MINISTRY OF ENERGY AND MINERAL RESOURCES
REPUBLIC OF INDONESIA

THE STUDY ON DEVELOPMENT OF TECHNICAL STANDARDS AND COMPETENCY STANDARDS IN ELECTRICAL POWER SECTOR IN INDONESIA

FINAL REPORT

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JAPAN INTERNATIONAL COOPERATION AGENCY
Tokyo Electric Power Company, Inc.

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Table of Contents

Appendix

List of Table

List of Figure

Abbreviations

ANSI	American National Standard Institute
ASEAN	Association of South East Asian Nations
BAPETEN	Nuclear Energy Regulatory Agency *(Badan Pengawas Tenaga Nuklir)*
BAPPENAS	National Development Planning Agency *(Badan Perencanaan Pembangunan Nasional)*
BATAN	National Atomic Energy Agency *(Badan Tenaga Atom Nasional)*
BNSP	National Board of Profession Certification *(Badan Nasional Sertifikasi Profesi)*
BS	British Standards
BSN	National Standardization Agency *(Badan Standardisasi Nasional)*
C/P	Counterpart
DEN	National Energy Council *(Dewan Energi Nasional)*
DG	Diesel Generator
DGEEU	Directorate General Electricity and Energy Utilization
GBU	Geneartion Business Unit
GT	Gas Turbine
IEC	International Electro technical Commission
IEEE	Institute of Electrical and Electronic Engineers
IP	PT Indonesia Power
IPP	Independent Power Producer
ISO	International Organization for Standardization
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standards
KAN	National Accreditation Committee *(Komite Akreditasi Nasional)*
KONSUIL	Safety National Committee for Electrical facility *(Komite Nasional Keselamatan untuk Instalasi Listrik)*
KUD	Village Unit Cooperative *(Koperasi Unit Desa)*
MEMR	Ministry of Energy and Mineral Resources
MOF	Ministry of Finace
NQF	National Qualification Framework
OEM	Original Equipment Manufacturer
O&M	Operation and Maintenance
P3B JB	Java Bali Transmission and Load Dispatching Center *(Penyaluran dan Pusat Pengatur Beban Jawa Bali)*
PJB	PT Pembangkitan Jawa-Bali
PLN	PT PLN (Persero)
PUIL	Electric Facitility General Regulation *(Peraturan Umum Instalasi Listrik)*
RUKN	National Electricity General Plan *(Rencana Umum Ketenagalistrikan Nasional)*
R&D	Research and Development
SCADA	Supervisory Control and Data Acquisition
SKKNI	Indonesian Standard for National Competency Standardization *(Standar Kompetensi Kerja Nasional Indonesia)*
SNI	Indonesia National Standard *(Standar Nasional Indonesia)*
SOP	Standard of Operation
SPLN	Standard PLN
ST	Steam Turbine
S/W	Scope of Work
TEMA	Tubular Exchanger Manufacturers Association
UPB	Load Dispatching Unit *(Unit Pengatur Beban)*
UPT	Transmission Service Unit *(Unit Pelayanan Transmisi)*
WTO	World Trade Organization

Chapter 1 Introduction

1.1. Background

Although Indonesia has overcome a monetary crisis in the late 1990s and has recently achieved stable economic growth, foreign direct investment is still sluggish pace and a real economic growth recovery has yet to be seen. Hence, there is a substantial need for the influx of foreign direct investment via improving the investment climate, particularly in the area of economic infrastructure development such as electric power.

In order to solve chronic power shortage problems in the electricity sector, enhancement and diversification of the electrical facilities by improving the capacity capability of existing power facilities and increasing power generation capacity of Independent Power Produces (IPPs) through liberalization of the electric power market is essential. Since at the same time it is also necessary to enhance the human capacity of personnel who operate, maintain and manage electrical facilities, the Government of Indonesia has been addressing the establishment of qualification systems for engineers and technicians who work in the electric power sector. As qualification areas for technicians working in the power sector, more than 2,000 technical competency units for entry-level technicians have been specified until now and accredited competency certification bodies have issued more than 12,000 certifications.

