INDONESIA

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1. GENERAL INFORMATION

1.1 General Overview

The Republic of Indonesia is located in Southeast Asia on an archipelago of more than 17,000 islands astride the equator. Sumatra, the westernmost major island, lies south of Myanmar, while Irian Jaya or Papua on the island of New Guinea is the country's eastern extreme. Indonesia, formerly part of the Netherlands East Indies, proclaimed its independence on Aug. 17, 1945, after more than 350 years of Dutch control.

Figure 1 Map of Indonesia

Most islands are hot and humid throughout the year. 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.

As in many rainy, tropical areas, the soils are predominantly infertile in Indonesia because of leaching. The most productive are those on Java and adjacent islands. Soil nutrients there are replenished by frequent volcanic eruptions, and the lava's alkalinity is conducive to plant growth.

One of Indonesia's principal mineral resources is petroleum, which is extracted in eastern Sumatra and Kalimantan. Indonesia's oil reserves are not large (9823 million barrels in 2000), being only about 1% of the world's oil reserves. Indonesia, a member of the OPEC since 1962, placed its oil industry under government control in 1965.

Indonesia is the world's largest producer of liquefied natural gas. In year 2000, the total gas reserves are respectively about 166 TSCF. Compare to the world reserves, Indonesia's natural gas reserves are small, only about 2%.

The total known coal resources in Indonesia has reached 36 billion tons, about 2.5% of the world's coal reserves. But the amount of economically exploitable coal is still limited. The proven reserves is only 5 billion tons, the rest is still inferred or indicated and hypothetical reserves.

Other mineral resources are Tin, Bauxite, Copper, etc. Tin is abundant on some islands, and Indonesia ranks third in world tin production after Malaysia and Thailand. Bauxite is mined on Sumatra, nickel on Sulawesi, coal on Sumatra and Kalimantan, iron ore on Java, and copper on Irian Jaya.

Indonesia is the world's fifth most populous nation (c. 216 m.) and continues to grow rapidly. About 64% of the population is crowded onto the island of Java, where the density is nearly 700 persons per sq. km. Other islands, by contrast, are sparsely populated. The largest cities are Jakarta (the capital), Bandung, Surabaya, Semarang, Malang, Surakarta, and Yogyakarta, all of which are on Java, and Medan, on Sumatra.(Table 1.)

TABLE 1. POPULATION INFORMATION

							Growth rate (%)
	1960	1970	1980	1990	2000	2001	1980 To 2001
Population (millions)	96.0	120.1	150.3	182.5	212.1	214.8	1.7
Population density (inhabitants/km²)	50.4	63.1	78.9	95.8	111.4	112.8	

Predicted population growth rate (%) 2001 to 2010	10.5
Area (1000 km²)	1904.6
Urban population in 2001 as percent of total	

Source: IAEA Energy and Economic Database.

1.2. Economic Overview

The Indonesia's economy was plunged into a deep recession in 1998 accompanied by rising inflation, falling exchange rate, increasing interest rates and sinking asset value. The crisis severely set the clock on the achievement of a decade of sustained high growth. During recession, GDP growth contracted by more than 13.5%.

By the end of 1999, national economic grew 0.23 per cent. Entering the year of 2000, national economic growth at the first, second and third quarters steadily increased by 3.2 per cent, 4.13 per cent and 5.12 per cent, respectively.

TABLE 2. GROSS DOMESTIC PRODUCT (GDP)

						Growth rate (%)
	1970	1980	1990	2000	2001	1980 To 2001
GDP (millions of current US$)		78,013	114,426	154,562	151,994	3.2
GDP (millions of constant 1990 US$)	30,308	64,222	114,426	172,207	170,829	5
GDP per capita (current US$/capita)		519	627	729	707	1.5

Source: IAEA Energy and Economic Database.

1.3. Energy Situation

The energy sector is of particular importance in the development of the Indonesian economy. Indonesia has considerable reserves of primary energy resources, even though not abundant. Indonesian current per capita energy consumption is relatively low compared to that of other ASEAN countries. The increase of population, especially in the rural areas which does not yet have adequate access to electric power, is an indication of an expected high-growth rate of electricity demand. Most energy resources are located outside the Island of Java; yet Java, with its large population and industry, constitutes the major area of energy demand.

TABLE 3. ESTIMATED ENERGY RESERVES

	Estimated energy reserves in 1999 (Exajoule)					
	Solid	**Liquid**	**Gas**	**Uranium (1)**	**Hydro (2)**	**Total**
Total amount in place	119.93	29.69	83.28	3.44	206.97	443.32

(1) This total represents essentially recoverable reserves.

(2) For comparison purposes a rough attempt is made to convert hydro capacity to energy by multiplying the gross theoretical annual capability (World Energy Council - 2002) by a factor of 10.

Source: IAEA Energy and Economic Database.

1.1.4. Energy Policy

In order to successfully support the national development programme in Indonesia and in consideration to the changes of global strategic environment, an integrated and solid energy policy has been set up.

TABLE 4. ENERGY STATISTICS(*)

							Average annual growth rate (%)	
	1960	**1970**	**1980**	**1990**	**2000**	**2001**	**1960 To 1980**	**1980 To 2001**
Energy consumption								
- Total (1)	0.33	1.35	2.29	5.01	6.75	6.94	10.24	5.42
- Solids (2)	0.02	0.88	1.14	1.46	2.15	2.23	22.36	3.25
- Liquids	0.20	0.41	0.97	2.19	3.19	3.25	8.10	5.94
- Gases	0.09	0.05	0.16	1.26	1.25	1.29	2.59	10.53
- Primary electricity (3)	0.01	0.01	0.03	0.11	0.16	0.17	6.78	8.73
Energy production								
- Total	0.97	2.72	5.03	7.93	10.48	10.71	8.58	3.67
- Solids	0.02	0.88	1.14	1.59	3.85	4.06	22.63	6.24
- Liquids	0.85	1.78	3.25	3.89	3.72	3.64	6.95	0.54
- Gases	0.09	0.05	0.61	2.35	2.74	2.84	9.73	7.62
- Primary electricity (3)	0.01	0.01	0.03	0.11	0.16	0.17	6.78	8.73
Net import (Import - Export)								
- Total	-0.62	-1.27	-2.57	-2.68	-4.87	-5.51	7.35	3.70
- Solids	0.00	0.00	0.00	-0.13	-1.73	-1.91	-7.58	34.93
- Liquids	-0.62	-1.27	-2.05	-1.47	-1.10	-1.10	6.14	-2.93
- Gases			-0.51	-1.09	-2.03	-2.50		7.82

(1) Energy consumption = Primary energy consumption + Net import (Import - Export) of secondary energy.

(2) Solid fuels include coal, lignite and commercial wood.

(3) Primary electricity = Hydro + Geothermal + Nuclear + Wind.

(*) Energy values are in Exajoule except where indicated.

Source: IAEA Energy and Economic Database.

Principally, there are five main energy policy measures:

- 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 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%;

- Intensification: to increase and expand the exploration of the available energy sources aiming to secure sufficient supply of energy;

- Conservation: to economize energy production and utilization;

- Energy Price: to formulate energy prices based on economic values and by taking into consideration its environmental cost;

- Clean Energy Technologies: to support the environmental programme and towards a sustainable development.

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:

- Technologies to produce substitutes for oil, as oil is non-renewable and is a very limited resource.

- Technologies to support a more sustainable energy supply.

- Technologies for clean and efficient energy to support environmental programmes and towards sustainable development.

The nuclear energy option is unquestionably capable of meeting the objectives of reducing the dependence on oil and gas, so that oil and gas could be used for export and feed-stocks to support the take-off era. Nuclear energy provides a secured long-term energy supply as well as supporting the reduction of potential of air pollution.

2. ELECTRICITY SECTOR

2.1. Structure of the Electricity Sector

At the present, the largest electric Power Company in Indonesia is Limited Liability Company or PT. PLN (Persero) that manages the generation, transmission and distribution facilities. Electricity is also generated independently by private companies for their own used, which is, called captive power. Other public electricity enterprises are Rural Electricity Co-operation (KLP) and the Rural Co-operatives (KUD). These are the key bodies responsible for extending electricity supply to the remote areas. In July 1992, a presidential decree was released allowing private company called Independent Power Producers (IPP), to take part in the supply of electricity.

