around 57,5% of the population (136 millions), while Maluku and Papua which account for 25% of the total area, are inhabited by 3% of the total population. The population density in other islands are as follow: Sumatera 21%, Sulawesi 7%, Population density of Java is thus around 1034 persons per square kilometres, Bali 690 persons per square kilometres, and Papua 8 person per square

kilometres. Jakarta is the most crowded city with a population density near to 12,978 persons per square kilometres. The largest cities are Jakarta (the capital), Bandung, Surabaya, Semarang, Malang, Surakarta, and Yogyakarta, all of which are in Java, and Medan in Sumatra. The Statistics Indonesia published that the figure of population in 2006 was 222.7 millions, while the number for 2009 was projected to be 231.3 millions and 2010 is 237.6 millions.

According to the UNDP Human Development Report 2007/2008, the life expectancy at birth for all population of Indonesia is 69.7 years (2005) increased from 66.2 years in 2001. The Human Development Index trend of Indonesia is continuously increasing, and the value for 2005 is 0.728 which gives the country a rank of 107th out of 177 countries.

1.1.4. ECONOMIC DATA

Indonesia had an average real gross domestic product (GDP) growth rate of 19.3 percent between 2005 and 2009 and during the period, the rate of poverty was reduced from 15.97 percent of the population to 13.33 percent with a significant improvement of the overall standard of living.

Indonesia Poverty Rate 2005-2010

Year	Poverty rate (%)
2005	15.97
2006	17.75
2007	16.58
2008	15.42
2009	14.15
2010 (as of March)	13.33

TABLE 2. GROSS DOMESTIC PRODUCT (GDP)

	Year					Average ann. growth rate (%)
	2005	2006	2007	2008	2009	2005 to 2009
GDP (millions of current US\$)	292,030	351,497	415,883	521,195	590,889	19.3
GDP (millions of constant 2000 US\$)	184,296	194,434	206,771	219,191	229,155	5.6
GDP per capita (current US\$/capita)	1,328.30	1,578.01	1,843.12	2,280.19	2,551.92	17.8

Source: <http://www.bps.go.id>

1.2. ENERGY INFORMATION

1.2.1. ESTIMATED AVAILABLE ENERGY

In 2009, Indonesia's proven and potential reserves of oil and gas were about 8.00 billion barrels of oil and 159.63 TCF gas (see the following tables). This is a decline of 14% of oil reserves compared to that of 2001. At today's rates production of around one million barrels per day, Indonesia's current oil reserve has a life-time of about 24 years.

Indonesia Oil Reserve (Billion Barrel)

Year	Proven	Potential	Total
2000	5.12	4.49	9
2001	5.1	4.65	9
2002	4.72	5.03	9
2003	4.73	4.4	9
2004	4.3	4.31	8
2005	4.19	4.44	8
2006	4.37	4.56	8
2007	3.99	4.41	8
2008	3.75	4.47	8

2009	4.3	3.7	8
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Source : Directorate General of Oil and Gas

Indonesia Gas Reserve (TSCF)

Year	Proven	Potential	Total
2000	94.75	75.56	170.31
2001	92.1	76.05	168.15
2002	90.3	86.29	176.59
2002	91.17	86.96	178.13
2004	97.81	90.53	188.34
2005	97.26	88.54	185.8
2006	94	93.1	187.1
2007	106	59	165
2008	112.5	57.6	170.1
2009	107.34	52.29	159.63

Source : Directorate General of Oil and Gas

Potential coal resources is shown in Table 6 with the biggest resources located in South Sumatra and East Kalimantan. The export quality coal is mainly found in East Kalimantan, South Kalimantan and Central Kalimantan.

Indonesia Coal Reserve (Million Ton)

Province	Resources					Reserves
	Hypothetic	Inferred	Indicated	Measured	Total	
Banten	5.47	5.75	0	2.09	13.31	0
West Java	0	0	0	0	0	0
Central Java	0	0.82	0	0	0.82	0
East Java	0	0.08	0	0	0.08	0
Nangroe Aceh Darussalam	0	346.35	13.4	90.4	450.15	0
North Sumatera	0	7	0	19.97	26.97	0
Riau	12.79	467.89	6.04	1,280.82	1,767.54	1,940.37
West Sumatera	24.95	475.94	42.72	188.55	732.16	36.75
Bengkulu	15.15	113.09	8.11	62.3	198.65	21.12
Jambi	190.84	1,462.03	243	173.2	2,069.07	9
South Sumatera	19,909.99	10,970.04	10,321.10	5,883.94	47,085.08	9,542.01
Lampung	0	106.95	0	0	106.95	0
West Kalimantan	42.12	482.6	1.32	1.48	527.52	0
Central Kalimantan	122.72	974.4	17.33	471.89	1,586.34	74.28
South Kalimantan	0	5,525.16	362.59	6,377.81	12,265.56	3,604.36
East Kalimantan	14,212.67	11,068.56	4,775.42	7,684.72	37,721.37	5,903.82
South Sulawesi	0	144.94	33.09	53.09	231.12	0.12
Central Sulawesi	0	1.98	0	0	1.98	0
North Maluku	2.13	0	0	0	2.13	0

West Irian Jaya	89.4	61.86	0	0	151.26	0
Papua	0	2.16	0	0	2.16	0
Total	34,628.24	32,217.61	15,804.12	22,290.26	104,940.22	21,131.83

Source : Geology Agency

Hydropower has high potential energy resources but has not been effectively harnessed except in Java Island. The potential is estimated at 75,7 GWe, mini and with micro-hydro installed capacity it is 86 GWe: 17.2% of total identified potential are about a 500 MWe capacity. Java Island is almost fully harnessed with installed capacity of about 2.4 GWe. The highest potential energy resources of hydropower is around 25 GWe located in Papua Island.

Around 40% of the world's geothermal resources are located in Indonesia. The active volcanic belt in Indonesia, measuring 7,000 km in length and 50-200 km in width distributes geothermal energy resources along the volcanic lines of Sumatra, Java, Bali, West Nusa Tenggara (NTB), Northern Sulawesi and Maluku. Most of the geothermal energy resources are located at the base or old caldera area of volcanoes.

Indonesia's total geothermal energy potential is equivalent to 27,601 MW of electricity in which only 1 GWe is being utilized. Of this total, 11,135 MW is confirmed as probable reserve, 1,050MW as possible reserve and 2,288 MW as proven reserve. The remaining 13,128 MW are still speculative and hypothetical resources.

Indonesia Geothermal Reserve

No	Location	Resources		Reserves			Total
		Speculative	Hypothetic	Probable	Possible	Proven	
1	Sumatera	4,975	2,121	5,845	15	380	13,336
2	Jawa	1,960	1,771	3,265	885	1,815	9,696
3	Bali-Nusa Tenggara	410	359	973	-	15	1,757
4	Sulawesi	1,000	92	982	150	78	2,302
5	Maluku	595	37	327	-	-	959
6	Kalimantan	45	-	-	-	-	45
7	Papua	75	-	-	-	-	75

Indonesia Utilized Geothermal as Power Plant (MW)

No	Working Area	Location	Turbine Capacity	Operator	Total Cap.
1	PLTP Kamojang	West Java	1 x 30 MWe	PLN	200
2	PLTP Lahendong	North	2 x 20 MWe	PLN	60
3	PLTP Sibayak	North	1 x 12 MWe	Pertamina	12
4	PLTP Salak (Chevron)	West Java	3 x 60 MWe	PLN	375
5	PLTP Derajat (Chevron GSI)	West Java	1 x 55 MWe	PLN	255
			1 x 90 MWe	CGI	
			1 x 110 MWe	CGI	
6	PLTP Wayang Windu	West Java	1 x 110 MWe	SE	227
			1 x 117 MWe		
7	PLTP Dieng (Geo)	Central	1 x 60 MWe	GDE	60

					Total	1,189
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(PLTP=Geothermal Power Plant)

Source : Statistic Geothermal Business Indonesia 2009. Directorate general of Mineral, Coal, and Geothermal

1.2.2. ENERGY STATISTICS

TABLE 4. ENERGY STATISTICS

							Annual Average Growth Rate (%)
Energy Consumption	2003	2004	2005	2006	2008	2009	2003-2009
Total	4.52	4.42	4.77	4.79	6.31	5.82	-0.41%
Solid	2.05	1.85	1.92	2.09	2.73	2.22	-3.95%
Liquid	1.75	1.81	1.98	1.84	2.54	2.36	-0.33%
Gases	0.42	0.45	0.49	0.48	0.56	0.73	11.09%
Electricity	0.3	0.31	0.37	0.39	0.48	0.51	8.59%
Others	..	..	..	..		-	..
Energy Production	2003	2004	2005	2006	2008	2009	2003-2009
Total	10.24	10.6	11.11	11.76	12.71	13.51	5.12%
Solid	4.13	4.72	5.19	6.23	7.56	8.31	13.55%
Liquid	2.51	2.39	2.41	2.24	2.18	2.13	-3.32%
Gases	3.33	3.16	3.16	3.09	2.71	2.82	-0.82%
Geothermal	0.13	0.14	0.14	0.06	0.18	0.09	-24.86%
Hydro	0.13	0.19	0.2	0.14	0.08	0.18	36.60%
Nuclear	-	-	-	-			-
Other	-	-	-	-			-
Export-Import	2003	2004	2005	2006	2008	2009	2003-2009
Total	-4.234	-4.336	-3.615	-4.378	+ 4.97	+6,00	6.90%
Solid	-2.606	-3.091	-2.546	-3.443	+ 4.1	+5,11	15.21%
Liquid	-0.009	0.303	0.414	0.448	+ 1.48	+0,57	-870.83%

Gases	-1.537	-1.544	-1.484	-1.383	+ 0.36	+0,32	-5.34%
Other renewable and waste	-0.004	-0.004	0	0	0	0	..

Source: www.esdm.go.id

1.2.3. ENERGY POLICY

The President of the Republic of Indonesia issued a Presidential Regulation No. 5 of 2006 that outlined the National Energy Policy (NEP). This NEP is a comprehensive policy which covers both the supply and the demand-side policy. The NEP also underlines the need that energy conversion in all sectors has to be implemented immediately, not only to reduce the dependence on oil fuel, but also to diversify energy, alleviate poverty, increase economic growth, and promote environmentally-friendly development.

The aforementioned Presidential Regulation serves as the main guideline in the national energy management to achieve the security of domestic energy supply. This regulation sets a clear target of the share of each type of energy up to the year 2025, as follows: oil supply will be reduced to share only up to 20%, natural gas increases to 30%, coal should be more than 33%, and new and renewable energy sets at 17%.

With a clear and consistent policy in creating much needed conducive investment climate, as well as with the support and participation of all national stakeholders, this target may be achieved. The Presidential Regulation also supports the development of various sources of energy, including new and renewable energy by the end of 2025.

All aspects related to the resources, use and arrangement of energy in Indonesia has then been regulated by the Act No. 30 of 2007 on Energy, including new and renewable energy resources. According to this Act, among others, new energy resources can be produced by new technology, either from renewable or non-renewable energy such as nuclear for hydrogen, coal bed methane, liquefied coal and gasified coal. These new energy resources should be managed by the state and utilized for the prosperity of the people.

In addition to the Presidential Regulation No. 5/2006, the Indonesian Government also issued several other regulations and policies on new and renewable energy, such as Geothermal Law, Green Energy Policy, and Small Distributed Power Generation using Renewable Energy.

There are five main energy policy measures:

1. Diversification: to maximize and economize the supply of energy, to curb the rate of excessive use of hydrocarbon resources, to reduce the dependence on a single type of fuel (i.e. petroleum) and later to replace it with other available fuels. In 1995 oil shares was around 60%, and in 2020 is projected to be around 40%;
2. Intensification: to increase and expand the exploration of the available energy sources aiming to secure sufficient supply of energy;

3. Conservation: to economize energy production and utilization;
4. Energy Price: to formulate energy prices based on economic values and by taking into consideration its environmental cost;
5. Clean Energy Technologies: to support the environmental programme and towards a sustainable development.

The focuses of the energy policy are as follows:

1. Supporting national stability and fuelling macro economic recovery by ensuring the availability of energy in enough number and realistic price, which is efficient, safe, reliable and environment-friendly.
2. Conducting energy sector restructuring through regulation and legislation.
3. Improving the efficiency of the State-owned companies.
4. Improving bureaucracy efficiency.
5. Supporting the implementation of Regional Autonomy based on legislation and its rule of implementation.

The goals of the policy are outlined as the following:

1. Supporting to increase private companies' role in energy business that leads to establishing free market mechanism.
2. Reaching electrification ratio of 90% in the year 2020.
3. Increasing the share of renewable energy which consists of geothermal, biomass and micro/mini-hydro, to be at least 5% in the year 2020.
4. Increasing strategic partnership between domestic and international companies to explore and/or exploit energy source in the country and abroad.
5. Supporting domestic energy companies to "go international" to compete in global market.
6. Decreasing energy intensity to 1% per year so that the energy intensity becomes 3 BOE/ thousand USD, and its elasticity becomes less than 1 in the year 2025.
7. Increasing the domestic manpower share/role in energy industry so that the dependence on foreign companies and or manpower can be minimized.

The implementation of the energy policy covers several aspects such as the issuance of regulations, standards, energy-pricing incentives and disincentives, and the application of appropriate technologies. The technologies that would be considered are identified as follows:

1. Technologies to produce substitutes for oil, as oil are non-renewable and are a very limited resource.
2. Technologies to support a more sustainable energy supply.
3. Technologies for clean and efficient energy to support environmental programmes and towards sustainable development.

Nuclear energy is a viable option within an optimum energy mix to reduce dependence on fossil fuels. Furthermore, nuclear energy may provide a secured long-term energy supply as well as supporting the reduction of potential of air pollution.

According to the results of the study on the Comprehensive Assessment of Different Energy Sources (CADES) for Electricity Demand (2001-2002), it is reasonable to operate nuclear power plant in about 2016. The Act No. 17 year 2007 concerning the National Long-Term Development Planning 2005 – 2025 notes that utilization of nuclear power for electricity generation may be performed in this period.

1.3. THE ELECTRICITY SYSTEM

1.3.1. *ELECTRICITY POLICY AND DECISION MAKING PROCESS*

The Indonesian power sector is ruled and regulated by the following law and government regulations:

1. Law No. 15 /1985 regarding electricity;
2. Government Regulation No. 3/2005 regarding amendment of the Government Regulation No. 10/1985 regarding electricity;
3. Ministerial Decree of the Minister of Energy and Mineral Resources (MEMR) No. 9/2005.
4. Ministerial Decree of MEMR No.10/2005.

When the law no. 20/2002 regarding electricity was revoked by the Supreme Constitutional Court (*Mahkamah Konstitusi*) in 2004, the former electricity law no. No. 15/1985 is to be enforced again to rule the Indonesian power sector. Under this law, PT PLN (Persero) is the sole holder of *Pemegang Kuasa Usaha Ketenagalistrikan* or *PKUK* (authority and obligation to supply electricity to all people in the whole country). With this authorization and obligation, PT PLN (Persero) is obliged to provide electricity to meet the national electricity demand.

The Directorate General of Electricity and Energy Utilization (DGEEU) under the Ministry of Energy and Mineral Resources is primarily responsible to formulate electricity policy and regulation. One responsibility of DGEEU is to prepare general national electricity planning to meet electricity power demand in a reliable and sustainable way. The National Electricity General Planning is an integrated policy in the electricity sector comprising projection of electricity demand and supply of power generation, investment and financing, utilization of primary energy resources, as well as new and renewable energy for power generation.

According to Act No. 15 on Electricity (1985) and the Government Regulation No. 26 on supply and utilization of power generation (2006), the electricity utility should undertake planning and have a general Power Generation Master-plan.

On August 1998, the Government of Republic of Indonesia has implemented a policy on restructuring of the electric power sector. The main target of this restructuring of the power generation industry, which was formerly a monopoly in nature, is to develop a competitive market, where the price of electric power is determined by market.

1.3.2. STRUCTURE OF ELECTRIC POWER SECTOR

The structure of the current Indonesian electricity supply industry is shown in Figure 2. According to the law no. 15/1985, PLN - which is a state owned enterprise as well as a limited liability company - is the only authority in the country that provides electricity to all Indonesian people (PKUK). In serving the national electricity demand, PLN produces electricity from its own power plants, including from generator companies which are PLN's subsidiaries. PLN also acts as the *single buyer* that purchases electricity from independent power producers (IPP). Other power producers apart from PLN and IPP are 'captive power', mostly industries that produce power for self uses, and some other smaller companies including cooperatives that sell their electricity directly to consumers.