Since law No.15 of the year 1985 on Electric Power in Indonesia stipulates that the Government of Indonesia should develop efficient an electric power sector through stable electric power supply and utilization in an environment with reliability and safety, the Government has thus far been addressing the establishment of various technical standards and safety regulations. Under such conditions, many countries have concluded Free Trade Agreements (FTA) with increasing globalization, and improvement of international competitiveness in Indonesia, especially human resource development, which has become a major issue. While Government Regulation No.3 year 2005 stipulates that every technician working in the electric power sector is required to have a competency certification in accordance with laws and regulations, the inefficiency of qualification systems becomes apparent due to the fact that some of existing competency standards do not meet international standards. In the future, it will be required to develop competency standards and qualification systems for management-level personnel who are in positions to manage entry-level technicians

In light of this context, the Government of Indonesia requested the Government of Japan to

conduct a study on the development of technical competency standards and qualification systems based on a review of existing electric power competency standards.

1.2. Objectives of the Study

The objectives of the Study are to carry out the following two items to achieve the enhancement of human resources supporting operations, maintenance and management of electrical facilities that have been newly introduced in a bid to relieve chronic power shortage in Indonesia.

1) Development of technical standards in the electric power sector that meets international standards

Nuclear Energy Regulatory Agency (BAPETEN)

2) Development of competency standards for national qualification based on the above-mentioned technical standards and relevant qualification systems

1.3. Target Area

The Study covers the whole country of Indonesia.

1.4. Scope of the Study

The Study was carried out in accordance with the Scope of Work (S/W) agreement signed in October 2008 and covers the followings.

1. Review of existing technical standards, competency standards and qualification systems
   1) Confirmation of the existing electrical facilities
   2) Review of existing technical standards
   3) Review of competency standards for entry-level technicians
   4) Review of existing qualification systems
2. Development of technical standards in the electric power sector in selected fields
   1) Review of technical standards in the electric power sector in Japan and the ASEAN countries
   2) Development of new technical standards in the electric power sector in selected fields (generation, transmission and distribution)
3. Development of competency standards for management level personnel
4. Development of qualification systems based on competency standards for management

level personnel

1) Review of Japanese qualification systems and followed by an introduction of them into Indonesia
2) Development of qualification systems for management level personnel

5. Seminars aiming at presenting the progress of the Study

Since it is expected that the Government of Indonesia will make an effort to legislate the technical standards, competency standards and qualification systems based on the competency standards which the JICA Study Team proposes, the JICA Study Team was required to look into those legislations in consideration of the comments and opinions made by the Indonesian counterparts throughout the Study.