2.2. Decision Making Process

According to the Act No.10 of 1997, Article 13(d) which performs to the mention above is described that the decision over the construction nuclear power plant is established by the Government after Consultation with the People's House of Representatives of the Republic of Indonesia. The consultations are conducted for each site where one or more nuclear power plants are to be built in this consultation. The Government shall give its utmost considerations to the comments and recommendations from the People's House of Representatives of the Republic of Indonesia, and the results of the consultations shall be respected and shall become the guidance by the Government and People's House of Representatives of the Republic of Indonesia.

2.3. Main Indicators

By the end of the first Semester 2000, the total capacity of generating facilities had reached to 34 GW, consist of 20.5 GW owned by PLN and 13.6 GW owned by captive power, 651 MW operated by private sector. Electricity production was 7.8 GWh that were produced by PLN of 7.1 GWh and purchased from other utilities of 0.8 GWh.

TABLE 5. ELECTRICITY PRODUCTION AND INSTALLED CAPACITY

							Average annual growth rate (%)	
	1960	1970	1980	1990	2000	2001	1960 To 1980	1980 To 2001
Electricity production (TW.h)								
- Total (1)	2.10	4.67	14.23	48.90	104.46	112.33	10.05	10.34
- Thermal	1.29	3.23	11.23	37.53	87.50	94.87	11.45	10.70
- Hydro	0.81	1.44	3.01	10.24	14.08	14.41	6.78	7.74
- Nuclear								
- Geothermal				1.13	2.87	3.05		
Capacity of electrical plants (GWe)								
- Total	0.68	1.61	4.88	12.92	26.42	27.83	10.34	8.65
- Thermal	0.51	1.29	3.90	9.63	21.56	22.82	10.68	8.78
- Hydro	0.17	0.31	0.98	3.15	4.48	4.60	9.17	7.65
- Nuclear								
- Geothermal				0.14	0.38	0.41		
- Wind								

(1) Electricity losses are not deducted.
Source: IAEA Energy and Economic Database.

The number of PLN's consumers had been increased to be 27.9 million consisting of household of 26.2 million or 93.8%, industrial consumer of 43.0 thousand or 1.5%, and others of 1.7 million or 6.1 % consisting of commercial and public consumers.

Electricity consumption per capita has also been increased from 130 kWh at the first year of long-term development plan (1969/1970) to be 347 kWh per annum at the end of 1999. In addition, consumption per consumer had been increased from 1,638 kWh to be 2,584 kWh.

TABLE 6. ENERGY RELATED RATIOS

	1960	1970	1980	1990	2000	2001
Energy consumption per capita (GJ/capita)	3	11	15	27	32	32
Electricity per capita (kW.h/capita)	22	37	90	264	472	532
Electricity production/Energy production (%)	2	2	3	6	10	10
Nuclear/Total electricity (%)						
Ratio of external dependency (%) (1)	-191	-94	-112	-54	-72	-79
Load factor of electricity plants						
- Total (%)	35	33	33	43	45	46
- Thermal	29	29	33	44	46	47
- Hydro	55	53	35	37	36	36
- Nuclear						

(1) Net import / Total energy consumption.
Source: IAEA Energy and Economic Database.

3. NUCLEAR POWER SITUATION

3.1. Historical Development

We all have come to realize that the increasing demand and supply of energy is a reality and a necessity to support social-economic development. Developing countries, like Indonesia and other South East Asian countries, have low a standards of living and low consumption of energy. In their endeavors to reach a high quality of life, they need a lot of energy and electricity to fuel their social-economic development. The electricity demand in Indonesia is very high due to the National Economic Development based on industrialization and supported by a strong agriculture base. It can be noted that in the last five years, the annual electricity growth rate has been assumed at around 15%

per annum. However, due to the economic crisis the electricity demand has experienced a reduction. Nevertheless, it is forecast that eventually in the early 2000s the economic growth in Indonesia will gradually increase. As a consequence, the electricity growth rate will also increase in the next coming decades.

Increased concern on the long-term effect of greenhouse gas emissions calls for greater priority in utilizing electricity generations that produce less greenhouse gases. So, it is very important to reduce the greenhouse gas emissions that are forecast to lead to atmospheric warming with global and regional climate changes, which is mainly due to fossil fuel combustion. With an awareness to the environmental benefits of nuclear power, which produces remarkably little environmental pollution without any greenhouse gas emissions and with its potential as a sustainable long-term energy supply into the distant future, nuclear energy is an option that must be developed in Indonesia.

3.2. Current Policy Issues

In order to meet the rapid increase of domestic energy demand, it is becoming more difficult to depend on the existing resources which are now getting more limited.

It is projected that oil will still play an important role in the domestic energy mix. Although its share is declining, the total consumption is increasing. As a result, the current status of Indonesia as an oil exporting country will likely to change into an oil importing country in the not too distant future.

Coal will be dominating the domestic energy mix in the Second Long Term Development Plan. However it creates several environmental problems. The utilization of clean coal technology and energy diversification programme will, therefore, need to be given priority to anticipate future energy problems. The development of the wise utilization of natural gas, both in domestic use and export, is to be considered in response to the increasing energy demand.

The introduction of Nuclear Power Plant (NPP) in Indonesia is not only to reach an optimum energy mix considering costs and environment, but also to relieve the pressure arising from increasing domestic demand for oil and gas (so that oil and gas could be used for export). Thus, the role of Nuclear Power Plants is clearly to stabilize the supply of electricity, conserve strategic oil and gas resources and protect the environment from harmful pollutants as a result of the use of coal or fossil fuels. This concept is exactly congruent to the national energy policy which stresses diversification, conservation and environmental awareness in energy supply development.

3.3. Status and Trends of Nuclear Power

In order to give strong justifications to the NPP introduction into the Indonesian electricity system, a comprehensive and in-depth Feasibility Study had been undertaken since November 1991. The study was completed in 1996. The scope of the study covers both techno-economic and safety aspects as well as site and environmental aspects. Additionally, the Feasibility study can clearly delineate the main features of the requirements for future nuclear power plants in Indonesia.

The results of the study, especially on the electric system analysis shows that the introduction of nuclear power plants in the early 2000s for Java-Bali electric system represents an optimal solution.

4. NUCLEAR POWER INDUSTRY

4.1. Supply of Nuclear Power Plants

At present time, there is no company in Indonesia operating in the field of nuclear energy.

4.2. Operation of Nuclear Power Plants

At present time, all nuclear installations are owned and operated by the government, that is, the National Nuclear Energy Agency (BATAN) which based on the Act No.10 of 1997 is a supreme executive and to promote the application and the research activities in the field of atomic energy in Indonesia.

The management of the Indonesian NPP is determined by the financing conditions for the NPP development. For the conventional financing scheme the NPP Owner will be a government-owned company. Therefore, the GOI will designate the organization that will own and operate the NPP. There is still a possibility that the National Electric Company (PT. PLN) will act as the utility.

4.3. Fuel Cycle and Waste Management Service Supply

4.4. Research and Development Activities

Nuclear R&D activities are classified into reactor safety, radiation safety, environmental safety, and radioactive waste treatment. The Serpong Nuclear Energy Research Establishment (PPTN-Serpong) is a research facility and complete nuclear technology development. By the completion of the establishment of the Multipurpose Reactor and Supporting Laboratories, PPTN Serpong is able to play as the motivator and supporter for the nuclear industries development for the needs of peace in Indonesia. The role is carried out through:

- Mastering and developing of nuclear technology and Science.
- Education and training for becoming experts and skilled workers on the field of nuclear.
- Manufacturing the basics components for the nuclear process equipment.

The unit organizations in the PPTN Serpong are as follows:

- Center for Research and Development of Material Science and Technology.
- Center for Development of Research Reactor Technology.
- Center for Development of Nuclear Fuel and Recycling Technology,
- Center for Development of Nuclear instrumentation
- Center for Development of Radioisotope and Radiopharmaceutical.
- Center for Development of Radioactive Waste Management.
- Center for Management and Guidance for the industry.
- Center for Development of information and Computation Technology.
- Center for Development of Nuclear Safety Technology.
- Center for Development of Advanced Reactor System

The activities on reactor safety covers safety assessment using deterministic and probabilistic methods, reliability of material, component and system, thermal hydraulic experiment, and coolant chemistry study. These activities mainly carry out at the Center for Development of Nuclear Safety Technology, BATAN.