PLN builds and owns most electricity infrastructure in the country. In term of generation facilities, PLN owns almost every kind of power plants, such as coal-fired and oil-fired steam power plants, gas turbine, geothermal, hydro electric, and diesel plants. Most of these generation facilities are under the management of two PLN's subsidiaries, PT Indonesia Power and Java-Bali Electric Company (PT. PJB).

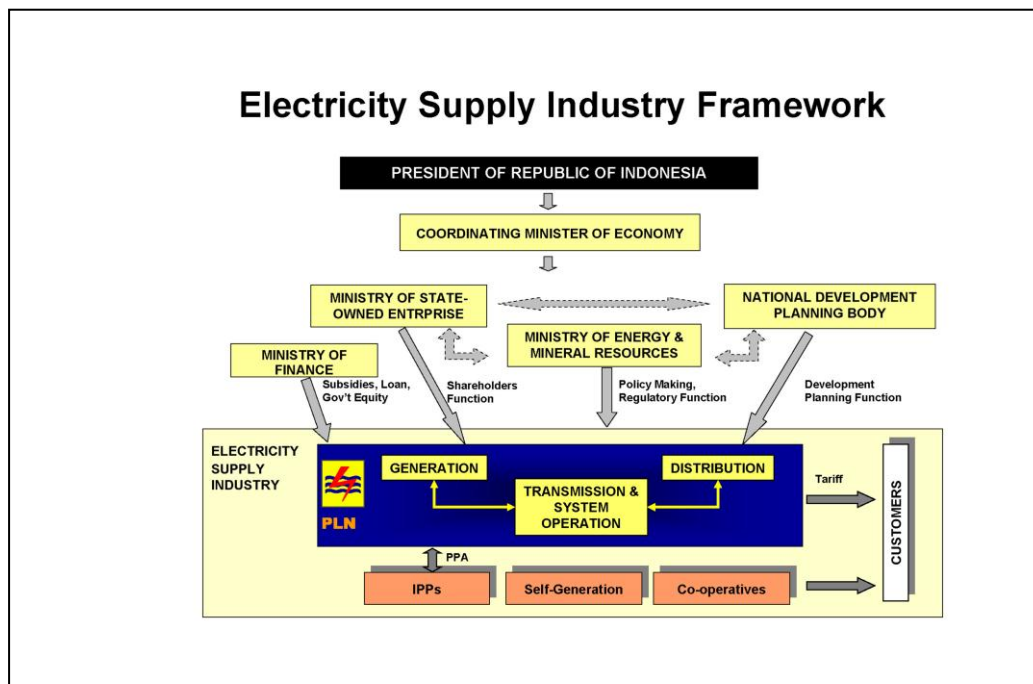


Figure 2 The structure of the current Indonesian electricity supply industry

In delivering electricity to its large, medium and small customers while maintaining the quality and reliability of service, PLN has developed extensive transmission and distribution networks, including the large scale interconnection power grid in Java-Bali system.

Furthermore, PT PLN established 5 subsidiaries and 1 joint venture as the following:

1. PT. Indonesia Power, whose main business is electricity generation. It was established on 3 October 1995 named PT PJB I that later became PT Indonesia Power on 1 September 2000.
2. PT. Pembangkitan Jawa Bali (PT PJB), whose main business is electricity generation. It was established on 3 October 1995 named PT PJB II. The name was changed to PT Pembangkitan Jawa Bali (PT PJB) on 22 September 2000.
3. PT. National Electricity Service of Batam Island (PT. Pelayanan Listrik Nasional Batam - PLN Batam), that engaged in business of electricity provision for public purposes in the Region Batam Island, was established on 3 October 2000.
4. PT. Indonesia Comnets Plus, whose main business is telecommunications business, was established on 3 October 2000.
5. PT. Prima Layanan Nasional Enjiniring (PT. PLN Enjiniring), a company on engineering, consultant, and construction supervision. It was established on 3 October 2002.
6. PT. National Electricity Service Tarakan (PT PLN Tarakan), a provider of electricity for public purposes in Tarakan Island of East Kalimantan.
7. PT. Geo Dipa Energi, a joint venture between PT.PLN and PT. PERTAMINA , whose business is in electricity generation, especially geothermal power plant.

1.3.3. MAIN INDICATORS

Installed Capacity

As of December 2009, PT. PLN and its subsidiary companies owned and operated about 5,014 generating units with total installed capacity of 30.32 GWe, of which 22.91 GWe (75.56%) was installed in Java-Bali. There is also captive power with total capacity of 5.64 GWe.

The system peak-load of Indonesia in 2009 was 24.07 GWe, and of Java-Bali system was 17.67 GWe. The peak load of Indonesia increased 5.99% over the previous year, while of Java-Bali system 4.61%.

PT. PLN produced electricity of about 133.11 TWh in 2009 including those produced from power generation units rented from other companies. Of this energy production, 28.74 TWh (24%) was produced with natural gas, 43.14 TWh (36%) with coal , 34.94 TWh (29%) with

oil, 10.31 TWh (9%) by from hydropower generation, and the remaining 3.5 TWh (3%) geothermal.

Total energy production (including those purchased from other IPPs) during year 2009 was 156.8 TWh. Energy purchased from independent power producer (IPP) was 8.98 TWh from PT. Paiton Energy Company and 9.2 TWh from PT. Jawa Power in East Java.

ENERGY RELATED RATIOS

	2005	2006	2007	2008	2009
Electrification ratio	58,3	59,0	60,8	62,3	65.0

TABLE 5. ELECTRICITY PRODUCTION AND CAPACITY

											Annual Average Growth Rate (%)
Electricity Generation	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000 to 2009
Total	99.5	101.7	108.4	113	120.2	127.4	133.1	142.4	149.4	156.8	5.19%
Nuclear	..	..		..	..	..	..			..
Hydro	13.7	10.7	8.8	8.5	8.9	9.8	8.8	10.6	10.7	10.3	-2.31%
Geothermal	2.65	3	3.2	3	3.1	3	3.1	3.2	3.4	3.5	3.28%
Wind	..	..	...	..	..	..	..	0.02	...	0.05	
Other renewable	..	..	...	..	..	..	..	...	...	0.1	
Thermal	83.14	74.9	77.2	81	84.2	88.5	92.6	97.4	103.9	106.8	2.94%
“Purchase from IPP”		13.3	19.1	20.5	24.1	26.1	28.6	31.2	31.4	36.2	12.38%
Installed Capacity	2000 (PLN+IPP)	2001 (PLN)	2002 (PLN)	2003 (PLN)	2004 (PLN)	2005 (PLN)	2006 (PLN)	2007 (PLN)	2008 (PLN)	2009 (PLN+IPP)	2000 to 2009
Total	25.4	21.1	21.1	21.2	21.5	22.5	24.8	25.2	25.6	30.3	2.38%
Nuclear	..	..	..	..	..	..	..	..	-	-
Hydro	4.39	3.1	3.2	3.2	3.2	3.2	3.5	3.5	3.5	3.6	-1.55%
Geothermal	0.36	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	1.1	20.68%
Wind	..	..	..	..	..	..	..	0.0001	0.0003	-	
Other renewable	..	..	..	..	..	..	..	..	-	-
Thermal	20.65	17.6	17.6	17.7	17.9	18.9	20.8	21.3	21.7	24.95	2.43%

Source: National Electricity Company, PT PLN

For power generation programme, according to the 2006 Government Regulation No. 71, PT. PLN should build 10 GWe under an Acceleration Programme based on PT. PLN's financial strength. The target should be achieved in 2009, which is likely to be delayed until 2010. The focus of the programme is for regions:

1. having high oil consumption for electricity generation,
2. experiencing electricity shortages (crisis), or

3. having experienced crisis of electricity supply.

The programme consists of 10 projects totalling 6.9 GWe for Java-Bali-Madura grid system, and another 30 projects totalling 3.1 GWe for outside Java.

Considering the large geothermal and hydro energy resources in Indonesia of about 29 GWe and 42.8 GWe respectively, a great effort is needed to accelerate the construction of power plants to harness these resources. The Government of Indonesia therefore launched a programme called the Crash Programme Step II dedicated to increase the share of geothermal in the total generation mix between 2014 and 2016.

TABLE 6. ENERGY RELATED RATIOS

	2000	2003	2004	2005	2006	2008	2009	Annual Average Growth Rate (%)
	2000	2003	2004	2005	2006	2008	2009	2000 to 2009
Energy consumption per capita (GJ/capita)	31.1	30.7	29.0	23.5	23.2	27.76	25.31	-8.65
Electricity per capita (KW.h/capita)	482.4	472.3	475.8	489.02	504.95	657.16	681.86	2.63
Nuclear/Total electricity (%)	..	..	..			-	-
Annual capacity factor - Total (%)	44.7	44.8	45.3	52.15	48.0	52.62	53.71	2.59
Annual capacity factor - Thermal (%)	46	47.7	47.7	53.39	50.51		-	2.18
Annual capacity factor - Hydro (%)	35.7	27.9	30.6	34.84	28.33		-	1.62
Annual capacity factor - Nuclear (%)	..	..	..	..	..		-
Annual capacity factor - Wind (%)	..	..	..	..	..		-
Annual	84	88.9	91.3	86.87	90.78		-	0.78

capacity factor - Geothermal (%)								
Annual capacity factor - Other renewable (%)	..	..	..	..	..		-

Source: www.esdm.go.id

2. INDONESIA NUCLEAR ORGANIZATION

2.1. HISTORICAL DEVELOPMENT AND CURRENT ORGANIZATIONAL STRUCTURE

2.1.1. OVERVIEW

Nuclear activities in Indonesia began with the establishment of the State Committee for the Investigation of Radioactivity in 1954. The Committee was assigned to investigate the possibility of radioactive fall-out in Indonesian territory due to nuclear weapon test in the Pacific Ocean.

Noting that the development and application of atomic energy could enhance the welfare of the people, the Government on December 5, 1958 issued Government Regulation No. 65 establishing the Atomic Energy Council and the Atomic Energy Institute. This Government Regulation was then followed by the enactment of the Act No. 31 in 1964 regarding the Basic Stipulations on Atomic Energy. In 1965 Government Regulation No. 33 renamed the Atomic Energy Institute as the National Atomic Energy Agency (Badan Tenaga Atom Nasional or BATAN). However, the 5th of December has been retained as the date of anniversary of BATAN.

In 1965, the operation of the first research reactor (Triga Mark II, 100 KWt later upgraded to 1 MWt in 1971 and 2 MWt in 2000) was inaugurated in Bandung. In order to improve mastery of nuclear science and technology, several research & development and engineering facilities were built, among others are the Nuclear Technology Research Center of Pasar Jumat, Jakarta in 1966, and the Nuclear Technology Research Center of GAMA, Yogyakarta in 1967. In this last one, the Kartini research reactor was in 1979 with a capacity of 100 KWt. To further support the nuclear energy programme, research & development and engineering facilities, the 30 MWt Multipurpose Research Reactor was inaugurated in 1987. To support this last reactor's activities, laboratories, including facilities for fuel fabrication of research and power reactors, reactor safety testing, production of radioisotope and radiopharmaceutical, management of radioactive wastes and other nuclear facilities have been built in the PUSPIPTEK science and technology research complex in Serpong.

Further development saw the enactment of Act No. 10 on Nuclear Energy in 1997, which stipulated among others the separation of the executing function on the beneficial

applications of nuclear energy (BATAN), from the regulatory function held by the Nuclear Energy Regulatory Agency (BAPETEN).

According to the Act No. 10 in 1997 on Nuclear Energy and the Presidential Decree No. 64 in 2005, BATAN has been stipulated as a Non Departmental Government Institution which is under and responsible to the President. BATAN is led by a Chairman and its programme is under the coordination of the Minister for Research and Technology. The main duties of BATAN are to conduct research, development and the beneficial applications of nuclear energy in accordance with the laws and regulations.

In conducting its duties, BATAN has the following functions:

1. To assess and prepare the national policy in the field of research, development, and the beneficial uses of nuclear energy,
2. To coordinate functional activities in implementing the all duties of BATAN,
3. To support and foster activities of government institutions in the field of research, development and beneficial uses of nuclear energy,
4. To conduct general administrative services in the field of general planning, administration, organization and procedures, personnel management, financing, archiving, procurement as well as education and training.

2.1.2 CURRENT ORGANIZATIONAL CHART(S)

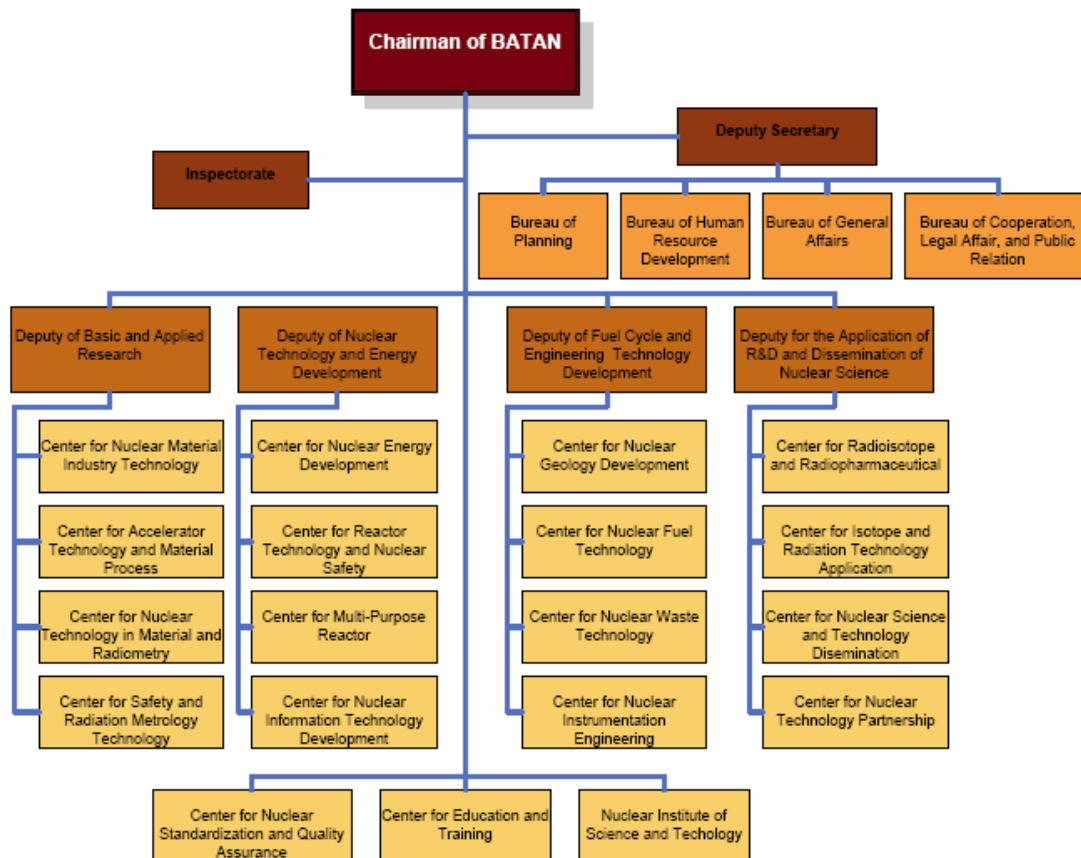


Figure 4: Structure organization of BATAN

2.2. NUCLEAR POWER PLANTS: OVERVIEW

STATUS AND PERFORMANCE OF NUCLEAR POWER PLANTS

NA

PLANT UPGRADING, PLANT LIFE MANAGEMENT AND LICENSE RENEWALS

NA

2.3. FUTURE DEVELOPMENT OF NUCLEAR POWER

Preparatory activities cover mainly preparation of infrastructures. It should be known that activities to introduce nuclear power plant into Indonesia's electricity system has being done since some years ago, therefore an assessment should be done in order to see the last status of infrastructure. A self-assessment activity has been done in 2009 and the result of this assessment has been reviewed through the IAEA INIR (Indonesia Nuclear Infrastructure Review) Mission. This mission shows that infrastructures that should be prepared in Phase-1 have been prepared adequately and then Indonesia should do more activities to achieve Milestone for Phase-2.

In 2008 – 2009 a program has been done to prepare User Consideration Document (UCD). The Indonesian UCD defines general characteristics used by user of nuclear power plant in Indonesia. This document includes general requirements on system related to nuclear power plant and its supported facilities and specific requirements suited for Indonesia. This document is prepared in order to provide basic criteria as technical consideration for stakeholders in the deployment and development of nuclear power plant in Indonesia.