The basic concept of the Study as understood is shown in Figure 1.4-1

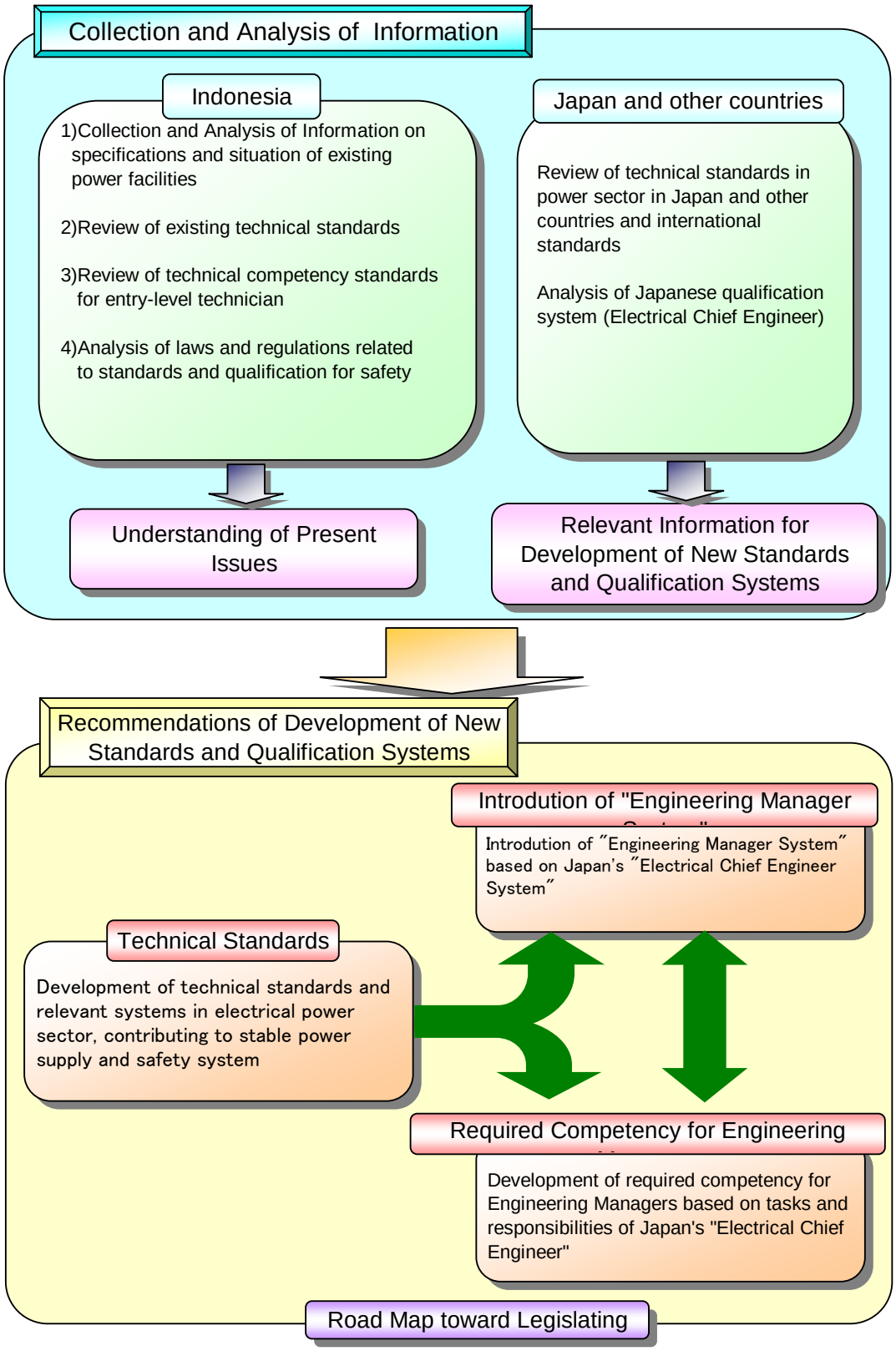


Figure 1.4-1 Basic Concept of the Study

1.5. Work Schedule

The Study was implemented in eighteen (18) months, from January 2009 to June 2010. The overall work flow of the Study is shown in Figure 1.5-1.