The activities on radiation safety covers evaluation and application of standards and principle of radiation safety, radiation protection, radiation effect, radiation measurement, calibration and standardization of measuring equipment. These activities mainly carry out at the Center for Research and Development of Radiation Safety and Nuclear Biomedicine, BATAN.

The activities on environmental safety covers environmental impact analysis and emergency planning and preparedness. These are carried out together by some centers, mainly at Center for Development of Nuclear Safety Technology and Center for Riset and Development of Radiation Safety and Nuclear Biomedicine, BATAN.

The activities on radioactive waste treatment cover waste treatment, storage, and disposal studies. These activities are mainly carried out by the Center for Development of Radioactive Waste Management, BATAN.

5. REGULATORY FRAMEWORK

5.1. Safety Authority and the Licensing Process

5.1.1 Governmental Organizations

In recognition of the need to develop a viable nuclear regulatory infrastructure in order to proceed with the development of nuclear power, the government of Indonesia has issued the new basic nuclear energy act on April 1997 (Act No. 10 of 1997) to replace the Act No. 31 of 1964 which have become inappropriate.

In this new Act, the authority in executing and regulating nuclear energy is separated into two different institutions to avoid the overlapping of activities on the use and control as well as to optimize the control of nuclear energy in order to improve nuclear safety.

One of the responsibility to regulate and control of nuclear energy is vested in the regulatory body, and in April 1998 the new President Decree No.76 of 1998 was issued to established the Nuclear Energy Control Board (NECB, also known as BAPETEN) which has responsibility to regulate and control the use of radioactive materials, radiation sources, nuclear reactors and nuclear materials in Indonesia.

The other is the institution which has responsibility to promote the applications of nuclear energy is vested in the promotional body, and the other new President Decree No.197 of 1998 was also issued to established the National Nuclear Energy Agency (NNEA, also known as BATAN) which has responsibility to execute, and to promote the research and the use of nuclear energy in Indonesia.

In the year of 2000, the Government of Republic of Indonesia issued Presidential decree No. 178/2000 concerning the new structural organization of Non Ministry Governmental Agency where BATAN is one of its components. For implementation of the presidential decree, the chairman of BATAN issued decree No. 166/Ka/IV/2001 concerning structural organization of BATAN. In this recent organization BATAN is headed by a Chairman with four Deputies and one Executive Secretariat as described in Figure 2.

5.1.2. Nuclear Safety Legislation

In the Act No.10/1997 on Nuclear Energy, basic changes to the previous Act No.31/1964 are as follows:

1. Separation of the Regulatory Body from the Promotion Body:

- The Promotion Body will be responsible to undertake only basic and noncommercial researches.

- The Regulatory Body will be responsible to regulate and control all nuclear activities in Indonesia.

2. Introduction of a Nuclear Energy Council which will be responsible to give advice to both Promotion and Regulatory Bodies concerning nuclear energy development in Indonesia.

3. Radioactive waste management control including the need of approval from parliament regarding decision for permanent site of high level waste disposal.

4. Financial protection in the form of liability insurance (strict liability/liability without fault) required in all aspects of nuclear activities.

5. Cooperation of private sectors in the nuclear application activities for commercial purposes.

6. Criminal and financial penalties for regulation violation.

In case to a specific requirement, IAEA NUSS Code(s) might be adopted and apply as a base in drafting such a specific legislation need. Moreover, the possibly document(s) from related NPP supplier countries might also be adopted as further standards to the extent practicable.

In consideration that nuclear energy involves the life and safety of the people, a public role shall be enhanced in the form of an advisory counsel, a nonstructural 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 a construction of a nuclear power plant and a final radioactive waste repository, the Government, before taking decision, shall consult with the People's House of Representatives of the Republic of Indonesia.

Furthermore, it is also necessary to give considerations on other regulations related to the Act on Nuclear Energy, such as Act Number 1 Year 1970 on Work Safety, Act Number 8 Year 1978 on the Ratification of Treaty on Nuclear Proliferation of Nuclear Weapons, Act Number 4 Year 1982 on Basic Stipulations on Environmental Management, Act Number 5 Year 1984 on Industry, Act Number 15 Year 1985 on Electricity, Act Number 3 Year 1992 on the Insurance for Workers, Act Number 23 Year 1992 on Health, Act Number 24 Year 1992 on Landscape, and Act Number 10 Year 1995 on Customs.

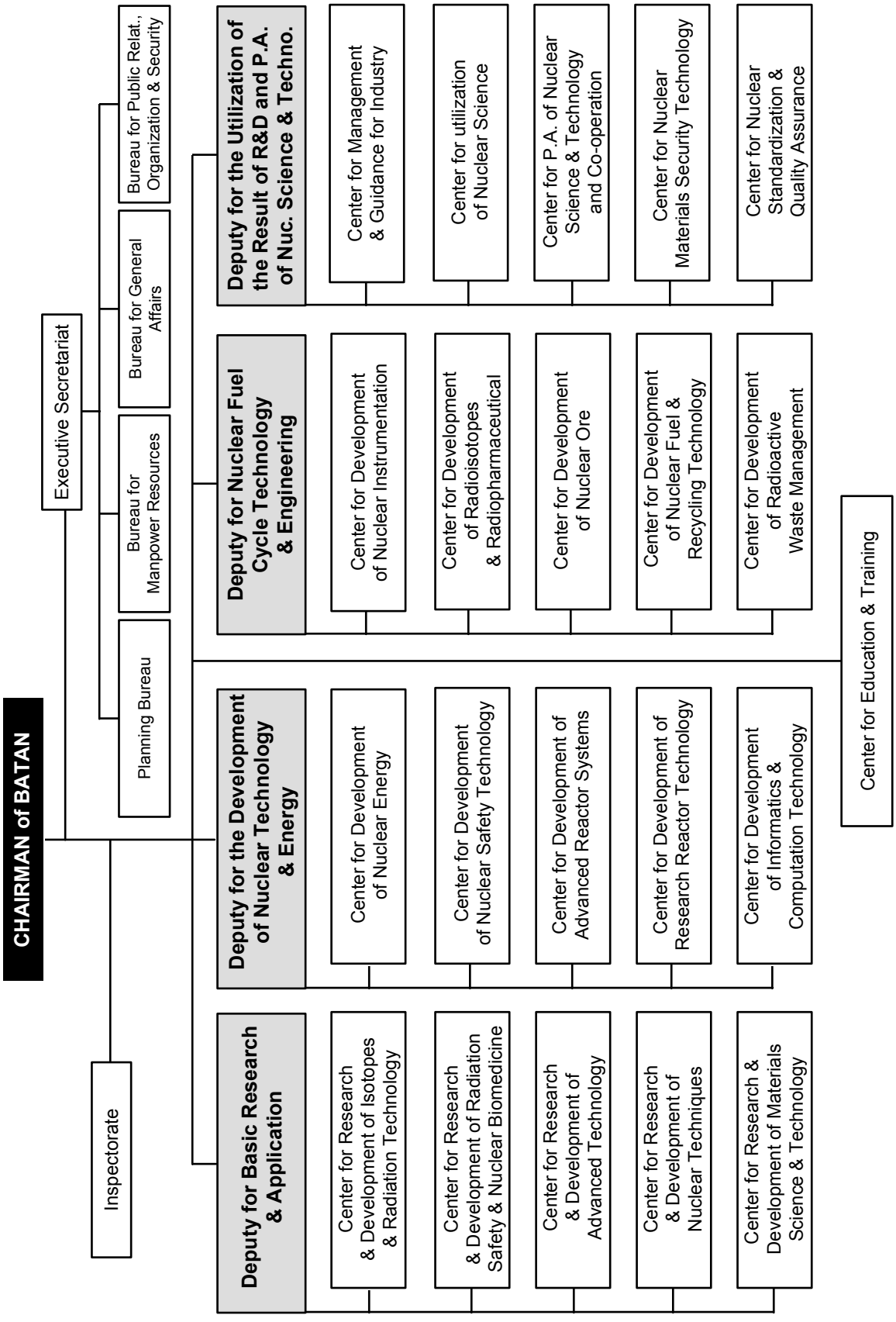

Figure 2 Structural Organization of BATAN

5.1.3. Role & responsibility of the regulatory body

BAPETEN as an independent regulatory body has responsibility to assure that any activity related to the use of any nuclear energy is obligated 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:

- Drafting and establishing nuclear safety regulations

- Controlling nuclear installations and nuclear materials through licensing and inspection systems that covered all stages of NPP establishment (from site selection to decommissioning stages);

- 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 site personnel, 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:

- the rulemaking of national policy in the field of the control of nuclear energy utilisation;

- the planning of national program in the field of the control of nuclear energy utilisation;

- the guidance and the rulemaking and the implementation of nuclear safety, radiation safety, and safeguards assessments;

- 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;

- 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;

- the implementation of safeguards and SSAC (State's system on accounting for and control of nuclear material);

- the implementation of the guidance and counseling for the effort that related to the safety and health of the worker and the people, and the effort of environmental conservation.