2.3.1. NUCLEAR POWER DEVELOPMENT STRATEGY

Utilization of NPPs as a part of national energy mix was noted in the Presidential Regulation No. 5 in 2006 on the National Energy Policy, as well as in the Act No.17 in 2007 on the National Long-term Development Plan for 2005-2025. This last Act of 2007 mentions that the introduction of nuclear power should be utilized with high consideration of safety factor. According to these two legal documents, NPPs utilization may be initiated within the period mentioned.

The strategy for introducing nuclear energy system in Indonesia includes preparation of nuclear infrastructure covering nuclear regulatory framework in order to support the safe, reliable and peaceful use of nuclear energy system. Indonesia, through its nuclear energy agency – BATAN, has made and devoted special effort to build a nuclear science and technology base for conducting research and development of nuclear energy system and to prepare highly competent personnel to support its endeavour in the introduction of nuclear energy system. Indonesia, as one of the International Project on Innovative Nuclear Reactors and Fuel Cycle (INPRO) Members, continues to support the IAEA's INPRO activities to meet the global energy demand and promote sustainable economic and social development. BATAN considers that intensive bilateral and multilateral cooperation, within the framework of the existing international instruments, with countries that are already more advanced and experienced in developing and managing nuclear energy system is a necessity. Indonesia has been carrying out cooperation on peaceful uses of nuclear energy with many countries such as South Korea, Japan, USA, Russia, etc., as well as with the IAEA.

Indonesia is considering having NPP project through an open bids mechanism. Regarding to the nuclear fuel cycle, an open cycle is for the moment a preferred option.

According to the BAPETEN Chairman Regulation No. 4 on Nuclear Reactor Decommissioning of 2009, the Owner has responsibility for decommissioning of NPP including provision for financial guarantee.

It is indicated in the draft of User Consideration Document of Indonesia, developed with the assistance of IAEA, that NPP to be constructed in Indonesia should be designed to allow co-generation application. Co-generation application includes desalination, coal liquefaction, coal gasification, hydrogen production, etc.

Table below shows the planned reactor to be built.

TABLE 7. STATUS OF NUCLEAR POWER PLANTS

Station/Project Name	Type	Net Capacity	Expected Connection to the Grid	Expected Commercial Date
Java-1	PWR	1000 MWe	Before 2020	Before 2020

2.3.2. PROJECT MANAGEMENT

Commercial construction, operation, and decommissioning of nuclear reactor shall be performed by any company, State Company, co-operative, and/or private company, as mentioned in the Act No 10 of 1997. Regarding the operation of NPP, the operator should apply for licence or permit from BAPETEN for each site, for construction, for commissioning, for operation and for decommissioning.

The owner is responsible for the type of contract suitable for the implementing each NPP project. Presently, no organization has been established to own the first NPP. A study report on project management for NPP done by BATAN and KHNP shows that turnkey contract approach is the suitable one for the first NPP project.

As it is the case for all industrial construction projects in Indonesia, local participation and local content should be maximized. Local participation in the construction of a nuclear power plant would mean the use of material and manpower resources within Indonesia. A study recommends the target for localization: 20% of equipment localization at the first 2 units, 50% at the next 4 units and 70% at the other 4 units.

Policies and requirements for purchasing nuclear equipment and services are not considered yet, but it should follow any existing related regulations.

2.3.3. PROJECT FUNDING

Funding scheme for the project is still under consideration. Regarding the financial scheme, a study undertaken by BATAN, PLN and KHNP proposed a financing scheme and ownership structure for the first NPP in Indonesia. The funding for the construction of the first NPP may be a combination of long term loans and equity. The loan would be used mostly to finance procurement of foreign contents, most likely obtained from ECA (Export Credit Agency) and commercial bank through loan agreement with the ‘NPP company’ that could be owned by the government. Most of the equity portion would be used to finance local capital expenditure, such as land acquisition, professional fee, mobilization, certification, etc. The equity will be

sourced partly from the public utility's own funds, which might be PLN or another state owned enterprise, and from private investors who can be partners.

Funding for spent fuel handling, waste management and decommissioning and final disposal is the responsibility of the owner.

2.3.4. ELECTRIC GRID DEVELOPMENT

Presently, an integrated system of electrical grid exists in Java-Bali-Madura and Sumatera. The Java-Bali-Madura system is interconnected with 500 kV and 150 kV lines, while Sumatera is interconnected with 275 kV and 150 kV lines. There is a plan in place to interconnect these two grid systems with a HVDC submarine cable by the end of 2016. Currently, in Kalimantan Island, 150 kV line has interconnected the provinces of Central Kalimantan, South Kalimantan and East Kalimantan. However, West Kalimantan province is still isolated from the other provinces.

Based on the Report of transient stability study for Java-Madura-Bali (Jamali) system in 2005-2018, carried out by BATAN – PLN in 2005, NPP (Nuclear Power Plant) is feasible when introduced into the Jamali power system in the year 2016. Based on National Electricity Public Planning 2005-2025 the Jamali system has peak load, i.e. 14,851 MW (in 2005); 19,525 MW (in 2009); 32,509 MW (in 2016); 34,957 MW (in 2017); 51,815 MW (in 2023); and 55,343 MW (in 2024). The Jamali electricity network has sufficient capability to transfer the full power from Muria NPP and adequate to support safe and reliable operation of nuclear plants.

2.3.5. SITE SELECTION AND ENVIRONMENTAL PROTECTION

Three locations in Indonesia have been identified as potential sites for NPPs. They are in the Muria Peninsula, Banten and Bangka Island. Feasibility Study for Muria Peninsula has been completed in 1996, identifying three (3) candidate sites i.e. Ujung Lemahabang (ULA), Ujung Watu and Ujung Grenggengan, while the study for other potential sites are still on progress in Banten and Bangka Island

Nature of the Muria Sites

The following three (3) candidate sites i.e. Ujung Lemahabang (ULA), Ujung Watu and Ujung Grenggengan have been selected. These sites which lie on the north coast of Java Sea of Muria Peninsula, Central Java are similar in nature.

Geology of these three sites is mostly composed of primary volcanic products (lava, tuff, agglomerate) and secondary volcanic products (lahar, and sandstone, and conglomerate). It has been hypothesised that the geology of the western sites are related to Karimunjawa of middle-to-upper tertiary volcanic system and not belonging to Muria system, whilst the eastern part of Muria volcanic system is Quaternary. Karimunjawa islands lie on the north of

the sites at about 75 km offshore of Muria Peninsula. Mt. Muria lies on the center of Muria Peninsula in a range of 20 – 25 km from the sites.

Probabilistic assessment for Muria volcanic system based on the Poisson distribution reveals that the probability of forthcoming eruptions is 2.7×10^{-5} per 100 years. On the other hand, an assessment of spatial-temporal probability based on the Bayesian inference indicates that the value is in a range of 9.809×10^{-9} - 3.335×10^{-6} per 100 years.

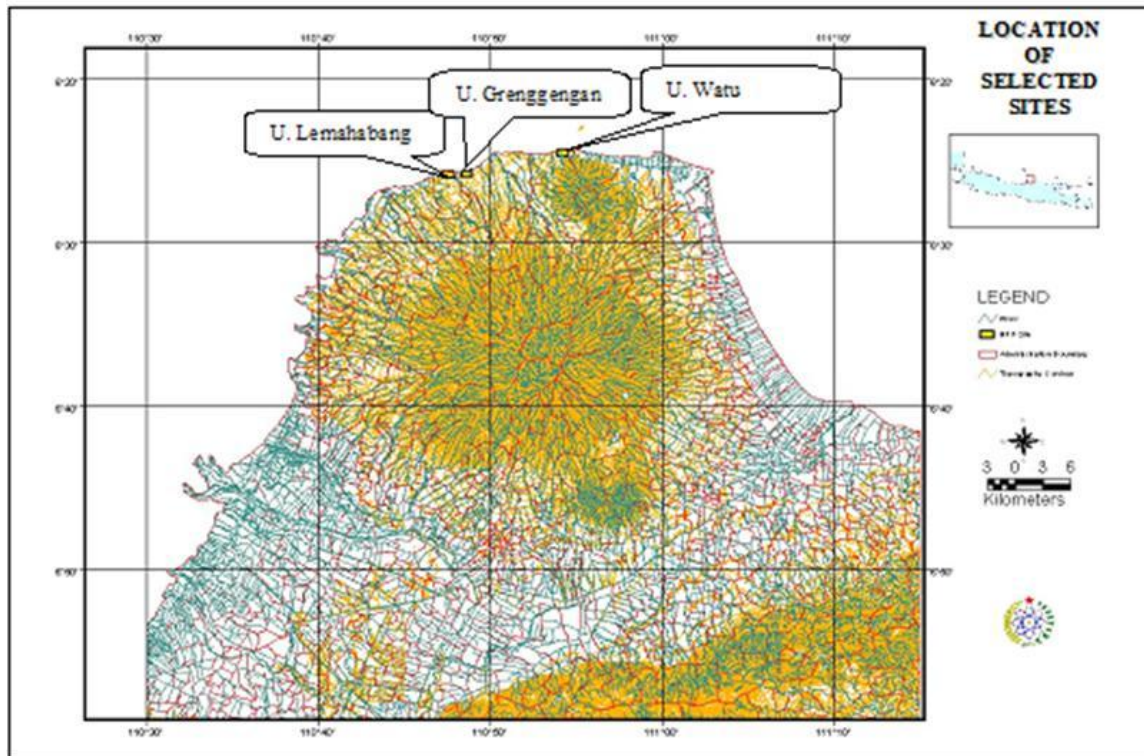


Figure 5: Location of NPP selected sites

Concerning the seismotectonics, there is a record of big earthquake occurrence in 1890 called Pati earthquake. The source of Pati earthquake seems to be located in the offshore area where a supposed capable fault (AF-3) is assumed to exist. Taking into account the fact that the iso-seismal map of the quake is open toward the sea and that there is a record of tsunami wave triggered by the quake which the epicenter is related to the Lasem Fault on the land area, it is supposed that the Pati earthquake has a deep relation to the AF-3.

Referring to the seismic zoning, the Muria Peninsula is located in the zone of estimated $PGA = 0.05 - 0.15$ g. The historical earthquake data shows that the Pati earthquake is the largest earthquake occurred near Muria Peninsula with assumed magnitude of $M=6.8$ and $MMI=VIII$.

There are at least 10 supposed capable faults identified in the Muria Peninsula and its surrounding. Maximum acceleration in the selected site due to those faults is calculated to be in a range of 0.102 – 0.29 g.

Geotechnical conditions can be divided into two groups i.e. offshore and onshore. The description of the off-shore conditions are as follows. Wet density of siltstone or sandstone is in a range of 1.45 t/m³ to 1.75 t/m³, and of 1.75 t/m³ to 2.14 t/m³; specific gravity value is mostly more than 2.5; liquid limit mostly over 70 %; porosity in a range of 50 % and 70 %.

The description of the onshore geotechnical conditions are as follows. Unit weight of the upper tuff is approximately 1.56 g/cm³ as a mean value; the sandstone, siltstone, conglomerate and claystone from 1.02 g/cm³ to 2.39 g/cm³; the lower tuff about 1.63 g/cm³; the specific gravity for the rocks ranges from 2.60 to 2.90, which is independent of the elevation; the moisture content of sandstone and conglomerate is in a range of 10 - 20 %; the lower tuff has higher moisture content; the claystone 46.8 %; porosity from EL.-5 m to EL.-15 m is in a range of 26.9 % to 67.9 %; EL.-15 m and EL.-68 m 22.7 % to 67.2 %; EL.-68 m 48.9 % to 68.6 %. In addition, the standard penetration test (SPT) value is found to be more than 40 which are found at the average minimum depth of about 18.5 m from the ground surface.

The characteristics of the coast line and marine condition are as follows. In general the seabed has a gentle slope from the coastal line to the sea. The slope is less than 8° up to a distance of several kilometres, except in the western area with a slightly steep locally. According to the tide observation, the highest water level is 0.70 m and the lowest water level is -0.74 m. The maximum significant wave height is 3.03 m, and the significant wave period is 7.7 second. The dominant direction of the tidal current is WSW - ENE and the velocity ranges from 0 cm/s to 70 cm/s at a depth of 2 m and from 0 cm/s to 50 cm/s at a depth of 8 m. The velocity of the littoral current in the dry season is approximately 4 cm/s to 12 cm/s with a direction of SW at the spring tide and 8 cm/s to 19 cm/s with the same direction at the neap tide. The velocity in the rainy season is approximately 1 cm/s to 36 cm/s with a direction of E - SE at the spring tide and 1 cm/s to 40 cm/s with the same direction at the neap tide. The sea water temperature ranges approximately from 28°C to 33°C, while the salinity is approximately in the range of 25 ‰ to 34 ‰.

Meteorology monitoring has been implementing since 1981 until now. The maximum wind speed per month is between 6.5 m/s and 9.4 m/s at the height of 10m. At the height of 40m, the maximum wind speed per month is between 10.6 m/s and 14.8 m/s. Wind speed at 40m is generally greater than that of 10m. There is no occurrence of wind speed of greater than 10 m/s at 10 m elevation. However, at 40 m elevation there is about 108 days of occurrence of wind with velocity more than 10m/s in a year. The wind flow regime in the site area is governed by slightly stronger west monsoon in the rainy/wet season and east monsoon in dry season.

Annual average temperature in the site at the height of 2m, 10m, 50m, and 100m are 27.5, 29.1, 28.6, and 27.7 centigrade respectively. The maximum temperature per month for the height of 2m, 10m, 50m, and 100m is 33.4, 32.4, 33.1 and 32.6 respectively. Minimum temperature for the height of 2m, 10m, 50m and 100m are 20.5, 25.3, 25.0, and 23.9 respectively.

Monthly relative humidity ranges between 73% and 91% for the maximum. Annual average RH is 65%. Maximum and minimum recorded monthly averages are 91% and 19% respectively.

There is plenty of rain in the wet season at the northern part of Java Island. The rainfall is brought mainly by the west monsoon. Rainfall is measured by on-site weather station at the height of 2 meters. The annual precipitation recorded during the period of observation was 2,355.4 mm with the monthly rainfall ranging from 0.00 mm in the period of May to October to 714.5 mm in January. The maximum 1-hour and 24-hour durations of rainfall were 60 mm in February 1996 and 139.9 mm in December 1994 respectively. On average annually there are 156.4 rainy days.

The area investigated in the radius of 50 km is classified as wet (40.56 %) and dry (59.44 %) land, housing (34.97 %), plantation (32.48 %), forest (22.99 %), fish pond (0.53 %), swamp (0.02 %), and others (4.17%) including road, river, etc. The land use of the site itself is essentially agriculture plantation i.e. rubber, coconut and cacao trees surrounded by shield trees, with some land devoted to rice production.

Demographic survey done in 2006 in the western site shows that the population within a range of 0-5 km from the site is about 33 thousand, 0 -10 km about 107 thousands, 0 – 20 km about 290 thousands and 0 – 50 km about 1.8 million.

According to the Act No 23 year 1997 regarding to the Environmental Management, any activity which will cause a large and significant impact to the environment should has an approved Environmental Impact Assessment Document (AMDAL) for obtaining activity permit. Detail implementation of AMDAL mechanism is arranged by the Government Regulation No 27 year 1999 on AMDAL. The Environmental Minister Regulation No 11 Year 2006 on the Kind of Activities and/or Business Planning that should be completed by AMDAL, states that NPP project activity of any capacity and type should be completed by approved AMDAL.

Commission of AMDAL approval for NPP consists of personals from different government institutions, NGOs, as well as public representatives.

The AMDAL process for NPP is not initiated yet.

Nature of Banten

NPP site survey has been conducted in the West Java and Banten Provinces to construct a site and environmental database based on Geographical Information system using MapInfo software. The objective of this activity is to collect data and provide site analysis within near-regional area (25 km radius) from potential sites in Banten Province (Kramatwatu-Kasemen and Panjang Island) and West Java (Blanakan and Pamanukan) using a set of criteria. The target of this activity is to obtain preliminary selected candidate sites within the near-regional study area.

IAEA guidance related to the safety and non-safety related aspects and other considerations are used as the basis for safety and non-safety analysis. Safety aspect covers the potential of external induced events to the safety of the NPP and the potential impacts from NPP operation to the safety of people and environment. Potential for external events includes surface faulting, seismicity, sub-surface material, volcanology, river flooding and man-induced events. Safety factor for people and environment include demography. Non-safety aspect includes infrastructure and spatial planning. Other than IAEA guidance and adjusted to the Indonesian condition additional aspect of social setting activity is performed.