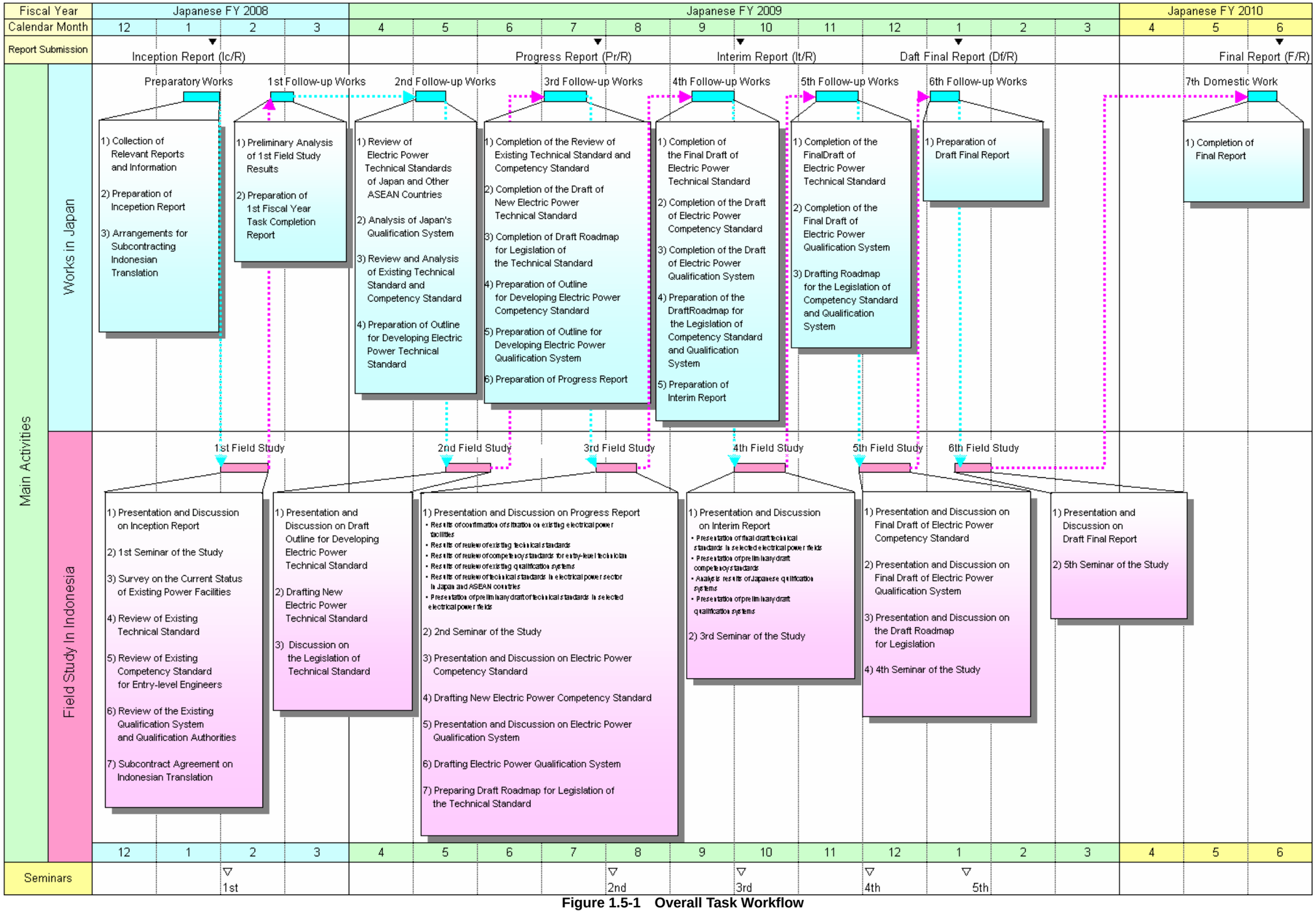


Figure 1.5-1 Overall Task Workflow

1.6. Seminars

In aiming to develop effective systems, the seminars were held five (5) times during the Study period to explain the progress and results of the Study to the Indonesian counterparts and hear the viewpoints from the various kinds of personnel concerned,.

The outlines and details of each seminar are shown in Table 1.6 1and Appendix-1 respectively.

Table 1.6-1 Outlines of Seminars

− 1st Seminar −
1) Date : 1st Field Study February 10, 2009
2) Venue : Jakarta
3) Participants : MEMR, PLN, IP, PJB, Accredited Competency Certification Bodies, IPPs, Embassy of Japan, JICA Indonesia Office, etc. (approx. 60 persons)
4) Agenda : Outline of the Study, Current Situation of Technical & Competency Standards, Electrical Power Industry and Electrical Safety in Japan
− 2nd Seminar −
1) Date : 3rd Field Study August 5, 2009
2) Venue : Jakarta
3) Participants : MEMR, PLN, IP, PJB, Accredited Competency Certification Bodies, IPPs, Embassy of Japan, JICA Indonesia Office, etc. (approx. 70 persons)
4) Agenda : Review of Current Situation, National Safety Requirements, Engineering Manager System
− 3rd Seminar −
1) Date : 4th Field Study October 13, 2009
2) Venue : Jakarta
3) Participants : MEMR, PLN, IP, PJB, Accredited Competency Certification Bodies, IPPs, Embassy of Japan, JICA Indonesia Office, etc. (approx. 70 persons)
4) Agenda : National Safety Requirements, Engineering Manager System, Safety Rules
− 4th Seminar −
1) Date : 5th Field Study October 13, 2009
2) Venue : Jakarta
3) Participants : MEMR, PLN, IP, PJB, Accredited Competency Certification Bodies, IPPs, Embassy of Japan, JICA Indonesia Office, etc. (approx. 70 persons)
4) Agenda : National Safety Requirements, Engineering Manager System, Safety Rules
− 5th Seminar −
1) Date : 6th Field Study January, 2009
2) Venue : Jakarta
3) Participants : MEMR, PLN, IP, PJB, Accredited Competency Certification Bodies, IPPs, Embassy of Japan, JICA Indonesia Office, etc. (approx. 80 persons)
4) Agenda : Handbook of New System for Improving Electrical Safety

1.7. JICA Study Team Members

The members of the JICA Study Team are shown in Table 1.7-1.