5.1.4. Organization of the regulatory body

BAPETEN which is headed by a Chairman, 2 Deputies, one Safety Committee, and one Safeguards, has 6 Directorate, and one Secretariat which is to regulate, and control the use of radioactive material, radiation, nuclear reactors and the nuclear material in Indonesia and these are located at Jakarta, the capital city. Figure 3 shows the organizational structure of BAPETEN based on the Decree of the Chairman of BAPETEN No.01/K-OTK/VIII-1998 and the BAPETEN is directly under the responsibility of the President.

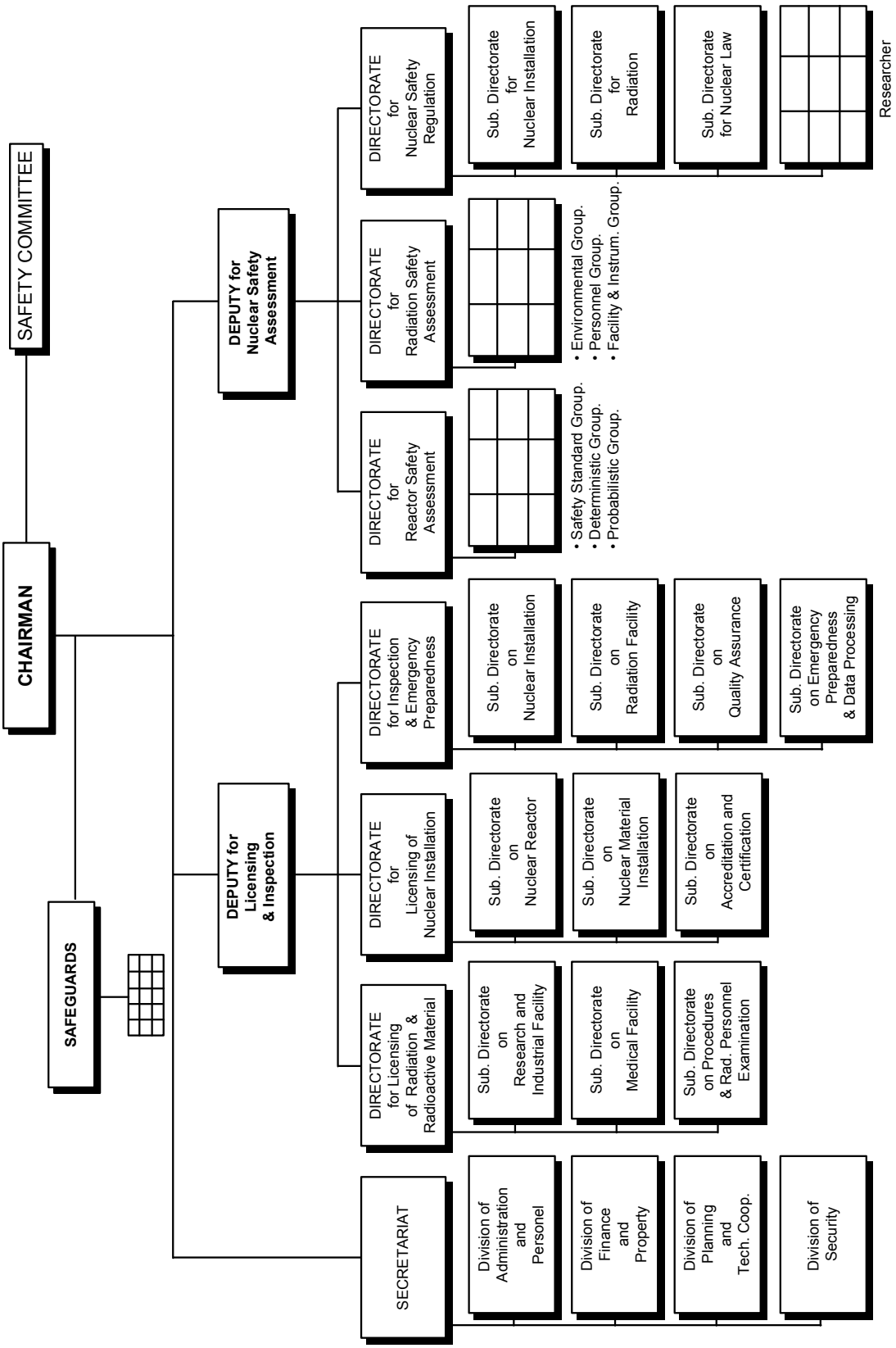

Figure 3 Organization Structure of BAPETEN

5.1.5. Regulations & guides

- Act:

– No. 10 of 1997 on Nuclear Energy.

– No. 8 of 1978 on Ratification of NPT.

- Decree of Chairman of BAPETEN:

– No.01/Ka-BAPETEN/V-99 on Working Safety Provision Against Radiation.

– No.02/Ka-BAPETEN/V-99 on Limit Values for Radioactivity in Environment.

– No.03/Ka-BAPETEN/V-99 on Safety Provisions for Radioactive Waste Management.

– No.04/Ka-BAPETEN/V-99 on Safety Requirements for Transport of Radioactive Material.

– No.05/Ka-BAPETEN/V-99 on Safety Requirements for Design of Research Reactor.

– No.06/Ka-BAPETEN/V-99 on Construction and Operation of Research Reactor.

– No.07/Ka-BAPETEN/V-99 on Quality Assurance for Nuclear Installation.

– No.08/Ka-BAPETEN/V-99 on Safety Provisions for Industrial Radiographic Operation.

– No.09/Ka-BAPETEN/V-99 on Safety Provisions for Well Logging.

– No.10/Ka-BAPETEN/VI-99 on Safety Provisions for Research Reactor Operation.

– No.11/Ka-BAPETEN/VI-99 on Construction and Operation of Irradiators.

– No.12/Ka-BAPETEN/VI-99 on Working Safety Provisions for Nuclear Ore and Mine.

– No.13/Ka-BAPETEN/VI-99 on State System on Accounting for and Control of Nuclear Material.

– No.14/Ka-BAPETEN/VI-99 on Safety Provision for Gas Mantle Fabrication.

– No.15/Ka-BAPETEN/VIII-99 on the Appointment of Nuclear Safety and Radiation Safety Inspectors for the year 1999/2001

– No.16/Ka-BAPETEN/IX-99 on the Appointment of Nuclear Safety and Radiation Safety Inspectors' Assistance for the year 1999/2001

– No.17/Ka-BAPETEN/IX-99 on Requirements of Radiation Worker Authorization.

– No.18/Ka-BAPETEN/II-00 on Certification and Acreditation for Laboratoria, Radiation Protection Course, and Certification Institutions.

– No.19/Ka-BAPETEN/II-00 on License Exemptions

– No.01-P/Ka-BAPETEN/VI-99 on Guide for Selection of Nuclear Reactor Site.

– No.02-P/Ka-BAPETEN/VI-99 on Guide for Physical Protection of Nuclear Material.

– No.03-P/Ka-BAPETEN/VI-99 on Technical Guide for Preparation of Environmental Impact Analysis Report in the NPP's Construction and Operation Planning.

– No.04-P/Ka-BAPETEN/VI-99 on Technical Guide for Preparation of Environmental Impact Analysis Report in the Nuclear Installation's Construction and Operation Planning.

to be issued:

– Guide for Preparation of Safety Analysis Report.