The method used is data analysis by integration of various results from topical activities to determine the interrelationship and effects on the selection of potential sites. The result of analysis for each aspect is manifested in an integrated GIS in a systematical manner by defining site rejection criteria according to the topical classification of NPP site study in below Table.

Definition and Site Exclusion Criteria Based on Topical Aspect in the First Stage of Site Screening

NO	TOPIC	DEFINITION	SITE EXCLUSION CRITERIA
1	Surface faulting	Capable fault: <ul style="list-style-type: none"> - Faulting within 0-126,000 years (NSC-Japan) - Faulting within 0-35,000 years for one movement or 0-500,000 years for more than once (US-NRC) 	<ul style="list-style-type: none"> - No faulting at or directed to site
2	Seismicity		Not exist
3	Sub-surface Material		Underground cavity exists which can result in surface deformation.
4	Vulcanology	Capable volcano: <ol style="list-style-type: none"> 1. historical volcanic activity (active post 1600: type A) type A) 2. showing manifestation of recent magmatic activity (type B and C) 3. resting period < interval of maximum resting period 4. quarternary composite type, pliocene caldera type 	<ul style="list-style-type: none"> - Not within SDV of capable volcano consisting of SDV from pyroclastic flow, fall and lava flow - Having significant spatial and temporal probability
5	River flooding		Not exist
6	Human-induced events		Permanent source: Not within SDV radius; <ul style="list-style-type: none"> - 16 km (large airport) - 10 km (small airport) - 30 km (large military facility) - 10 km (small military facility) - 3-5 km (oil refinery, large coal power plant, petrochemical industry) - 3 – 5 km (large port) Mobile source: Not within SDV radius; <ul style="list-style-type: none"> - 1 km (toll/artery road, rail road) - 1 km (oil and gas pipe)
7	Demography	Population Center: Cluster of population of more than 25,000 people	Not less than 1 km of the outside perimeter of population center
8	Spatial planning		Not within protected areas such as protected forest or animal reserve

Based on the integration of all safety aspects, a few areas which satisfies all the criteria are then become the selected candidate sites (Figure 3). The characteristics of selected candidate sites are provided in below Table

Selected Candidate Sites and Their Characteristics

NO	Selected Candidate Sites	Location	Site Characteristics
1	Panjang Island (Pulo Apel District, Serang Regency)	Reference coordinate: 106° 9' 6,6312" and -5° 55' 38,3268". Village: Panjang Island Area: 746 ha	-Safe from external events (volcanic, surface faulting, seismicity, extreme meteorology and coastal flooding). -Not within the Pyroclastic Density Current (PDC) of capable volcano -Surface faulting at > 5 km from potential site -Pga < 0.4 g -Not within an area with tornado or tropical cyclone occurrence -Not submerged by tsunami from historical tectonical occurrence and Mount Krakatau -Not inundated by eustacy within the next 100 years -Not a population center or town and having more than 1 km from the perimeter of population center -Safe from man-induced events having the potential as initiating events - In coherence with spatial planning
2	Bojonegara-Kramatwatu (Bojonegara and Kramatwatu districts, Serang Regency)	Reference coordinate: 106° 6' 28,4472" and -6° 1' 56,3304". Village: Terate, Tonjong, Pamengkang (Kramatwatu District), Argawana, Margagiri and Bojonegara (Bojonegara district). Area: 1993 ha	

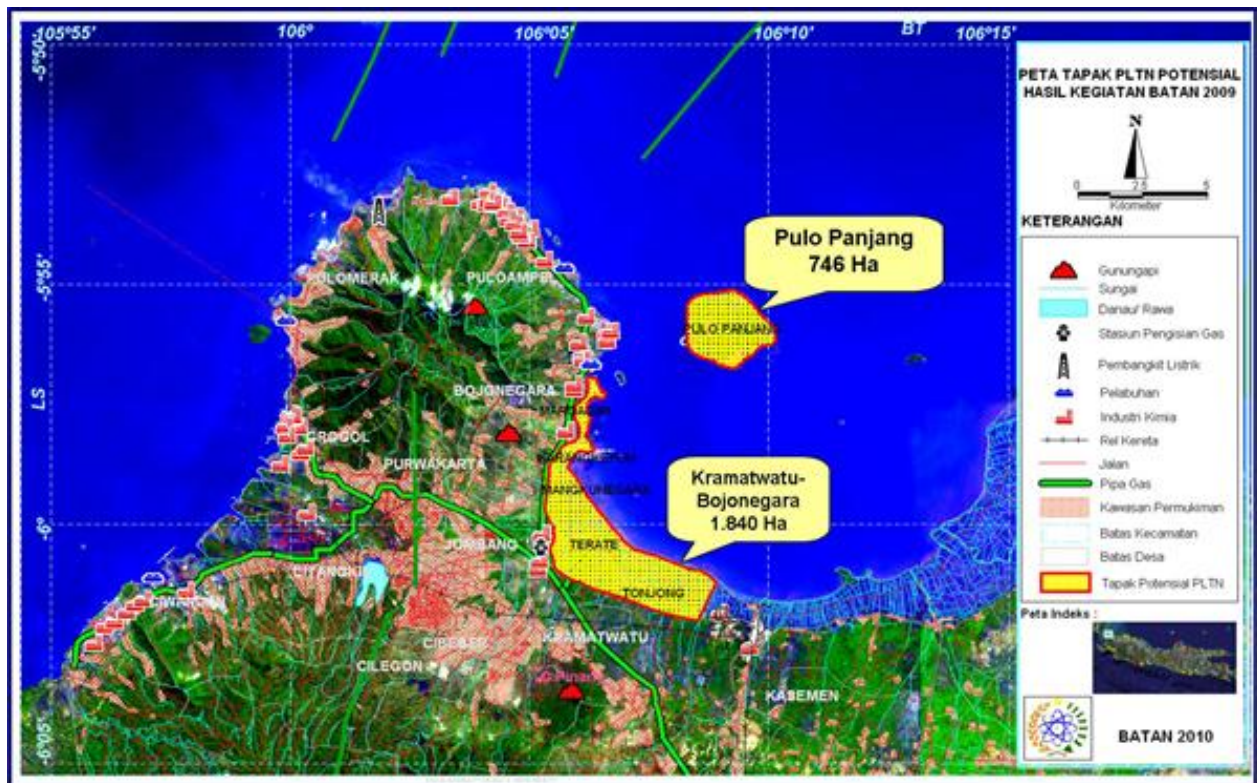


Figure 3. Selected Candidate Sites

Nature of the Bangka Island

Bangka-Belitung Islands Province was formed as the 31st province by Indonesian Government based on the Act No. 27 year 2000 with Pangkal Pinang as its capital city. It consists of two main islands i.e. Bangka and Belitung Islands and several small islands (see Figure 4), located at 104° 50' - 109° 30' E and 0° 50' - 4° 10' S.

The total area of Bangka-Belitung Islands Province is about 81,725.14 km², consisting of land area about 16,424.14 km² or 20.1 percent of the total area and sea area about 65,301 km² or 79.9 percent of the total area.

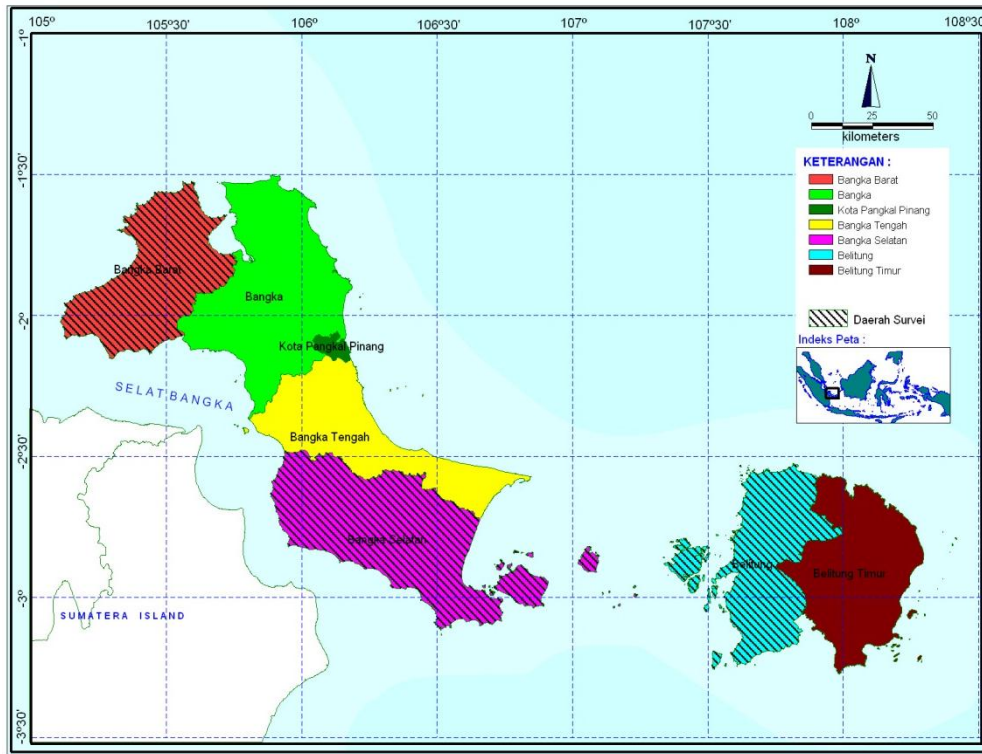


Figure 4. Administrative Map of Bangka-Belitung Islands Province

The hill or mountain lies at the center of Bangka and Belitung Island. The highest level of topography is 675 m at the mountain in the north part of Bangka Island. In general, the slope at the center of Bangka Island ranged from 5% to 40%, while near the coastline, the slope is very gentle.

In terms of the characteristics of the coast line and marine condition in general the seabed has a gentle to slightly steep slope from the coastal line to the sea. The regional bathymetry map is provided in Figure 5.

Bangka and Belitung Islands are located on the area with relatively low seismicity. There are no significant earthquakes in Bangka-Belitung Islands Province. The main earthquake events are along Sumatra Island at the western part as Semangko Fault manifestation (Figure 6). The value of peak ground acceleration on the basement rock for 500 years period is based on SNI 1726-2002 is very small, about 0.03 g.

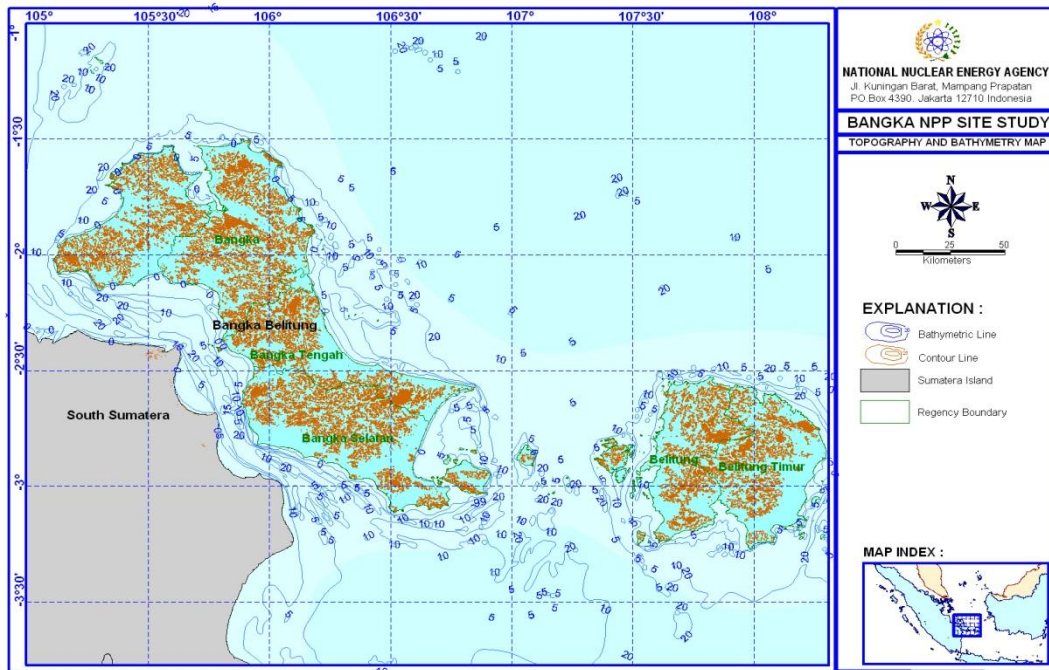


Figure 5. Topography and Bathymetry Map of Bangka Belitung Region

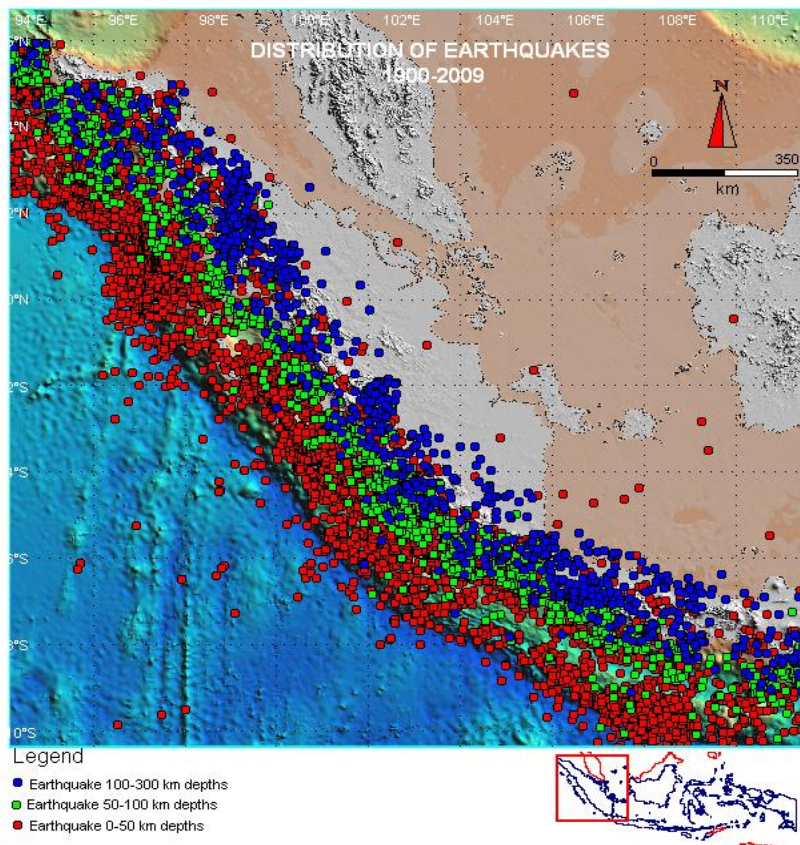


Figure 6. Earthquake Distribution along 1900 – 2009 (source USGS)

The shortest distance of an active volcano (Bukit Lumut Balai) to Bangka is ± 303 km to the southwest direction. There is no volcano in Bangka-Belitung Islands Province (See Figure 7).



Figure 7. Distribution of Active Volcanoes around Bangka-Belitung Islands Province

Geologically, the main formation in Bangka Island is the Tanjung Genting Formation which is dominated by clastic rocks (sandstone) sedimentation of Triassic age which settled at shallow sea and Klabat Granite which is dominated by intrusive granite of Late Triassic age (see Figure 8).