– Technical Guide for Radioactive Waste Management by Licensee

– Calibration of Nuclear Instrument, Radiation Output, Radionuclide Standardization Facilities, and Calibration Facilities.

– Requirements for the Transport of Specified Types of Radioactive Materials Consignments.

- Government Regulation (GR)

– No. 11 of 1975 on Working Safety Provision Against Radiation(*to be revised*).

– No. 12 of 1975 on Licensing of the Use of Radioactive Material and/or Radiation Source(*to be revised*).

– No. 13 of 1975 on Transport of Radioactive Material(*to be revised*).

– GR on Radioactive Waste Management(*to be issued*)

– GR on Construction and Operation of Nuclear Reactors(*to be issued*)

- President Decree:

– No 49 of 1986 on Ratification of Convention on the Physical Protection of Nuclear Materials.

– No. 80 of 1993 on Ratification of An Amendement Of Article VI Of The Statute Of The International Atomic Energy Agency.

– No. 81 of 1993 on Ratification of Convention On Early Notification Of A Nuclear Accident.

– No. 76 of 1998 on Nuclear Energy Control Board (BAPETEN)

Most of these documents were written to control the implementation of nuclear energy specifically as it applies to research activities. For applicability to a commercial NPP, the documents would have to be reviewed; and revisions or additions as appropriate.

5.1.6. Licensing process

Based on the draft government regulation, the construction and operation of a nuclear reactor can be performed after approval has been issued by NECB.

The approval will be issued in stages: Site Permit, Construction Permit, Operating License, and Decommissioning Permit.

Evaluation of application of each stage is carried out within a certain period: 12 months for Site Permit, 24 months for Construction Permit, 18 months for Operating License, and 12 months for Decommissioning Permit. During the period of evaluation, NECB can ask the applicant to provide additional information(s) on the proposed installation as deemed necessary.

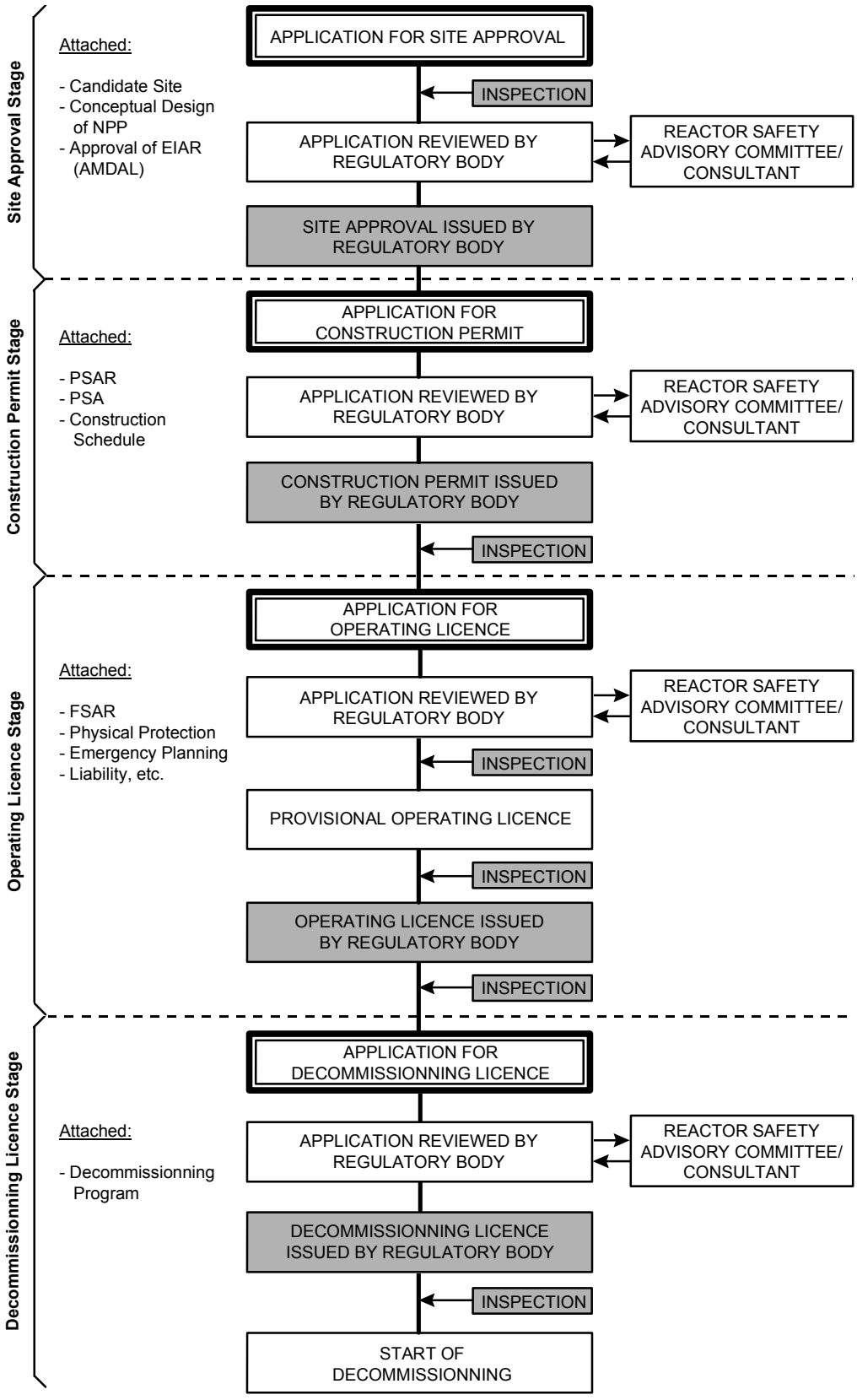

Figure 4 Licensing Procedures

Most notably is the length of time required in the whole licensing process, but there is a consideration to revise the draft to, for example, shorten the time required and also to provide such a flexibility as in the case where a rigorous safety review has already taken place by a competent regulatory authority in another country.

Figure 4 shows diagram of the entire licensing process.

Site Permit

Application of site permit should be submitted to NECB by proposing the candidate site. The basic objectives in the site permit stage are to establish the conceptual design of the facility and to determine whether it is feasible to design, construct, and operate the facility on the proposed site to meet the safety objectives and requirements established by NECB. The primary documentation required is a Site Evaluation Report providing information on:

- The characteristic of conceptual design of the reactor and its installation and the planned operation of the reactor;

- The latest data on population density as well as estimation of population density in the future and the specific characteristics in the surroundings of the proposed site;

- The physical conditions of the site, including seismological, meteorological, geological, hydrological and radiological aspects;

- Steps taken to maintain the security of the environmental conditions (ecological, meteorological and cultural values), and the existence of natural reservations, airports, food industries, and other places/building based on Government Provision(s).

- Analysis of the supposed "major accident" and "hypothetical accident" shall be conducted to check that radiation dose received by individual is still within the dose criteria as below:

Exclusion Area

▪ Whole body	: 0.25 Sv (25 rem)	*during 2 hours immediately*
▪ Thyroid	: 3.00 Sv (300 rem)	

Low Population Zone

▪ Whole body	: 0.25 Sv (25 rem)	*after the accident*
▪ Thyroid	: 3.00 Sv (300 rem)	

Distance from a population center is at least one and one-third times the distance from the reactor to the outer boundary of the low population zone (refer to the criterion of 20,000 man-Sv).

The other important document required is an Environmental Impact Analysis Report, which consists of:

1. Terms of Reference for Environmental Impact Analysis

2. Environmental Impact Analysis

3. Plan for Environmental Management

4. Plan for Environmental Monitoring

The Environmental Impact Analysis consists of the following:

- Design description of the complete nuclear reactor, ECCS, safe shutdown system, containment system, and waste management system;

- Estimation of the impact on the environment during reactor construction, operation, decommissioning, and a nuclear accident through air, water and soil, as well as biological and socioeconomic impacts to the public within the area surroundings the reactor.

The Site Permit will be issued after the application, including all enclosures there in, meet the provision and other requirements set by the NECB. The Site Permit is valid for a period of 4 years, and could be extended up to 2 x 1 year.

Construction Permit

Prior to granting a construction permit, the NECB must be assured that the reactor design meets the safety principles and requirements set out by the NECB and the plant will be built in accordance to appropriate quality standards. The primary documents required are Preliminary Safety Analysis Report, a Probabilistic Safety Assessment, and a statement on construction schedule.

The Construction Permit is given for a period up to 8 years, after all requirements, including design alterations and all modifications intended to minimize negative impacts have been fulfilled.

The Permit is granted by imposing a condition that any modification to the design, structures, systems or components which influence the nuclear safety can be performed only after consent has been obtained from the NECB.

In case the construction is not started within a period of 18 months after the issuance of the Construction Permit, then the Licensee should notify the NECB, presenting the reasons for the delay. If the reasons are not acceptable, the permit might be revoke by NECB.

In case the Licensee considers that the construction could not be completed within the defined time period, an application for extension of the permit should be submitted at least 3 months before it expires, presenting the underlying reasons. Extension of the Construction Permit can be given each time for 1-year period.

Operating License

When the construction approaches its completion and at the latest before fuel loading, the Licensee should submit an application for an Operation License. NECB, before issuing, have to be assured mainly that the plant, as built, conforms to the design previously submitted and approved, and that the plans for operation are satisfactory.

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 2 stages as follow:

1. A Provisional Operating License is 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 the NECB based on results of evaluation from the latest condition.

Among the term included in the Operating License is the requirement that the Licensee informs the NECB promptly of any occurrence or situation, which could alter the safety of the plant. The NECB 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 NECB inspectors, annual reviews of operation, and major reviews at the time of renewal of the Operating License.

The Operating License may be revoked by the NECB for the following one or more reasons:

- There is an evidence that false information have been submitted to the NECB in the application or report concerning the reactor and reactor operation;
- The Licensee does not comply with the specifications and/or the conditions approved by the NECB;
- The Licensee does not comply with the provisions mentioned in the existing regulations.

Decommissioning permit

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

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

Licensing operating personnel

According to BAPETEN's decree No.17/Ka-BAPETEN/IX-99 on Requirements of Radiation Worker Authorization, personnel willing to work as reactor operators should apply for Work Licenses to NECB. The Operator License and Supervisor License, are issued separately for reactor operators and reactor operator supervisor, respectively through examination conducted by NECB. Both Licenses are valid for a period of 2 years and can be extended for another period of 2 years if all requirements are fulfilled.

Besides the examination for the new reactor operator, NECB also conducting refreshment examination for the Work License holder.

5.1.7. Requirements on the licenses

The applicant or licensee shall be required to submit and make available to the regulatory body in due time all information requested in each stages of the licensing process as follow:

- For Site Permit:

1. Site Evaluation Report

2. Environmental Impact Analysis Report

- For Construction Permit:

3. Preliminary Safety Analysis Report

4. Probabilistic Safety Assessment

5. Construction Schedule

- For Operating License:

6. Final Safety Analysis Report (FSAR)

7. Physical Protection Plan for nuclear materials and nuclear installation

8. Financial capability evidence for operating the nuclear reactor

9. Evidence of nuclear liability insurance

10. Approval or license(s) from other government authority (license for land use, building erection, etc.)

- For Decommissioning Permit:

11. Plan for Decommissioning

5.1.8. Review & assessment

During the Licensing Process

At present time, there is no clearly defined and established procedure for the review and assessment of documents during the licensing process. NECB only made an evaluation, referring to IAEA NUSS, some people made the procedure(s) for their own use, while others use the procedure(s) based on the way the previous person did.

As a new established institution, NECB has only a very limited personnel, both quantitatively and qualitatively and furthermore, NECB still does not has neither technical supports institution nor technical assistance from any consultants to cooperate with for undertaking such an assessment and technical review needed in every step of the licensing process. As a consequences, at present NECB does not perform a thorough review and assessment (through testing and examination of system, structures and components) of the operators technical submission appropriately, and rely on the results done by the operators in all technical aspects in the licensing process.

However, NECB define the safety principles and criteria (based on IAEA NUSS documents) on which its judgment is based.

During Operation

a. Submitted Documents and Assessment

An operating license holder is obliged to submit the documents related to:

- Implementation guides, technical guides for operation, maintenance and repairs.

- Establishment of organization responsible to nuclear emergency programme.
- Establishment of organization responsible to radiation protection programme.
- Establishment of QA organization and programme

NECB evaluate all those submitted documents.

b. Plant Modifications

No thorough review and assessment is undertaken (such as testing, examinations and the like) of the document(s) related to plant modifications.

c. Periodic Safety Reviews (PSR)

There is no regulation concerning these requirements.

d. Submitted Information on the Operation

The Licensee is obliged to report periodically the following programme:

- Routine operation programme
- Environmental monitoring programme and meteorological conditions.

The submitted documents which consist of those programs are then evaluated by NECB on a monthly basis and, resume and report are made yearly.

e. Event Assessment

If an abnormality or a discrepancy during operation or an accident occurs to assert the radiation hazard, the operator shall take safety measures in accordance with the procedures previously agreed by NECB, to prevent radiation hazard and to mitigate the radiation damage. After that, the operator shall made an evaluation and assessment of the cause of event appropriately, and report it to NECB together with all the safety measures taken by the operator.

5.1.9. Inspection & enforcement

The objective of the inspections is to ensure conformance of materials, components, systems and structures, as well as operational activities, processes, procedures and personnel competence with the predetermined requirements.

Inspection Programme and Procedures

At present time, NECB only has established the programme and procedures of inspection for normal operation stage, since NECB only deal with research reactors and mainly in the operation stage. The programme and procedures, especially the procedures, are being revised from time to time in order to meet the conditions of each research reactor.

The programme and procedures for other stages are still not established yet.

Inspections

The NECB performs inspections periodically (announced) and occasionally (including unannounced) during the licensing process to ensure whether all safety requirements are met.

- Prior to the issuance of site license, the site inspection is performed to evaluate the data submitted by the applicant.

- During the construction stage, inspections are performed to verify whether provisions affixed to the construction license are fulfilled and complied.

- Prior to the issuance of temporary operating license, inspections are performed to verify whether all provisions and inspection follow-up instruction are complied.

- Prior to the issuance of long term operating license, inspections are performed to verify continuing compliance of all the provisions, and

- Prior to the issuance of decommissioning permit inspections are performed to verify the compliance of all the provisions and of the decommissioning preparation.

NECB also perform national-level safeguards inspections on nuclear fuel materials.

Enforcement

At present time, the NECB have adequate powers to enforce compliance with its regulations and safety requirements, i.e. power to enforce licensee to modify or correct any aspect of safety, i.e. procedures, practices, systems, structures or components as necessary to ensure nuclear safety. According to the BAPETEN's decree No.15/Ka-BAPETEN/VIII-99 on the Inspector of BAPETEN year 1999/2001, the inspector are authorized to make warning or directive, order to curtail activities, revocation of license or authorization, or penalties to the licensee.

5.1.10. Emergency preparedness

The programme and activities of emergency planning and preparedness in Indonesia are based on the existing nuclear facilities, i.e. research reactors, research reactor fuel fabrication plant, radioactive waste treatment installation and radioisotopes production installation. The preparation covers on-site or within facilities, off-site facilities and in the public domain including transport accidents.

Bapeten is introducing to facilities a National Emergency Preparedness based on IAEA Tec-Doc 953, conducted an evaluation to sites/facilities, National Seminar on Emergency Preparedness which invited all related organization and institution.

The following number of facilities are subjects to emergency planning and categorized based on TEC-DOC 953 are applied:

FACILITY	Number of Facility	Category
Medium research reactor : – MPRR 30 MWt	1	II
MPR Fuel fabrication Installation	1	II
Small research reactor : – Bandung-NRC 2 MW – Yogyakarta-NRC 250 kWt	2	III
Radioisotope production	1	III
Nuclear installation : – Radiometallurgy inst. – Radwaste proc. – Nuclear fuel element research center – Inventory spent fuel fac.	4	III

Radiography	80	IV
Logging	19	IV
Gauging	161	IV
Analysis	49	IV
Research	20	IV
Thorium appl.	2	IV
Baggage fluoroscopy	3	IV
Tracer	2	IV
Radioactive Material Storage	59	IV
Irradiator	3	IV
Calibration	4	IV
Diagnostic	1767	IV
Nuclear medicine	20	IV
Therapy	25	IV

Table 1 Identification of Facilities in Indonesia

Based on national experience and EPREV Mission recommendation, BAPETEN has proposed a draft on National Nuclear Emergency Preparedness in Indonesia which will be developed mainly for Category II of Radiological emergency preparedness.