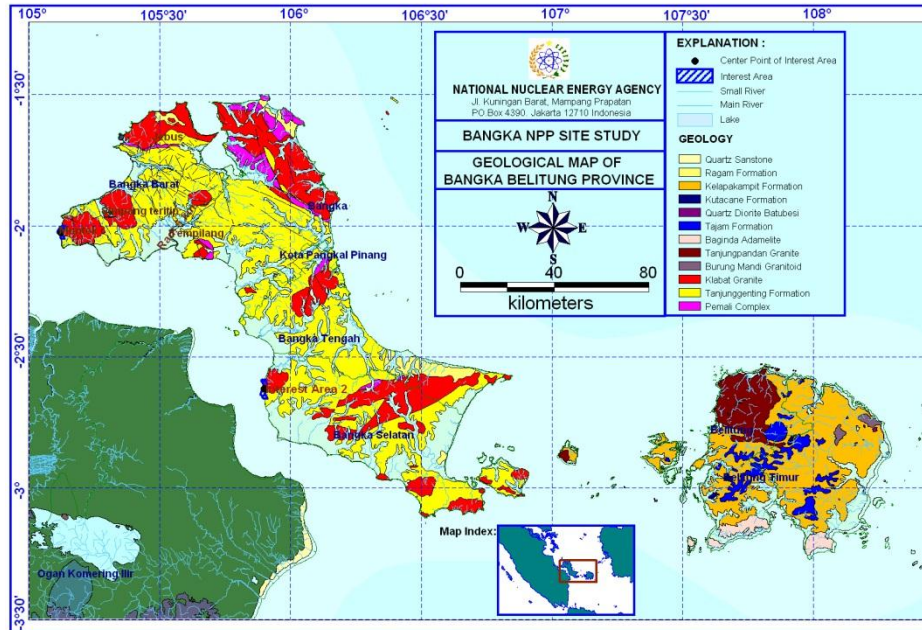


Figure 8. Geological Map of Bangka Belitung Islands Province

Bangka island lies in Sunda peneplain, which is a part of elevated Sunda land. From geological point of view, distribution of tin ore in Indonesia is a continuation of granitic belt of Jurassic to Cretaceous that extends from Burma, Thailand, Malaysia, Riau islands (Singkep, Karimun and Kundur islands), Bangka, Belitung to Karimata islands. The belt is also known as the tin belt, a granite containing casiterite series.

There is no significant tsunami effect in Bangka-Belitung Islands Province. The main sources of tsunami are mostly located in Indian Ocean, at the west side of Sumatera Island. The effect of tsunami from this area is retained by Sumatera Island and therefore the Bangka-Belitung Islands was protected from tsunami hazard.

Demographically, the total population of Bangka-Belitung Islands Province in year 2008 was 1,122,526 people (National Socio-economy Survey, SUSENAS 2008) as shown in Table 16, while population in 2000 was 899,095 people (Year 2000 Population Census), therefore the population growth rate is about 1,19 percent.

Population at Bangka-Belitung Islands Province (2008)

Regency/Municipality	Number of Population		
	Male	Female	Total
Bangka	149,912	127,792	270,704
Bangka Barat	83,641	74,792	158,433
Bangka Tengah	76,903	68,767	145,670
Bangka Selatan	85,042	76,045	161,087
Belitung	73,143	65,404	138,547
Belitung Timur	48,096	43,007	91,103
Pangkalpinang	82,875	74,107	156,982
Total	592,612	529,914	1,122,526

Interest area

According to literature study and field confirmation, all of the visited areas in Bangka Island are free from exclusions factors and therefore they can be considered as areas which are potential to be developed further. However, to enable good site survey management, 2 areas with best characteristics in terms of their acceptability (safety, suitability, and construction cost), proximity to Sumatera Island, and other considerations are selected as the preferred areas for the first NPP sites. The two areas will then be called interest areas. The two interest areas are: (1) Teluk Manggris-Tanah Merah in Bangka Barat Regency, and; (2) Tanjung Berani-Tanjung Krasak in Bangka Selatan Regency (see Figure 9).

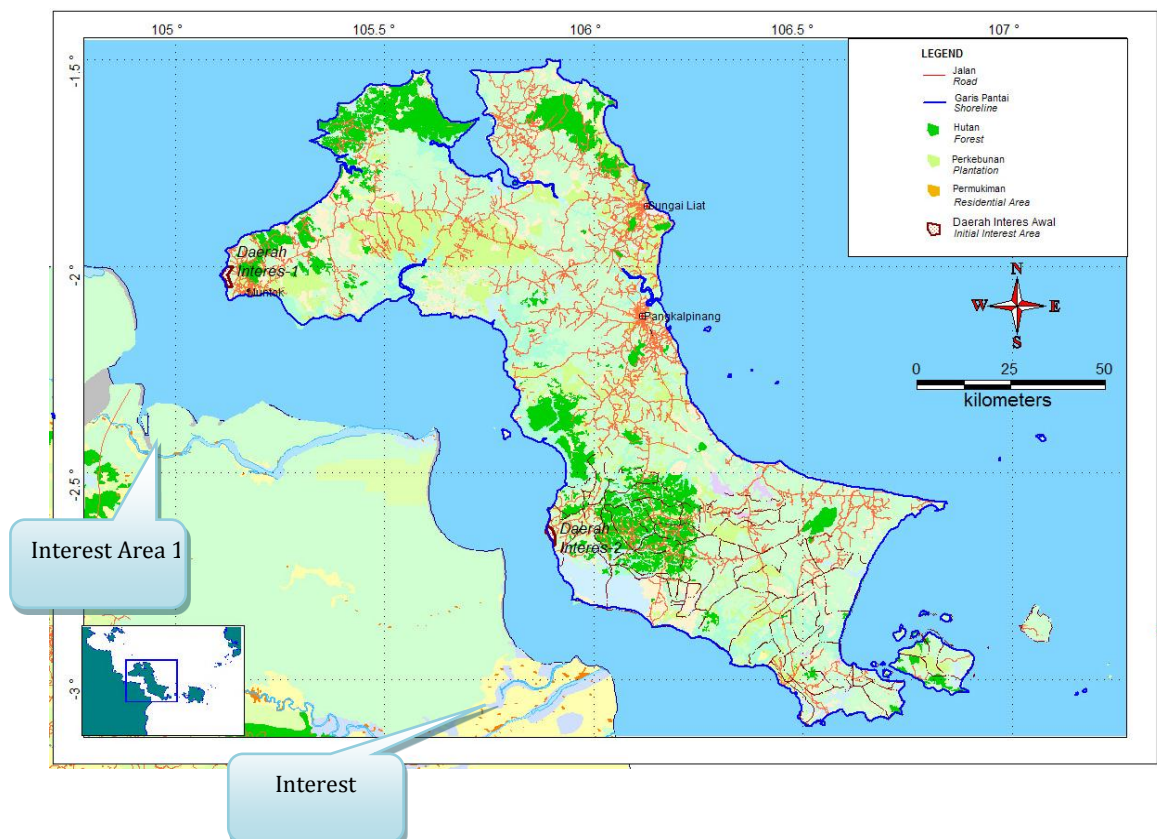


Figure 9. Interest Areas in Bangka Island

The interest area 1 can be reached from Pangkal Pinang through Kelapa by paved road of approximately 140 km long, then continued for about 4 to 6 km by unpaved road, of which only 3 km can only be accessed by car and the rest by motorcycle or by 4 wheel-drive vehicle. The unpaved road needs to be repaired before starting the main activity.

The interest area 2 can be reached from Pangkal Pinang through Sungai Selan, Bangka Kota, Simpang Rimba, Permis, Village, Rajik Village and Sebakin Village by paved road of 83.5 km long. It seems that the unpaved road does not need further improvement before main activities start except for the broken small Sebakin bridge.

Road network including access road to both interest areas is provided in Figure 10

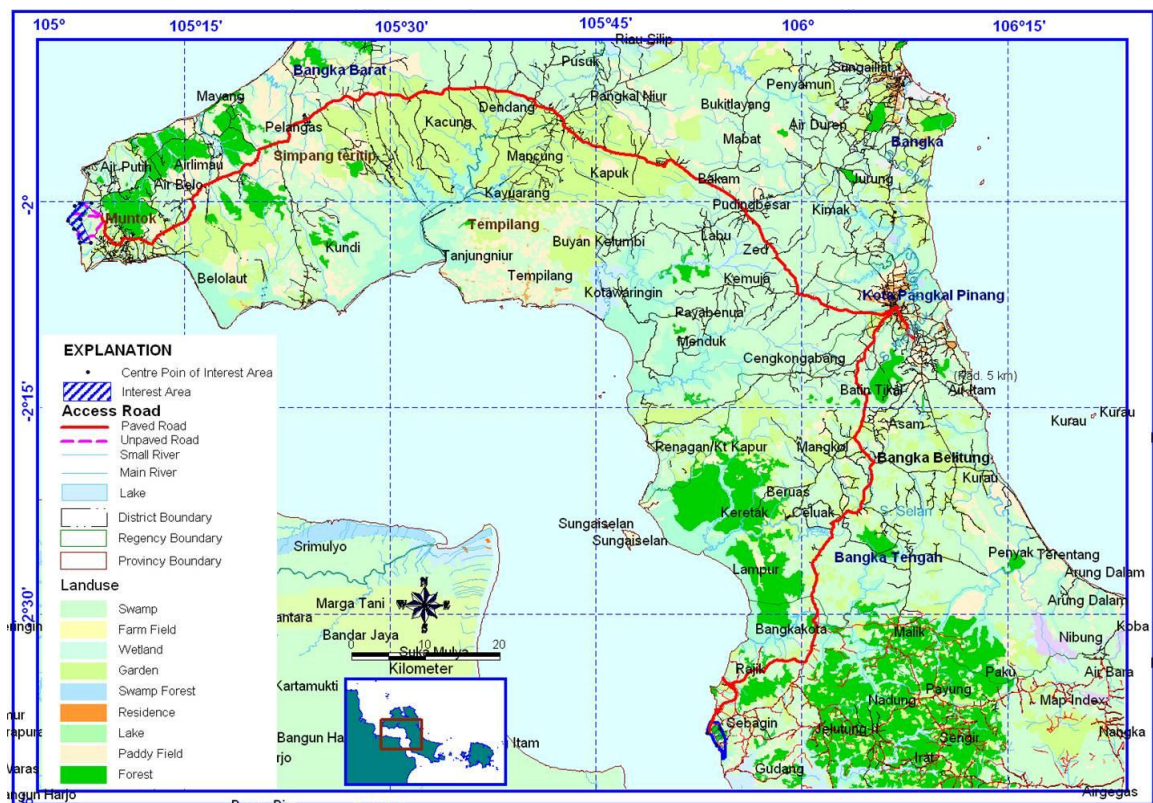


Figure 10. Access Road to Interest Area 1 and 2 from Pangkal Pinang

2.4. ORGANIZATIONS INVOLVED IN CONSTRUCTION OF NPPS

N/A

2.5. ORGANIZATIONS INVOLVED IN OPERATION OF NPPS

N/A

2.6. ORGANIZATIONS INVOLVED IN DECOMMISSIONING OF NPPS

N/A

2.7. FUEL CYCLE INCLUDING WASTE MANAGEMENT

Based on the Act No 10, 1997 on Nuclear Energy, general surveys, explorations and exploitations of nuclear material ore as well as the production and/or procurement of raw materials for manufacturing nuclear fuel shall only be performed by BATAN that may be done in cooperation with state company, co-operative, private company. BATAN shall also perform non-commercial production of nuclear fuel and radioisotopes, while the commercial production shall be performed by state company, co-operative, and/or private company.

Act 10, 1997 stipulated that the radioactive waste management shall be performed by BATAN. Low level and intermediate level radioactive waste generated shall collect, segregate, treat and temporarily stored before being transferred to BATAN. High level radioactive waste (i.e. spent fuel) generated shall temporarily be stored for a period not less than the life time of nuclear reactor.

A final repository for high level radioactive wastes shall be provided by BATAN.

2.8. RESEARCH AND DEVELOPMENT

2.8.1. R&D ORGANIZATIONS

Researches and development of nuclear science and technology are mainly implemented by BATAN. Nuclear R&D activities are classified into reactor safety, radiation safety, environmental safety, radiation and radioisotope application, and radioactive waste-management. R&D activities are implemented in several nuclear complexes as the following.

SERPONG NUCLEAR COMPLEX

There are many centres in the Serpong Nuclear Complex for research & development and engineering of nuclear science and technology that have been built with the objectives to support development of the nuclear industry and for preparation, development as well as the operation of Nuclear Power Plants in Indonesia.

The development of installations and laboratories of the Serpong Nuclear Complex had been conducted in 3 phases beginning in 1983 and fully completed in 1992. The area is about 25

hectares and is located in the National Center for Research of Science and Technology (PUSPIPTEK), Serpong.

The main facility in the area is the GA. Siwabessy Multipurpose Research Reactor with a power of 30 MWth. The Installation is used for Production of Research Reactor Fuel Element, Radioisotopes and Radiopharmaceuticals Installation, Experimental Fuel Element Installation, Radioactive Waste Processing Installation, Radiometallurgy Installation, Reactor Safety and Engineering Installation, Facility for Development of Informatics and Computation, Nuclear Mechano-Electronic Installation, Neutron Spectrometry Installation, as well as Storage for Spent Fuel Elements and Contaminated Materials Installation.

BANDUNG NUCLEAR COMPLEX

The Bandung Nuclear Complex was initially constructed in early 1960's on an area of 3 hectares and where the first research reactor was built in Indonesia. The activities conducted covers the utilization of the reactor for research and fostering of expertise, R&D of basic materials, radioisotopes and labelled compounds, instrumentation and radiometry analysis techniques, supervision of occupational radiation safety and environment.

In addition, nuclear medicine firstly developed in Bandung nuclear complex was the embryo of the nuclear medicine in Indonesia. The activities of nuclear medicine are then further developed in several hospitals in Indonesia.

In order to support the R&D activities, the Bandung Nuclear Complex utilizes various facilities, among others, the Triga Mark II Reactor which started with a power of 250 kW in 1965. The power of this reactor was increased to 1000 kW in 1971 and further to 2000 kW in the year 2000.

Other facilities in this area are the laboratory for physics, chemistry and biology, production of isotopes and labelled compounds.

YOGYAKARTA NUCLEAR COMPLEX

The Yogyakarta Nuclear Complex was established in 1974 on a land of 8.5 hectares. The Center for Technology of Accelerator and Material Process and the Polytechnic Institute of Nuclear Technology are located within this area.

The activities conducted covers R&D in nuclear physics, chemistry, technology of low and medium energy particle accelerator, process technology, analysis of nuclear materials and reactor, as well as the use of the reactor for research and fostering of expertise.

In addition, supervision of occupational radiation safety and of environmental radioactivity is also conducted. Meanwhile the Polytechnic Institute of Nuclear Technology conducts programmes of education in the field of nuclear science and technology.

The facilities in this area are the Kartini Research with a power of 100 kW, complemented with a subcritical assembly, a laboratory for pure materials research, accelerators, laboratories for nuclear physics and chemistry, a work safety and health facility, library facilities, as well as laboratory facilities for education.

PASAR JUM'AT NUCLEAR COMPLEX

The Pasar Jum'at Nuclear Complex was built in 1966 in an area of about 20 hectares. In this area, Center for Application of Isotope and Radiation Technology, Center for Technology of Radiation Safety and Metrology, Center for Development of Nuclear Geology, Center for Education and Training and Center for Dissemination of Nuclear Science and Technology are located.

In this area, among others are the following facilities: 3 units of Co-60 Gamma Irradiators, 2 electron beam machines, laboratory for uranium processing, radiation measuring equipment, chemistry, biology, process and hydrology, education and training facility as well as a permanent exhibition for nuclear science and technology.

MONITORING STATIONS FOR MICRO-EARTHQUAKES AND METEOROLOGY JEPARA - CENTRAL JAVA

Studies show that the region of the Muria Peninsula may be a suitable location for the first NPPs site. Therefore, since 1982 a Monitoring Station for Micro- Earthquakes Meteorology has been built and operated in the Ujung Watu village in Jepara - Central Java. The micro-earthquakes monitoring station records the earthquakes data originating from volcanic as well as tectonic earthquakes, whereas the meteorology station is applied to record air pressure, wind speed and direction, air temperature, humidity and solar radiation.

2.8.2. DEVELOPMENT OF ADVANCED NUCLEAR TECHNOLOGIES

Indonesia is willing to participate in the development of nuclear reactor system through INPRO project. There is also a plan to develop HTR design with co-generation purposes.

2.8.3. INTERNATIONAL CO-OPERATION AND INITIATIVES

Indonesia has signed a number of international agreements as well as conducted bilateral and multilateral cooperations in the field of nuclear power development. A complete list of international agreements and cooperations is provided in Appendix 1.

2.9. HUMAN RESOURCES DEVELOPMENT

A human resource development (HRD) plan identifying the human resources needed by organization implementing nuclear energy program has been addressed in the study on HRD Program and HRD Blue Print carried in 2008.

Since qualified professionals and technicians are demanded in planning and implementing nuclear power plant program, it is necessary to obtain some highly specialized experts and training from domestic and abroad, in particular during the early implementation stages of a nuclear power program. However, this can only be applied in a very limited way and it certainly does not constitute a long-term solution.

TRS 200 IAEA has been used to identify competences and human resources needed by future organization of NPP. More detail competences and human resources needed for future organization and blue print of Human Resources Development (HRD) program and concept of Nuclear Training Center (NTC) facilities are being conducted by interdepartmental organization include MEMR, BATAN, Department of Labor and Transmigration, BAPETEN, and Ministry of Research & Technology.

In order to develop and maintain human resources, BATAN has sent many personnel abroad to obtain Master and Doctoral degree and is sending personnel abroad to notable NPP Company such as General electric, Westinghouse Companies, Atomic Energy of Canada Limited, Mitsubishi, Korea Nuclear and Hydro Power (KHNP), Korea Atomic Energy Research Institute (KAERI) and Korea Power Engineering Company (KOPEC).

BATAN has established the Education and Training Center (PUSDIKLAT), which is responsible for the implementation of education and training programs, especially in the nuclear science and technology related to BATAN's competency. The development program is oriented to provide well educated and well trained personnel in the fields of research, development and application of nuclear technology, as well as to promote nuclear science and technology to the public, especially industrial society, through education and training program.

Moreover, BATAN has also established a higher education institute called College of Nuclear Technology (STTN) based on Presidential Decree No. 71 Year 2001. STTN is an official education institute carrying out nuclear science and technology man-power development program through carefully crafted four year education. STTN has two majors study programs as follows:

1. Nuclear Techno-Chemistry – the purpose of this major is to educate students in the field of chemical processes using nuclear technology (nuclear techno-chemistry)
2. Nuclear Techno-Physics –The purpose of this major is to educate students in the field of monitoring, measuring, and controlling physical processes related to nuclear reaction and radiation.

In addition, for human resources development, BATAN has established cooperation with Gadjah Mada University, University of Indonesia, and Bandung Technology Institute in various fields of study.

The participation of key stakeholder organizations in the development and review analysis, which identifies the competences needed, is indicated by the Decree of ETC-MEMR Chairman No. 105K Year 2008 and Decree of BATAN Chairman No. 071 Year 2009. The stakeholders involved are BATAN, BAPETEN, MEMR, Ministry of Research and Technology, Department of Labor and Transmigration, and universities.

GOVERNMENT ORGANIZATIONS RELATED TO NUCLEAR HUMAN RESOURCES DEVELOPMENT
The following are the three national organizations for Human resources Development (HRD):

The National Nuclear Energy Agency (BATAN)

HRD in the field of nuclear energy has been carried out by BATAN for a long time. The capability of national human resources has been demonstrated in the construction and operation of three research reactors in Indonesia i.e. Triga Mark II in Bandung in 1965, Kartini Reactor in Yogyakarta in 1979 and Multipurpose Reactor of GA Siwabessy in 1983 to support the facilities in Puspitpek Area, Serpong. The education and training programme has been directed to cope with the nuclear energy utilization era and to meet the national energy needs and carried out in cooperation with related domestic and overseas research institutions.

The Education and Training Center (PUSDIKLAT), BATAN

Based on the Decree of the BATAN Chairman No. 166/KA/IV/2001, Pusat Pendidikan dan Latihan (PUSDIKLAT-BATAN) or the Education and Training Center (ETC) is responsible for implementing education and training programme, especially in the nuclear science and technology related to BATAN's competency.

The development programme is oriented to provide well educated and well trained personnel in the fields of research, development and application of nuclear technology, as well as to promote nuclear science and technology to the public, especially industrial society, through education and training programme.

The Nuclear Energy Regulatory Agency (BAPETEN)

BAPETEN as the regulatory body in Indonesia, is implementing training program for their staffs and other institutions which need license for utilization of nuclear energy. The type of the training programme includes:

1. Research reactor inspection
2. Re-qualification of radiation protection worker
3. Environmental Radiation Inspector
4. Nuclear emergency preparedness and safeguard
5. Assessor
6. Legal drafting
7. Others

In 2005 and 2006, BAPETEN had cooperated with the International Atomic Energy Agency in the project titled “Preparation of Regulations, Code, Guides and Standards for a Nuclear Power Plant”. The training programmes were as follows:

1. National Training on Legal Infrastructure and Site Evaluation
2. National Training on Safety for Design
3. Fellowship Training and Scientific Visit
- 4.

EDUCATIONAL ORGANIZATIONS WHICH ARE RESPONSIBLE FOR NUCLEAR EDUCATION AND TRAINING.

Almost all universities in Indonesia have engineering faculties which are needed for NPP HR such as mechanical, civil, electrical (electronic), and physics. However, there is only one higher level education under BATAN i.e. Sekolah Tinggi Teknologi Nuklir (STTN) or Polytechnic Institute of Nuclear Technology (PoINT) with specialization in nuclear technology.

Sekolah Tinggi Teknologi Nuklir (STTN)

STTN was inaugurated in August 2001 in Yogyakarta based on the Presidential Decree No. 71, of 2001 on the establishment of STTN and accredited as a higher education institute for graduate program. STTN is an official education institute carrying out nuclear science and technology manpower development program through carefully crafted four year education. STTN has two majors study programmes as follows:

- **Nuclear Techno-chemistry.** The purpose of this major is to educate students in the field of chemical processes using nuclear technology (nuclear techno-chemistry).
- **Nuclear Techno-physics.** The purpose of this major is to educate students in the field of monitoring, measuring, and controlling physical processes related to nuclear reaction and radiation.

The University of Gadjah Mada (UGM)

The University of Gajah Mada (UGM) runs graduate and post-graduate programmes in nuclear education under the Engineering Physics Department. There are two graduate programmes in Nuclear Engineering and Engineering Physics and one post-graduate in Industry Safety Engineering. Engineering Physics Department is also undertaking a special program in with Medical Instrumentation and Medical Physics Technology in collaboration with the Health Department.

Bandung Institute of Technology (ITB)

ITB undertakes nuclear energy related science and engineering study under physics program in the faculty of mathematics and natural science and under mechanical and aeronautical engineering in the faculty of engineering as well as School of Electrical and Informatic Engineering. These faculties undertake Masters degree (S2), and Doctorate degree (S3) study programs.

ITB offers fundamental physics at the basic level and advanced physics at upper level as compulsory courses. The elective courses include Theoretical Physics; Physics of Electronic Material; Physics of Magnetic and Photonic; Earth Physics, Computational Physics; Nuclear and Reactor Physics; Biophysics and Medical Physics; and Instrumentation.

At the Masters degree level in physics, students may choose one out of the following five research areas: High Energy Theoretical Physics and Instrumentation; Physics of Electronic Material; Physics of Complex System; Nuclear Physics & Biophysics; Physics of Magnetism and Photonics.

2.10. STAKEHOLDER COMMUNICATION

Within the framework of public information and communication, BATAN and the Ministry of Research and Technology have undertaken several activities in public information and education.

Public information and education are carried out for disseminating information on nuclear power program to various target audiences, which include parliamentary representatives, government executives, politicians, journalist and editors, social organizations (including women associations), local representatives and religious leaders, professional groups (engineers, ecologists, sociologist, culture researchers, artists etc.), schools/universities (schools/universities/colleges, students, teachers, lectures), and the armed forces.

The means of disseminating public information and education are through several periodic events including exhibitions, opening events of any nuclear facility of information center involving high ranking officials, visit to nuclear research or power plants for decision makers (parliamentary representatives, civil servant), and for opinion leaders (newspapers, radio, TV), national seminar on nuclear technology and energy, inviting speakers from various domestic and overseas institutions.

3. NATIONAL LAWS AND REGULATIONS

3.1. REGULATORY AUTHORITY(S) AND THE LICENSING PROCESS

3.1.1. GOVERNMENTAL ORGANIZATIONS

In recognition of the need to develop a viable nuclear regulatory infrastructure for the development of nuclear power, the government of Indonesia issued in 1997 Act No. 10 on Nuclear Energy. In this Nuclear Energy Act, the authority to execute and regulate activities relating to nuclear energy was separated into two different institutions i.e. BATAN as the body to promote all nuclear activities and BAPETEN as the regulatory body.

NUCLEAR SAFETY LEGISLATION

The 1997 Act No.10 on Nuclear Energy, stipulates among other functions the following:

1. Establishment of a Nuclear Energy Advisory Council which will be responsible to give advice to both promoting and regulatory bodies concerning nuclear energy development in Indonesia.
2. Radioactive waste management control including the need of approval from the House of Representatives regarding decision for permanent site of high level waste disposal.
3. Financial protection in the form of liability insurance (strict liability/liability without fault) required in all aspects of nuclear activities.
4. Cooperation of private sectors in the nuclear application activities for commercial purposes.

In consideration that nuclear energy involves the life and safety of the people, public participation shall be enhanced in the form of an advisory council, a non-structural and independent institution that consists of experts and public figures, having the task to give advices and opinion on the use of nuclear energy.

To take in mind the public aspiration on the use of nuclear energy, especially for construction of a nuclear power plant and a final radioactive waste repository, the Government, before taking decision, shall consult the House of Representatives of the Republic of Indonesia.

Furthermore, it is also necessary to consult other related regulations such as the following:

1. Act No. 1 Year 1970 on Occupational Safety,
2. Act No. 8 Year 1978 on the Ratification of Treaty on Nuclear Proliferation of Nuclear Weapons,
3. Act No. 30 Year 2007 on Energy,
4. Act No. 23 Year 1997 on Environmental Management,

5. Act No. 5 Year 1984 on Industry,
6. Act Number 15 Year 1985 on Electricity,
7. Act No. 3 Year 1992 on the Insurance for Workers,
8. Act No. 23 Year 1992 on Health,
9. Act No. 26 Year 2007 on Spatial Planning, and
10. Act Number 10 Year 1995 on Customs.

ROLE & RESPONSIBILITY OF THE REGULATORY BODY

BAPETEN, as an independent regulatory body, has responsibility to ensure that any activity related to the use of any nuclear energy is performed to maintain the safety, security, and peace, as well as the health of the workers and the public, and also the protection of the environment. These are administered by:

1. Drafting and establishing nuclear safety regulations
2. Controlling nuclear installations and nuclear materials through licensing and inspection systems that covered all stages of NPP establishment (from site evaluation to decommissioning stages);
3. Controlling the use of radioactive materials and other radiation sources through licensing and inspection systems.

The primary objective of the regulatory body is to ensure that workers, the public and the environment are protected from possible adverse effects arising from nuclear activity. In order to achieve these objectives, BAPETEN has responsibility in:

1. the rule-making of national policy in the field of the control of nuclear energy utilization;
2. the planning of national program in the field of the control of nuclear energy utilization;
3. the guidance and the rule-making and the implementation of nuclear safety, radiation safety, and safeguards assessments;
4. the implementation of licensing and inspection to the development and the operation of nuclear reactor, nuclear installation, nuclear material facility, radiation source, and the development of nuclear preparedness;
5. the implementation of co-operation in the field of control of nuclear energy utilization with other Government agencies or organizations either internally or externally to the Government of Indonesia;
6. the implementation of safeguards and SSAC (State's system on accounting for and control of nuclear material);
7. the implementation of the guidance and counselling for the effort that related to the safety and health of the worker and the people, and the effort of environmental conservation.

3.1.2. ORGANIZATION OF THE REGULATORY BODY

BAPETEN is headed by a chairman assisted by two deputies and one executive secretariate. It has seven directorates, 2 centers for assessment, three bureaus, and one inspectorate, as shown in Figure 11 below. According to Decree No.01/K-OTK/VIII-1998 the Chairman of BAPETEN shall directly report to the President.

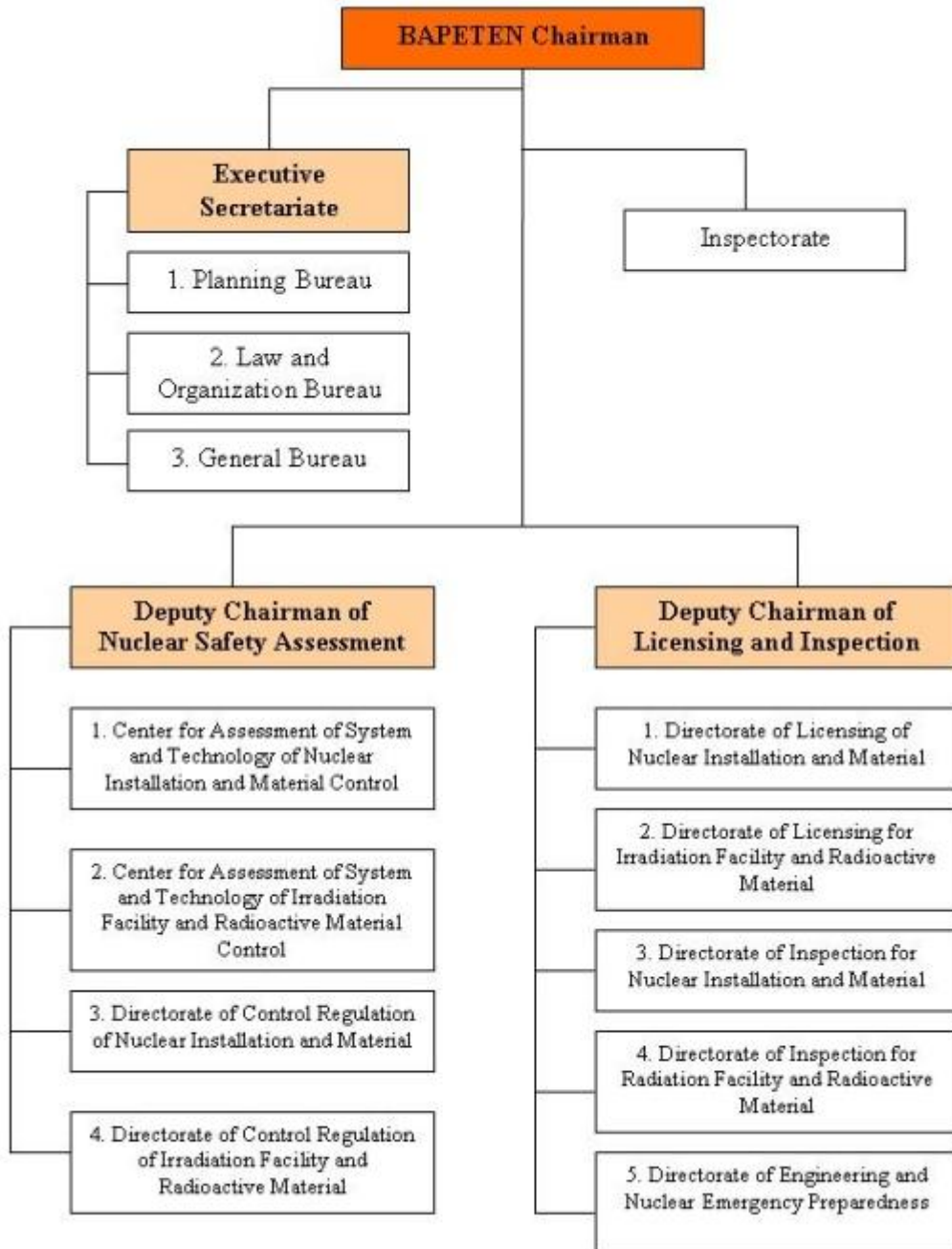


Figure 11 Organisation Chart of the regulatory body

3.1.3. OVERALL LICENSING PROCESS FOR NUCLEAR FACILITIES

Based on the government Regulation No 43 in 2006 on Nuclear Reactor Licensing, the construction and operation of a nuclear reactor can be performed after obtaining a license from BAPETEN. The license will be issued in the following stages: Site Permit, Construction Permit, Operating License, and Decommissioning Permit. There are two procedures for obtaining a license, which are as the follows:

Five stage licensing procedure:

1. Site permit
2. Construction Permit
3. Commissioning Permit/License
4. Operating License
5. Decommissioning Permit

Three stage licensing procedure (for commercial modular reactor only)

1. Site Permit
2. Combined Licensing (Construction, Commissioning and Operation)
3. Decommissioning Permit.

Evaluation of application for license for each stage is carried out within a certain period (after all required documents are submitted to BAPETEN and the administrative requirements have been fulfilled by applicant): 12 months for Site Permit, 24 months for Construction Permit, 12 months for commissioning permit, 24 months for Operating License, and 12 months for Decommissioning Permit.

For the three stage licensing procedure, 24 months for operation combined license. During the period of evaluation, BAPETEN can ask the applicant to provide additional information(s) on the proposed installation as deemed necessary.