Although there is still not yet a formal co-ordination between levels of government (national, provincial, regional, and district) in nuclear or radiological emergency preparedness, some nuclear facilities already have an emergency plan and preparedness. Moreover, there is National Disaster Management Coordination Agency (NDMCA) with Coordination Ministry of Welfare act as the national-level coordinator, that responsible to non-radiological emergency response. NDMCA has a relatively established co-ordination line from the upper national level down to the district level.

Figure 5 shows the draft on The National Nuclear Emergency Preparedness Organization in which nuclear emergency function, both co-odinators and technical supports are implemented into the NDMCA co-ordination line. However, in case of nuclear accident, BAPETEN shall take over a role of national-level coordinator from Coordination Ministry of Welfare since the Act No.10/1997 stipulates that BAPETEN is the only government organization that has a right to declare an emergency situation in Indonesia.

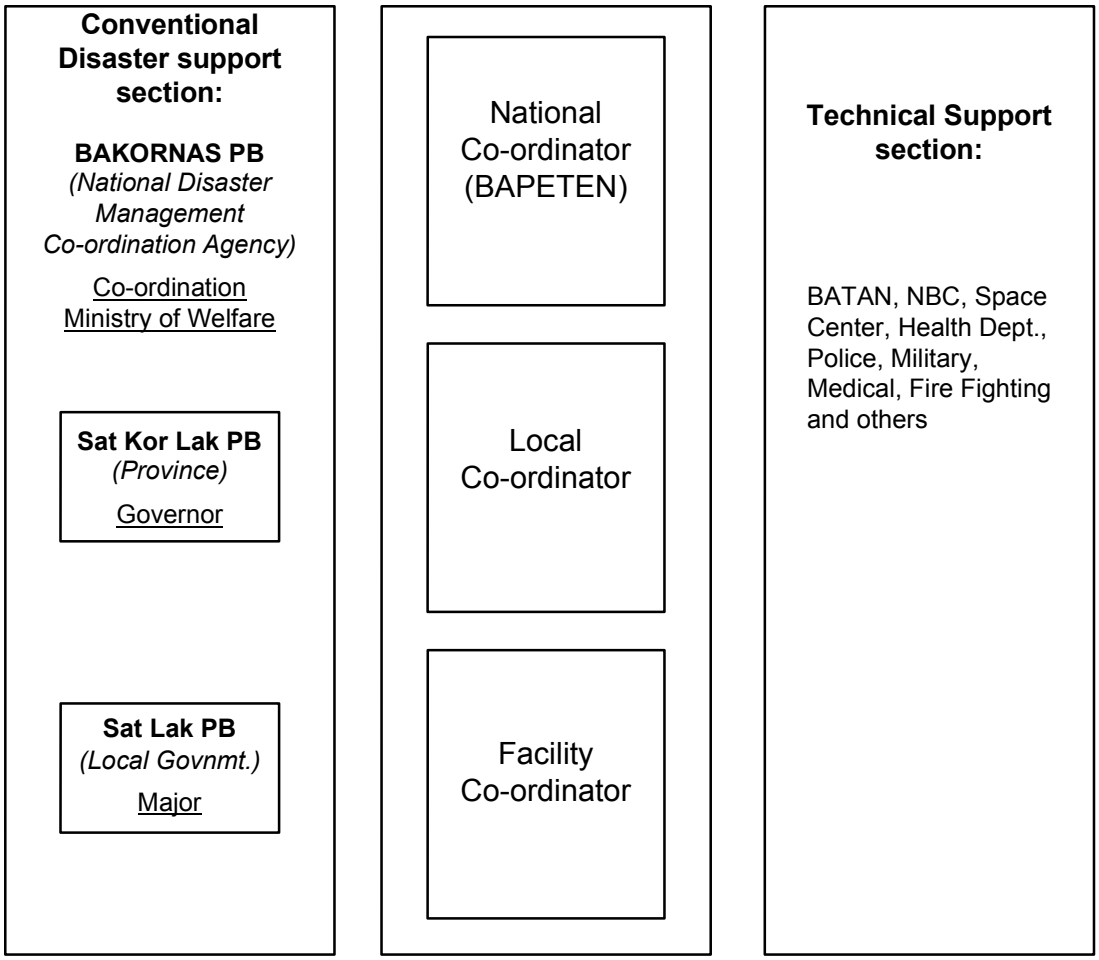

Figure 5 Draft of National Nuclear Emergency Preparedness Organization

In the Serpong Nuclear Energy Research Establishment (PPTN-Serpong), preparation of the emergency preparedness Involve all BATAN's Centers located on that area, Puspiptek as an area supporting center, Local Government (district), and other district authorities such as district police, fire fighters and hospital These emergency arrangements were established since beginning operation period of the nuclear facility in 1987. For the time being, the emergency procedure is being revised to accommodate interaction between each nuclear laboratory. During the last 10 years, 3-4 times emergency exercise were conducted together with national police authority, special section of the Indonesian army responsible for nuclear, biology and chemicals.

For the RSG-GAS reactor personnel, periodic exercises on fire fighting with simulation of radioactive releases and evacuation have been done once a year.

5.1.11. Information to the public

One of the most important issues in introduction of nuclear power is the Public Acceptance. The basis of public acceptance is public understanding, in which accurate and justified actual information on the benefits and risks of nuclear power must be provided to the public. A continuing and effective public acceptance program must always be pursued to enhance public perception on nuclear technology. Accidents like the Chernobyl and Three Mile Island (TMI) have had a large impact to the public, but, through a program of sound public acceptance, misinformation and misunderstandings

resulting in negative perceptions could be well prevented. We are hoping the following elaboration of our public acceptance program would have high expectations and results.

The objective of the public acceptance program is to provide the public with information on every activities in the nuclear energy conducted by nuclear facilities such as BATAN and other stakeholders in Indonesia, and also to encourage the involvement of all parties concerned in the decision making through inter-departmental organization activities.

The objective is to provide information are publicly opened, factual, and presented in the context of all energy sources.

It is recognized that the contents of information given should be varied enough in order to satisfy the different public expectations and in the language appropriate and understandable to the audience.

An important aspect in conducting Public Acceptance is the means on how to do it in an effective manner. We believe that the different audiences in Indonesia will be reached through several events normally held each year, such as: exhibitions, opening events, visits by the decision makers to the nuclear facilities, national seminars on nuclear technology and energy, etc.

Public Acceptance activities shall be more frequently conducted in areas near the site, as well as in certain areas where top level decision makers are present, such as the central government and the parliament in the capital city.

Recent activity in this area was “IAEA Seminar on Public Information for Mass Media and Top Level Government” held in Jakarta on July 14-16, 1997. Information concerning results of research in Agricultural, Medicine and the Outlook of Nuclear Power Generation was presented to the audience that consist of mass media, government officials and participants from other countries. Such a seminars with a focused audience will be held more often in the future.

According to Environmental Law No. 4 of 1982, people are entitled to look at the documents submitted as the application for the license of NPP.

5.1.12. International activities of the regulatory body

Up to the present time, the contact with international organization is only with the IAEA. Indonesia is party to the Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency.

The contact is based upon formal exchange information, and the contacts are made at Governmental level.

The participation of the Regulatory Body in the activities of international organizations are in the form of seminars, in training courses and in giving the opportunity to the IAEA's trainees to come to the Regulatory Body.

5.2. International and Bilateral Agreements and Co-operation

5.2.1. Memberships in international organizations

IAEA membership since August 7, 1957.

5.2.2. International agreements

- NPT related agreement INF/CIRC No. 283 Entry into force: 14 July 1980
- Project related safeguards agreement

INF/CIRC No. 136	Entry into force: 19 Dec. 1969
• Additional Protocol	Signature: 29 Sept. 1999
• Improved procedures for designation of safeguards inspectors	Accepted on 8 June 1989
• Supplementary agreement on provision of technical assistance by the IAEA	Entry into force: 4 July 1980
• RCA	Entry into force: 12 June 1987
• Agreement on Privileges and Immunities	Entry into force: 4 June 1971
• NPT	Entry into force: 12 July 1979
• Convention on physical protection of nuclear material	Entry into force: 8 Feb. 1987
• Convention on early notification of a nuclear accident	Entry into force: 13 Dec. 1993
• Convention on assistance in the case of a nuclear accident or radiological emergency	Entry into force: 13 Dec. 1993
• Vienna Convention on Civil Liability for Nuclear Damage	Non-Party
• Joint Protocol	Non-Party
• Protocol to amend the Vienna Convention on Civil Liability for Nuclear Damage	Signature: 6 Oct. 1997
• Convention on Supplementary Compensation for Nuclear Damage	Signature: 6 Oct. 1997
• Convention on Nuclear Safety	Signature: 20 Sept. 1994
• Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	Signature: 6 Oct. 1997
• ZANGGER Committee	Non-Member
• Nuclear Export Guidelines	Not adopted
• Acceptance of NUSS Codes	No reply

5.2.3. Bilateral agreements

• Agreement signed with JAERI (Japan) on Operation of Research Reactors. This assistance is related to the operation and utilization of the Multipurpose Research Reactor in BATAN.

• Agreement signed with MITI (Japan) on Nuclear Safety Regulation and on Safety Analysis (Assessment) for transient and accident condition in a nuclear power reactor.

• Agreement signed with STA (Japan) on Scientific Exchange Programme. Indonesian Scientists work together with Japanese Scientists to conduct experiments.

• Agreement signed with Germany on Thermohydraulic Experiments and Thermohydraulic Analysis (use of code ATHLET).

5.2.4. Past technical co-operation with IAEA

INS/1/015 Utilization of Multi-Purpose Research Reactor (1985)

To establish a coordinated experimental programme on the use of the multi-purpose research reactor and ancillary facilities.

The National Atomic Energy Agency (BATAN) embarked on a large scale development programme to establish a new complex of nuclear research centers in Serpong. The programme comprises a group of facilities/laboratories including a 30 MW multi-purpose research reactor,

installations for manufacturing fuel elements for research reactors and NPPs as well as for the production of radioisotopes and the treatment of radioactive wastes. This footnote-a/ project, made operational through an extrabudgetary contribution from Germany, provided a two-year expert mission and two short missions to assist in planning this development. Three fellowships and one scientific visit were awarded and some extra equipment was provided. The experimental capabilities for materials research of the multi-purpose research reactor centre at Serpong have been upgraded and its technical and managerial competence has been strengthened. Radioisotopes are being produced.

INS/4/023 Research Reactor Calculations And Experiments (1989)

To gain expertise in reactor physics calculations with the MPR-30 reactor.

In order to utilize fully the integrated facilities at the 30 MW multi-purpose research reactor at Serpong and the 1 MW TRIGA Mark-II research reactor at Bandung, a good understanding of the reactor physics parameters is essential. The project was originally approved for the research reactor at Serpong and was later extended to include the reactor at Bandung. The Agency provided a signals analyser, a radiation detector, and related equipment, together with extensive expert advice on measurements, calculations and neutron noise anaysis. Four fellowships and one scientific visit were awarded. The manpower and infrastructure at Serpong and Bandung have been strengthened to allow effective utilization of both research reactors.

INS/4/029 Upgrading Safety Instrumentation of Bandung Research Reactor (1993)

To upgrade the aging instrumentation system related to nuclear safety of the Bandung Triga Mark II research reactor.

At the Research Centre for Nuclear Techniques in Bandung, a 1 MWth TRIGA Mark II research reactor has been used for radioisotope production, research and training since 1964. The Government requested the Agency's assistance to upgrade the instrumentation system related to safety. The Agency provided monitoring equipment, radiation detectors, and equipment for reactor tank cleaning. Two expert missions assisted in planning an instrumentation upgrade, advised on planning power upgrading, and helped in improving the emergency core cooling system and the ventilation system of the reactor building. Three fellowships were completed. The operational safety of the reactor has now been improved and it is expected that the life of the reactor will be extended.

INS/4/030 Research Reactor Calculations and Experiments - Phase II (1993)

To develop manpower for research in neutronics, thermohydraulics, kinetics and noise analysis using the 30 MWth multi-purpose research reactor at Serpong.

The Reactor Physics Division of the Multipurpose Reactor Centre, BATAN, sought the Agency's assistance to continue its research activities initiated under a completed TC project INS/4/023. Under this project, Agency experts assisted in developing neutron noise analysis techniques, measuring reactor parameters, and performing neutronic and thermohydraulics calculations. An instrumentation tape recorder and a noise amplifier were provided to the Centre. Two fellowships were awarded to local staff. The project resulted in an upgraded reactor physics laboratory at Serpong. The well trained counterpart staff is now capable of undertaking reactor physics theoretical calculations and experiments at low and high power for a 30 MWth multipurpose research reactor to support its applications.

INS/9/012 Nuclear Power Plant Siting (1988)

To evaluate a power reactor site investigation plan in order to obtain firm data on which conclusions concerning the most suitable site can be based.

20 missions of IAEA experts have been carried out from 1989 to 1996.

INS/9/013 Strengthening Nuclear Safety Infrastructure (1989)

To strengthen research capabilities in different fields of reactor safety.

The National Atomic Energy Agency (BATAN) is responsible for research and development in reactor safety technology for the Reactor Safety Technology Research Centre at Serpong. Under this multi-year project, the centre has been furnished with a general thermohydraulic loop, a corrosion loop, a test rig and a material testing laboratory with government support. In the meantime, the Agency has provided expert services to assist counterpart staff in various aspects of reactor safety. They undertook five missions and advised on reactor material testing, reactor protection system, accident analysis for nuclear power plants, and man-machine interface design. A national seminar on emergency preparedness and a national workshop on nuclear safety regulatory control of nuclear power plants were also held to train the local staff. The project has strengthened the capabilities of the Centre in ensuring reactor safety in Indonesia.

INS/9/014 Research Reactor Safety (1989)

The primary objectives are to acquire expertise in the thermohydraulic aspect of reactor safety of the MPR-30.

A 30 MWth multipurpose research reactor was commissioned in 1987 in Serpong, West Java. Commissioning of the integrated facilities was the responsibility of the National Atomic Energy Agency. To study the safety aspects of reactor operation and to evaluate the thermohydraulic data derived during commissioning, it was necessary to determine accurately the reactor's thermohydraulic parameters by means of measurements and calculations, using computer codes. The project was approved in 1989 with footnote-a status and was upgraded in 1990. Germany also made additional extrabudgetary contributions for the provision of an expert. The Agency supplied equipment, including a computer system. Three Agency experts carried out four missions and advised on thermohydraulic assessment of the reactor, accident analysis, safety analysis calculations, and development of computer codes for flow distribution calculations. Two counterpart staff were awarded long-term fellowship training. As a result of the project, the counterpart at the Siwabessy Multipurpose Reactor Centre, Serpong, has developed expertise in the thermohydraulics of reactor safety.

5.2.5. Ongoing technical co-operation with IAEA

INS/0/015 Human Resource Development and Nuclear Technology Support (1999)

To upgrade and strengthen the skills and capabilities of technical personnel within the broad range of the applications of nuclear science and technology.

INS/4/028 Support for the First Nuclear Power Plant (1993)

To train personnel to be able to discharge the owner's function in relation to the acquisition of the first nuclear power plant in Indonesia.

INS/9/021 NPP Site Confirmation and Structural Safety (1997)

To confirm acceptability of the site for an NPP with regard to volcanic and geological stability and foundation safety; to finalize the definition of site-related design basis parameters and resolve site-related structural safety problems.

As of today, technical assistance proposal is always based on the long-term national program and BATAN strategic plan. Therefore, proposed technical assistance for the year 2001-2002 is similar to the previous year.

REFERENCES

[1] Data & Statistics/The World Bank, www.worldbank.org/data.

[2] IAEA Energy and Economic Data Base (EEDB).

[3] IAEA Power Reactor Information System (PRIS).

Appendix

DIRECTORY OF THE MAIN ORGANIZATIONS, INSTITUTIONS AND COMPANIES INVOLVED IN NUCLEAR POWER RELATED ACTIVITIES

NATIONAL ATOMIC ENERGY AUTHORITY

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