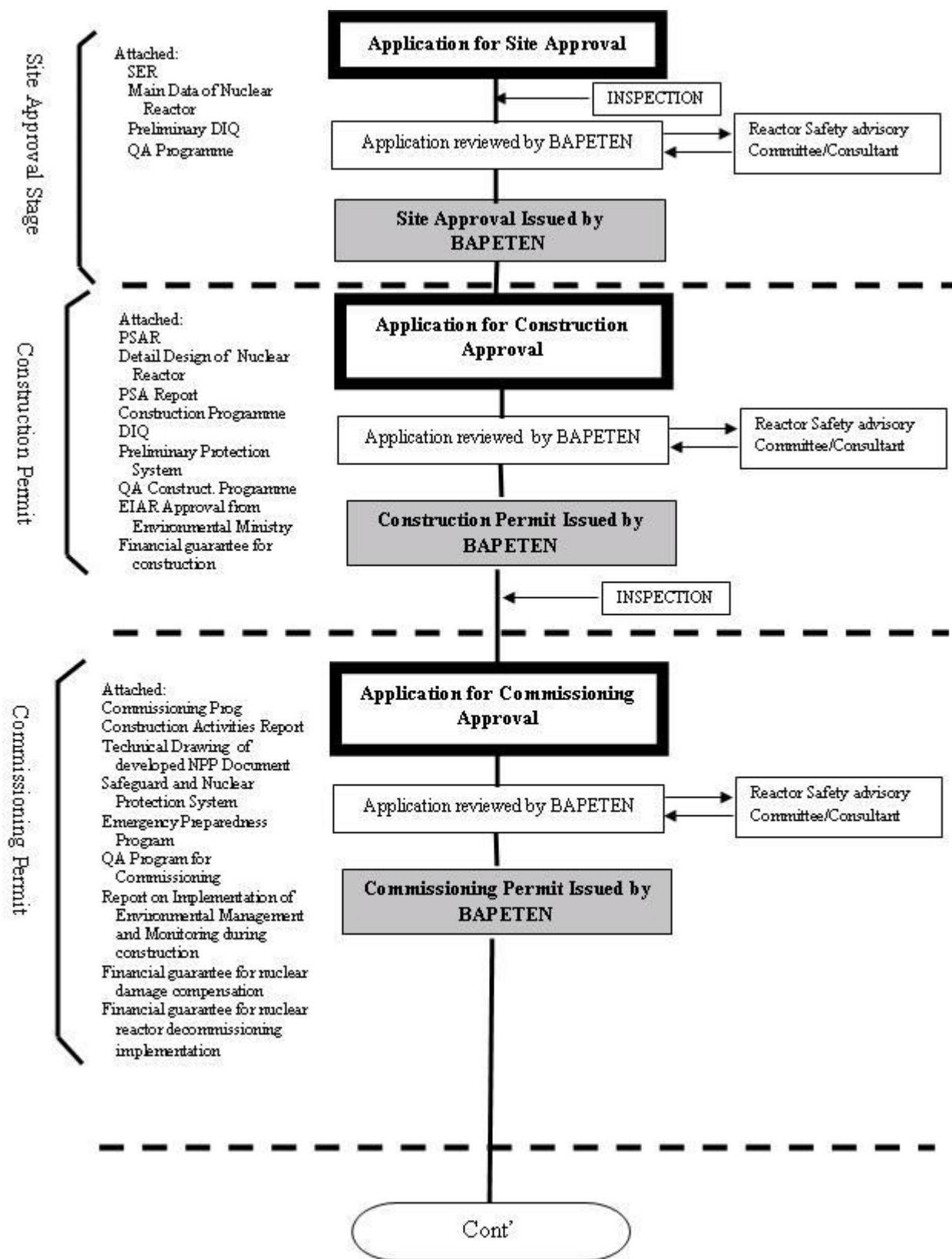


Figure 12. Diagram of the Entire Licensing Process

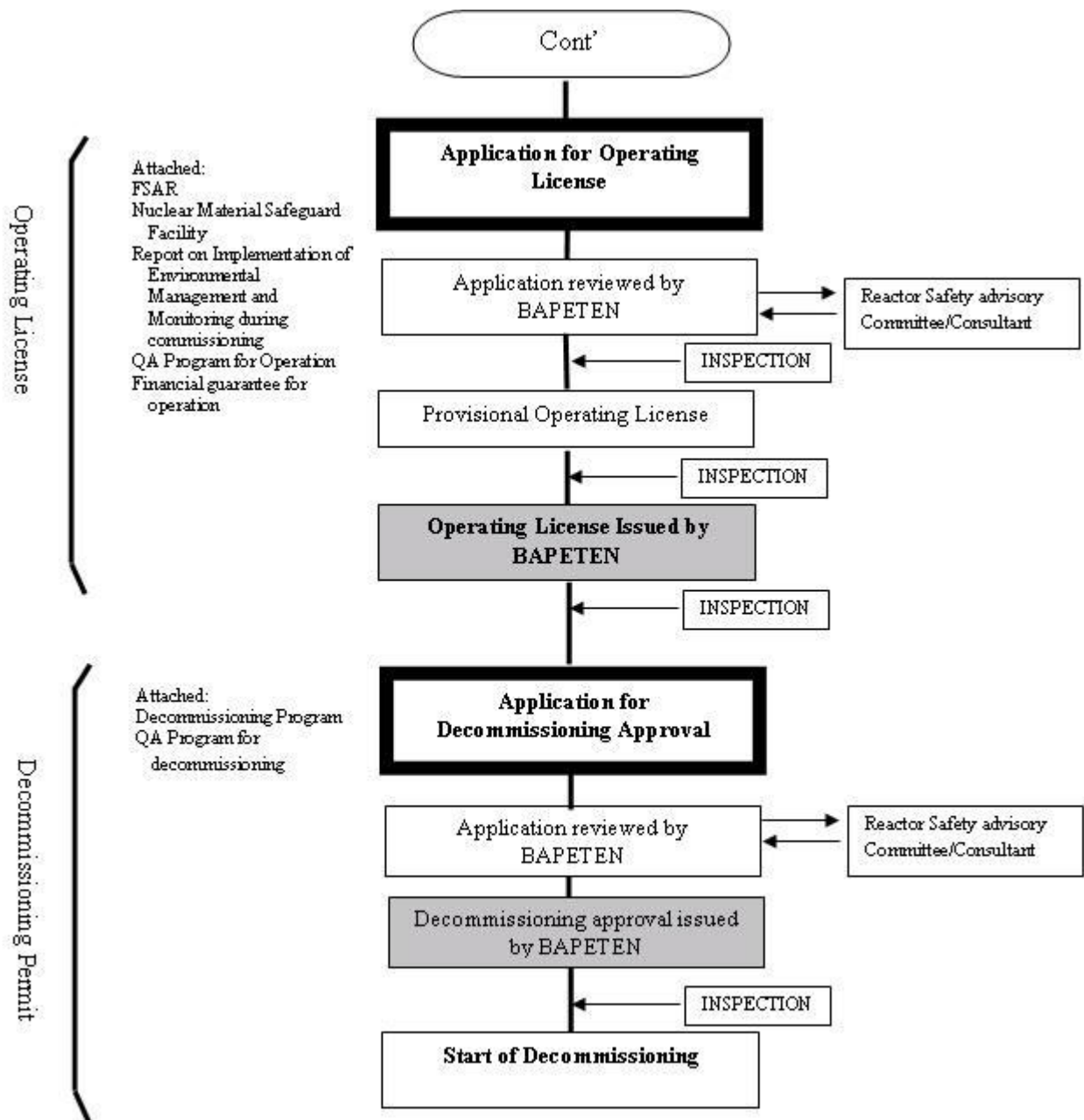


Figure 13. Diagram of the Entire Licensing Process (cont')

3.1.4. SITE PERMIT

Applicant should evaluate the preferred candidate site before applying for site permit. Application for site permit should be submitted to BAPETEN completed with site evaluation report, NPP main data, preliminary Design Information Questionnaire (DIQ) and records of quality assurance program implementation. The basic objectives of the site permit stage are to evaluate the conceptual design of the plant and to determine whether it is feasible

to design, construct, and operate the plant on the proposed site to satisfy the safety objectives and requirements established by BAPETEN.

Construction Permit

Prior to the issuance of a construction permit, BAPETEN must be assured that the plant design satisfies the safety principles and requirements set out by BAPETEN and the plant will be built in accordance to appropriate quality standards. The primary documents required are Preliminary Safety Analysis Report, Probabilistic Safety Assessment, DIQ, and construction schedule including financial guarantee for construction.

Commissioning License

Applicant should apply for commissioning permit after fulfilling the following requirements:

- (a) Construction activity has been completed.
- (b) Applicant has obtained nuclear material utilization permit.
- (c) Applicant has obtained licensed reactor operators.

Operating License

Applicant should apply for operating permit to BAPETEN by fulfilling the following requirements:

- (a) Commissioning activities have been completed.
- (b) Applicant has obtained nuclear material utilization permit.
- (c) Applicant has obtained licensed reactor operators.

The requirements include submission of a Final Safety Analysis Report, completion of a previously approved commissioning programme, examination and authorization of personnel, approval of operating policies and principles, preparation of plans and procedures for dealing with nuclear emergencies, and specific programmes for QA during Operation and Maintenance of the nuclear reactor.

The Operating License is issued in two stages as follows:

1. A Provisional Operating License is first issued for a maximum period of 24 months, including pre-operational and preliminary operational stages;
2. If and only if the provisional operation stage runs well and all requirements including implementation of the environmental management and monitoring plans are fulfilled, then a Long Term Operating License could be issued for a maximum period of 40 years. Otherwise, the Provisional Operating License will be extended for a certain

period as stated by BAPETEN based on results of evaluation from the latest condition (Reports on safety analysis, operation activity and ageing assessment).

Among the conditions included in the Operating License is the requirement that the Licensee informs BAPETEN promptly of any occurrence or situation, which could alter the safety of the plant. BAPETEN retains the right to impose additional conditions at any time.

Although the primary responsibility for the safe operation of the plant remains with the Licensee, there is periodic inspection and audit by BAPETEN inspectors, annual reviews of operation, and major reviews at the time of renewal of the Operating License.

Decommissioning Permit

If the Licensee does not wish to renew the Operating License, the licensee should submit an application for decommissioning to BAPETEN. The application for the permit should include decommissioning plans and procedures in accordance with provisions set by BAPETEN.

During and after decommissioning, BAPETEN carries out inspections to check whether the job has been done satisfactorily and safely, and the installation holds no more hazards to the public and the environment.

3.2. MAIN NATIONAL LAWS AND REGULATIONS ON NUCLEAR POWER

Hierarchy of regulation in Indonesia is provided in Figure 14. The highest regulation level is the 1945 Constitution followed by Act, Government Regulation and Presidential Decree, and Ministry/Chairman of BAPETEN. In the lowest level is guide and standard.

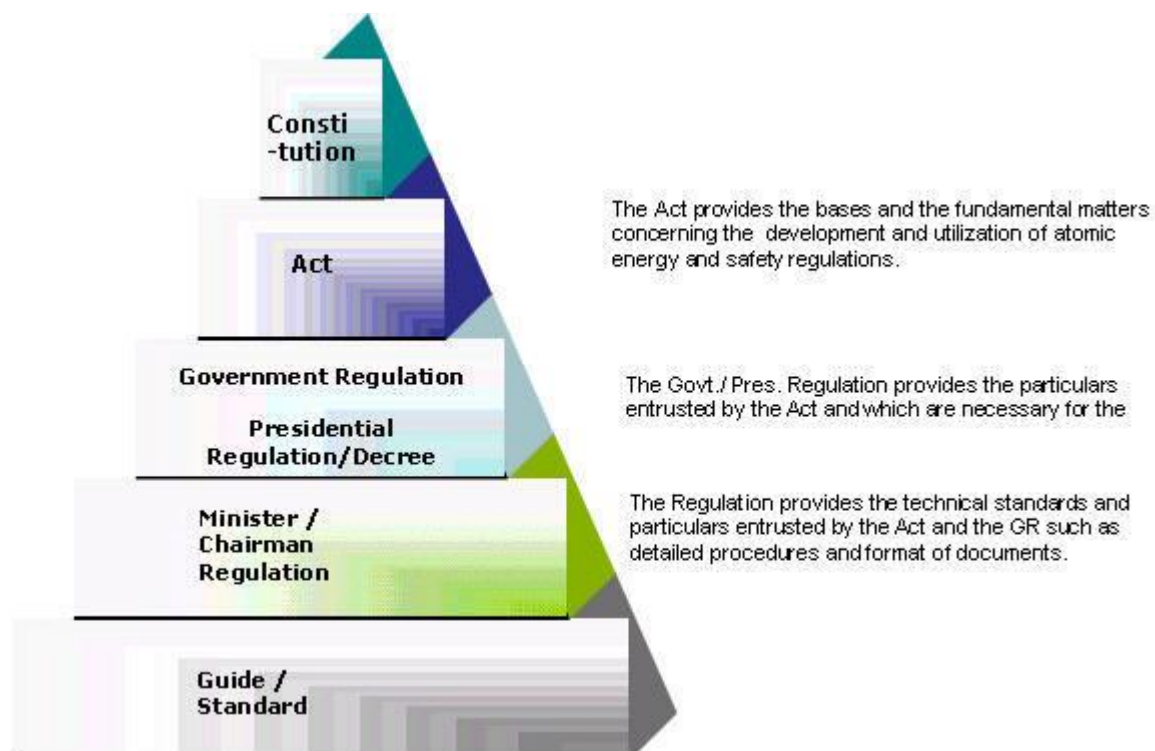


Figure 14. Hierarchy of Legislation in Indonesia

A number of regulations regarding to the NPP establishment have been prepared as follows:

1) **Act:**

- Act No 25 Year 2007 on Investment
- Act No 17 Year 2007 on National Long Term Development Planning
- Act No 30 Year 2007 on Energy.
- Act No 3 Year 2002 on National Defence
- Act No. 9 Year 1997 on Treaty on South East Asia Nuclear Weapon Free Zone
- Act No. 10 Year 1997 on Nuclear Energy.
- Act No. 8 Year 1978 on Ratification of NPT.

2) **Government Regulation (GR):**

- GR No. 29 Year 2008 on the Licensing on the Utilization of Ionizing Radiation Source and Nuclear Material
- GR No 33 Year 2007 on the Safety of Ionizing Radiation and the Security of Radioactive Source.
- GR No 43 Year 2006 on Nuclear Reactor Licensing
- GR No 26 Year 2002 on Safety of Radioactive Material Transport
- GR No 27 Year 2002 on Radioactive Waste Management
- GR No 63 Year 2000 on Safety and Health concerning Utilization of Ionizing Radiation
- GR No 64 Year 2000 on Licensing for Utilizing of Nuclear Energy
- Draft of GR on Nuclear Emergency Preparedness and Its Mitigation
- GR No 20 Year 1994 on Investment

3) **Presidential Decree:**

- Presidential Decree No 106 Year 2001 on Ratification of Convention on Nuclear Safety
- Presidential Decree No 66 Year 1999 on Radiation Risk and Subvention
- Presidential Decree No 81 Year 1993 on Ratification of Convention on Early Notification of a Nuclear Accident.
- Presidential Decree No 82 Year 1993 on Ratification of Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency
- Presidential Decree No 187 Year 1998 on BATAN and BAPETEN Establishment. This decree indicates existence of independent regulatory body.
- Presidential Decree No 49 Year 1986 on Ratification of Convention on the Physical Protection of Nuclear Material.

4) **BAPETEN Chairman Regulation (BCR):**

- BCR No.01/Ka-BAPETEN/V-99 Year 1999 on Working Safety Provision against Radiation.
- BCR No.02/Ka-BAPETEN/V-99 Year 1999 on Limit Values for Radioactivity in Environment.
- BCR No.03/Ka-BAPETEN/V-99 Year 1999 on Safety Provisions for Radioactive Waste Management.
- BCR No.04/Ka-BAPETEN/V-99 Year 1999 on Safety Requirements for Transport of Radioactive Material.
- BCR No.07/Ka-BAPETEN/V-99 Year on Quality Assurance for Nuclear Installation.
- BCR No.01-P/Ka-BAPETEN/VI-99 Year 1999 on Guide for Selection of Nuclear Reactor Site.
- BCR No. 04-P/Ka-BAPETEN/I-03 Year 2003 on Guide for Training for Supervisors and Operator of Nuclear Reactors.
- BCR No 05-P /Ka-BAPETEN/I-03 Year 2003 on Guidance for Emergency Preparedness Planning.
- BCR No 2 Year 2005 on System on Accounting for and Control of Nuclear Material.
- BCR No 5 Year 2007 on Safety Guidance on Evaluation of Nuclear Reactor Site
- BCR No 1 Year 2008 on Nuclear Power Site Evaluation for Seismicity Aspect.
- BCR No 2 Year 2008 on Nuclear Power Site Evaluation for Volcanic Aspect.
- BCR No 3 Year 2008 on Nuclear Power Site Evaluation for Aspects of Determination of Radioactive Material Dispersion in Atmosphere and Aquatic, and Consideration of Population Distribution surrounding the Power Reactor Site vicinity .
- BCR No 4 Year 2008 on Nuclear Power Site Evaluation for Aspects of Geotechnics and Power Reactor Foundation.
- BCR No 5 Year 2008 on Nuclear Power Site Evaluation for Meteorology Aspect.
- BCR No 6 Year 2008 on Nuclear Power Site Evaluation for External Human Induced Events Aspect.
- BCR No 9 Year 2008 on Additional Protocol to State System on Accounting for and Control of Nuclear Material.
- BCR No 10 Year 2008 on Certification for Personnel of Nuclear Installations.
- BCR No 1 Year 2009 on Physical Protection for Nuclear Installations and Nuclear Material.
- BCR No 2 Year 2009 on Design Information Questionnaire for Nuclear Installations.
- BCR No 3 Year 2009 on Limiting Condition of Operation for Nuclear Power Plants.
- BCR No 4 Year 2009 on Decommissioning of Nuclear Reactors.

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APPENDIX 1

INTERNATIONAL, MULTILATERAL AND BILATERAL AGREEMENTS

A. Convention and Treaty

NO.	TITLE	STATUS		REMARKS
		ADOPTED /ENTRY INTO FORCE	SIGNED /RATIFIED	
IAEA				
1.	Statute of the International Atomic Energy Agency	Open Signature: 26 October 1956	Ratified through Act No. 25 year 1957 on July 22, 1957	Act No. 25 year 1957 on the Agreement of the Government of the Republic of Indonesia on the Statute of the International Atomic Energy Agency
2.	Convention on the Privileges and Immunities of the United Nation, 1946 Convention on the Privileges and Immunities of the Specialized Agencies, 1947 Agreement on the Privileges and Immunities of the International Atomic		Ratified through Presidential Decree No. 51 year 1969 on July 24, 1969	Presidential Decree No. 51 year 1969 on the Ratification on the Convention on Privileges and Immunities

	Energy Agency			
3.	An Amendment of Article VI of the Statute of the International Atomic Energy Agency		Ratified through Act No. 2 year 1973 on January 12, 1973	Act No. 2 year 1973 on The Agreement of the Government of the Republic of Indonesia to the Amendment of Article VI of the Statute of the International Atomic Energy Agency

Non -proliferation				
4.	Treaty on the Non-Proliferation of Nuclear Weapons	Adopted: 12 June 1968 Entered into force: 5 March 1970	Ratified through Act No. 8 year 1978 on December 18, 1978	Act No. 8 year 1978 on the Treaty on the Non-Proliferation of Nuclear Weapons
4.a.	Agreement between the Republic of Indonesia and the International Atomic Energy Agency for the Application of the Safeguards on Connection with the Treaty on the Non-Proliferation of Nuclear Weapons.			
4.b.	Protocol Additional to the Agreement between the Republic of Indonesia and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons		Ratified on October 29, 1999	
5.	Southeast Asia Nuclear Weapon-Free Zone Treaty (Treaty Bangkok)	Adopted: 15 December 1995 Entered into force: 27 March 1997	Ratified through Act No. 9 year 1997	

Nuclear Security				
6.	Convention on the Physical Protection of Nuclear Material	Adopted: 3 March 1980 Entered into force: 8 February 1987	Ratified through Presidential Decree No.49 year 1986	
6.a.	Amendment to the Convention on the Physical Protection of Nuclear Material	Adopted: 8 July 2005. Entered into force: not yet		Currently in an inter-departmental review process
7.	Comprehensive Nuclear Test-Ban Treaty	Adopted: 10 September 1996. Entered into force: not yet	Signature : 10 September 1996	In order for this treaty to be effective, Indonesia as one of the 44 countries has to ratify this treaty. However, until recently it has not been ratified.

Nuclear Safety and Emergency Response				
8.	Convention on Early Notification of a Nuclear Accident	Adopted: 26 September 1986 Entered into force: 27 October 1986	Ratified through Presidential Decree No. 81 year 1993	
9.	Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	Adopted: September 26, 1986. Entered into force: February 26, 1987	Ratified through Presidential Decree No. 82 year 1993	
10.	Convention on Nuclear Safety	Adopted: June 17, 1994 Entered into force: February	Ratified through Presidential Decree No. 106 year 2001	

		26, 1987		
11.	Joint Convention on the Safety of Spent Fuel Management and the Safety of Radio Active Waste Management	Adopted: 5 September 1997 Entered into force: June 18, 2001	Signature : 6 October 1997	

Liability and Compensation for Nuclear Damage				
12.	Vienna Convention on Civil Liability for Nuclear Damage	Adopted: 21 May 1963 Entered into force: November 12, 1977		
13.	Protocol to amend the Vienna Convention on Civil Liability for Nuclear Damage	Adopted: September 12, 1997. Entered into force: 4 October 2003	Signature : 6 October 1997	
14.	Convention on Supplementary Compensation for Nuclear Damage	Adopted: September 12, 1997. Entered into force: not yet	Signature : 6 October 1997	

B. Bilateral Agreements

UNITED STATES OF AMERICA:

- Agreement for Cooperation between The United States of America and The Republic of Indonesia Concerning Peaceful Use of Atomic Energy, *a G to G cooperation signed on June 30, 1980.*
- *Extended through,*

- Protocol Amending the Agreement for Cooperation Between The Government of The United States of America concerning Peaceful Uses of Nuclear Energy, signed in Jakarta, February 20, 2004 effective until December 31, 2031.
- Memorandum of Understanding between BATAN and Westinghouse Electric Corporation on The AP600, signed on October 27, 1989.
- Memorandum of Understanding (MOU) BATAN-GE Nuclear Energy, USA and Mitsui & Company Limited, signed on November 8, 1990.
- Letter of Understanding Batan Participation in SBWR Program, signed on March 27, 1991.
- Arrangement between The United States Nuclear Regulatory Commission (USNRC) and The Indonesian National Atomic Energy Agency (BATAN) for Cooperation in Nuclear Safety Matters, signed on October 28, 1992.
- Arrangement between The Government of The Republic of Indonesia and Government of The United States of America and The IAEA for The Transfer of Enriched Uranium for a Research Reactor in Indonesia (Fourth Supply Agreement), signed on January 15, 1993.
- Arrangement between The International Atomic Energy Agency and the Government of the Republic of Indonesia and the Government of the United States of America concerning The Transfer of Enriched Uranium for the Fabrication of Targets to the Production of Radioisotopes for Medical Purpose (Project and Supply Agreement), signed on January 15, 1993.
- Program Participant Agreement between Westinghouse Electric Corporation and National Atomic Energy Agency (BATAN), signed on November 24, 1994.
- Program Participant Agreement BATAN-Westinghouse Electric Company signed on November 24, 1994.
- Nuclear Power Plant Technology Development Agreement between Badan Tenaga Atom Nasional and General Electric Company, signed on March 24, 1995.
- Agreement between General Electric Company and National Atomic Energy Agency of Indonesia for the on-the-job-Training (OJT) Under the ABWR First-of-a-Kind Engineering (FOAKE) Programme, signed on April 11, 1995.
- Nuclear Power Plant Technology Development Agreement between Badan Tenaga Atom Nasional and General Electric Company, signed on April 13, 1995.
- Agreement for Join Study on the Application of an Advance Boiling Water Reactor in The Republic of Indonesia between BATAN (National Atomic Energy Agency) and The General Electric Company in Cooperation with Hitachi, Ltd, Mitsui & Co., Ltd and Toshiba Corporation, signed on Augusts 16, 1996.

AUSTRALIA:

- Agreement between Government of The Republic of Indonesia and The Government of Australia Concerning Cooperation in Nuclear Science and Technology, *signed on November 11, 1997.*
- Memorandum of Understanding between The Government of The Republic Indonesia and The Government of Australia relating to the Nuclear Technical Assistance Project in Indonesia, *signed on February 19, 1988.*
- Safeguards-in-Confidence Proposed Collaboration on the Further Development of Remote Monitoring Techniques in Support of the International Atomic Energy Agency (IAEA), *signed on Augusts 4, 1998.*
- Agreement between The Government of The Republic of Indonesia and The Government of Australia for Cooperation in Science Research and Technological Development, *signed on July 11, 2005.*

CANADA:

- Agreement between The Government of The Republic of Indonesia and The Government of Canada Concerning the Peaceful Uses of The Nuclear Energy, *a G to G cooperation signed on July 12, 1982.*
- Memorandum of Agreement between National Atomic Energy Agency (BATAN) and The Atomic Control Board of Canada, *signed on November 14, 1994.*
- Memorandum of Agreement between Atomic of Canada Limited (AECL) and National Atomic Energy Agency (BATAN), *signed on November 21, 1995.*
- Technical Cooperation Agreement between National Atomic Energy Agency (BATAN) and Atomic Energy Agency of Canada Limited/Energie Atomique Du Canada Limitee, *signed on January 17, 1996.*
- Administrative Arrangement between The Indonesia Atomic Energy Agency and Atomic Energy Control Board of Canada for Technical Cooperation and Exchange of Information in Nuclear Regulatory Matters, *signed on January 17, 1996.*
- Design Attachment Letter of Understanding BATAN-AECL for the Purposes of Familiarization with the Design of Canada, *signed on December 7, 1998.*
- “Computer Code Licensing Agreement between AECL and BATAN ” Transfer of Cathena Code to BATAN, *signed on June 11, 1999.*

GERMANY:

- Agreement between The Government of The Republic of Indonesia and The Government of The Federal Republic of Germany on Cooperation Regarding the Peaceful Uses of Atomic Energy, *a G to G cooperation signed on July 14, 1976.*

- Agreement between Badan Tenaga Atom Nasional and Kernforschungsanlage Julich GmbH, signed on January 22, 1987.
- Memorandum of Understanding BATAN-Siemens AG signed on Augusts 18, 1992.

FRANCE:

- Agreement between The Badan Tenaga Atom Nasional and Rhecommisariat a L'energie Atomique Concerning Scientific and Technical Cooperation in the Field of Nuclear Energy for Peaceful Purposes, a G to G cooperation signed on April 2, 1980.
- Memorandum of Understanding BATAN/SGN, signed on April 4, 1996.
Memorandum of Understanding Between the National Atomic Energy Agency of Indonesia and La Socite Generale Pour Les Techniques Nouvelles (Identify Issues and the Creation of the Joint Venture), signed on April 4, 1996.

ITALY:

- Agreement between The Government of The Republic of Indonesia and The Government of The Republic of Italy on Cooperation Regarding the Peaceful Uses of Nuclear Energy, a G to G cooperation signed on March 17, 1980.

JAPAN:

- Agreement between The Government of The Republic of Indonesia and The Government of Japan on Scientific and Technological Cooperation, signed on January 12, 1980.
- Agreement between MITSUI & Co. Ltd., Japan and National Atomic Energy of Indonesia regarding the Participation of BATAN on the Simplified Boiling Water Reactor (SBWR) Program, January March 27, 1991.
- Memorandum of Understanding (MOU) between Mitsubishi Heavy Industries (MHI) and National Nuclear Energy Agency (BATAN) Muria Consortium (MURIA) and PT. Citacinas, signed on March 13, 2000 in Jakarta.
- Memorandum of Understanding (MOU) between Batan and Mitsubishi for a Joint Study On 1000 MWe Class PWR, signed on November 21, 1997.
- Memorandum of Understanding (MOU) between BATAN and Mitsubishi Heavy Industries Ltd. on Strengthening Cooperation Relationship through Exchange of Information for the Successful Introduction of Nuclear Power Plants in Indonesia, signed on July 14, 2006.

KOREA:

- Agreement between The Government of The Republic Indonesia and The Government of The Republic of Korea for The Cooperation in the Peaceful Uses of

Nuclear Energy, a G to G cooperation signed on December 4, 2006 in Jakarta and in the process of ratification by the Government of Indonesia.

- Agreement between the National Atomic Energy Agency of Indonesia and the Korea Atomic Energy Research Institute for Cooperation in the Peaceful Uses of Nuclear Energy, signed on April 7, 1995 in Taejon, Republic of Korea.
- Cooperation for 1997/1998 between National Atomic Energy Agency (BATAN) and Korea Electric Power Corporation, signed on July 11, 1997.
- Memorandum of Understanding between the National Nuclear Energy Agency (BATAN) of the Republic of Indonesia and the Korea Hydro and Nuclear Power Co., Ltd. (KHNP) of the Republic Korea for the Cooperation on the Nuclear Power Development in Indonesia, signed on February 6, 2004.

RUSSIA:

- Agreement between The Government of The Republic Indonesia and The Government of The Russian Federation on the Cooperation in the Peaceful Uses of Atomic Energy, a G to G cooperation signed on December 1, 2006 in Moscow, Russia, and in the process of ratification by the Government of Indonesia.

C. Technical Co-operation with IAEA in the Field of Nuclear Power Development

Project Number	Title	1st Year of Approval
INS/9/012	Nuclear Power Plant Sitting	1988
INS/9/013	Strengthening Nuclear Safety Infrastructure	1989
INS/4/028	Support for the First Nuclear Power Plant	1993
INS/9/021	NPP Site Confirmation and Structural Safety	1997
INS/0/015	Human Resource Development and Nuclear Technology Support	1999
INS/0/016	Comparative Assessment of Different Energy Sources for Electricity Generation	2001
INS/0/017	Human Resource Development And Nuclear Technology Support	2003

INS/4/033	Preparation for a Nuclear Power Plant	2005-2008
INS/4/034	Feasibility Study for Nuclear Desalination Plant Construction	2005-2006
INS/4/035	Preparation of Regulations, Codes, Guides and Standards for a Nuclear Power Plant	2005-2006
INS/0/017	Human Resources Development and Nuclear Technology Support	2005-2006
EBP-ASIA-178	Extra Budgetary Program on the Safety of Nuclear installations in South East Asia, Pacific and Far East Asia	2000-2004
INS/4/036	Supporting the Preparation of Regulatory Control for Nuclear Power Plant	2009
INS/7/005	Developing a Radioecology and Marine Environment Programme in Muria Peninsula	2009
INS/4/033	Preparation for a Nuclear Power Plant. Objectives: To enhance national capacity for preparation and introduction of a nuclear power plant (NPP). Field: (4V) Nuclear Power Plant Planning and Pre-Operational Support	2005-2008

APPENDIX 2: MAIN ORGANIZATIONS, INSTITUTIONS AND COMPANIES INVOLVED IN NUCLEAR POWER RELATED ACTIVITIES

1. Directorate General for Electricity and Energy Utilization (DJLPE)
H.R Rasuna Said, kav 06 & 07, Blok X2, Kuningan, Jakarta 12950
Tel. +62-21-5225180, fax. +62-21-5256044
www.djlpe.esdm.go.id
2. Badan Tenaga Nuklir Nasional (BATAN)
Jl. Kuningan Barat, Mampang Prapatan, Jakarta 12710, Indonesia
Kotak Pos 4390 Jakarta 12043
Tel. +62-21-5251109, Fax. +62-21-5251110
web: <http://www.batan.go.id>
3. Badan Pengawas Tenaga Nuklir (BAPETEN)

Jl. Gajah Mada No. 8, PO. Box 4005 Jakarta 10040 Indonesia Telp. (021) 6385 8269 - 70, Fax. (021) 6385 8275

<http://www.bapeten.go.id>

4. Sekolah Tinggi Teknologi Nuklir (STTN)

Jl. Babarsari POB 6101 YKBB, Yogyakarta 55281 Indonesia
Tel. +62-274-484085, Fax. +62-274-489715

www.sttn-batan.ac.id

5. Bandung Institute of Technology (ITB)

Office: Jl. Tamansari 64, Bandung 40116 Indonesia
Tel/fax. +62-22-250 0935

Campus: Jl. Ganesha 10, Bandung 40132

www.itb.ac.id

6. Department of Engineering Physics, Faculty of Engineering,
University of Gadjah Mada (UGM)

Jl. Grafika 2, Yogyakarta, Indonesia Tel./Fax. 062-274-580882

web: <http://tf.ugm.ac.id>