Table 1.7-1 Team Members of the JICA Study Team

No	Position	Name	Organization
1	Team Leader / Technical Standards& Competency Standards	Masahiko NAGAI	TEPCO
2	Legal System / Management	Yasushi IIDA	TEPCO
3	Qualification System / Capacity Development	Toshifumi KARASAWA	TEPCO
4	Thermal Power Engineering	Toru SUZUKI	TEPCO
5	Hydro Power Engineering	Keisuke KUMIHASHI / Chiyuki Jozaki[1]	TEPCO
6	Transmission Engineering	Kenichi KUWAHARA	YONDEN
7	Distribution Engineering A (Distribution Engineering)	Keisuke YANAGIUCHI	TEPCO
8	Distribution Engineering B (Technical Standard)	Tatsuya ISHII / Teru MIYAZAKI[2]	TEPCO
9	Distribution Engineering C (Competency Standard)	Manabu MIURA	TEPCO
10	Substation Engineering	Keiichi FUJITANI	TEPCO
11	Project Coordination	Ran AKAIKE	TEPCO

1.8. Counterpart Agency and Relevant Organizations

(1) Counterpart Agency

The main counterpart of the Study is the following agency of the Ministry of Energy and Mineral Resources (MEMR).

- Directorate of Technical & Environmental Regulation of Electric Power, Directorate General of Electricity and Energy Utilization
  - Mr. Johnni RH Simanjuntak; Director for Technical & Environmental Regulation of Electric Power

[1] Jozaki replaced Kumihashi in July 2009
[2] Miyazaki replaced Ishii in September 2009

- Mr Arief Indarto; Head of Technical Personnel

(2) Relevant Organizations

The relevant organizations in the Study are as follows.

- Education and Training Center for Electricity and Renewable Energy, Agency of Education and Training for Energy and Mineral Resources, MEMR
- PT. PLN (PERSERO)
- PT Indonesia Power (IP)
- PT Pembangkitan Jawa-Bali (PJB)
- Accredited Competency Certification Bodies
  - HAKIT
  - IATKI
  - HATEKDIS
- GEMA PDKB

Chapter 2 Current Status of Power Sector in Indonesia

2.1. Economic Situation of Indonesia

After the Asian monetary crisis in 1997, Indonesia has made efforts to stabilize its economy in accordance with a program set down by the International Monetary Fund (IMF) that while resulting in reforms to its monetary system and a greatly improved macro economy, the efforts towards revitalization have not been sufficient enough to improve the high unemployment rate. Indonesian President Susilo Bambang Yudhoyono, who was the first Indonesian President chosen in the direct presidential election in October 2004, made a public commitment to achieve prosperity for Indonesia and has been trying to overcome the nation's high unemployment rate by shifting the economic policy from a track of just maintaining stability to a more aggressive growth track, prioritizing the development of infrastructure, especially electrical facilities within the energy sector.

However, the Yudhoyono administration has suffered a series of unforeseen disasters since its inauguration. In particular, what disrupted the economic management most was the disaster in Aceh caused by a record-breaking tsunami and the soaring price of crude oil. Since the administration had to busy itself with these unforeseen issues, achieving originally articulated objectives was placed on hold during the early days of the government. Then, with the advance of the Aceh reconstruction in October 2005, the Yudhoyono administration succeeded in the drastically increasing the oil fuel prices minus any massive societal confusion and in 2006, issued two political packages to inject some much needed life into the investment climate. Given these actions, the government's efforts to improve the investment climate has at last begun bearing fruit.

2.2. Overview of the Main Stakeholders

PT PLN (Persero) is a 100 %-state-owned power utility company, which covers all of Indonesia. (In some special regions, PLN's subsidiaries supply electricity.) With progress being made in the restructuring of the electric power sector, the PLN had instituted some reforms such as making subsidiaries and separate transmission and distribution sectors in the power generation sector its own business units. However, given that its organizational structure is still vertical, it has been undertaking electric power supply throughout Indonesia under the supervision of the Ministry of Energy and Mineral Resources (MEMR).

In terms of playing a role in electric power supply, in the power generation sector, it is not only PLN and its subsidiaries, PT Indonesia Power (IP) and PT Pembangkitan Jawa-Bali (PJB), which were spun off from the PLN's power generation sector in the Java-Bali region, but also Independent Power Producers (IPPs), which have been allowed to participate in the Indonesian power sector since 1992. As for the transmission and distribution sectors, with the exception of some organizations such as communities for rural electrification and business entities supplying electricity in certain areas, PLN has been monopolizing these sectors up to now.

Apart from PLN, there are governmental organizations involved in the electric power sector, such as the State Ministry of State-Owned Companies which owns and manages PLN, the National Development Planning Agency (BAPPENAS) which formulates and coordinates national development policies and plans, National Energy Council (DEN) formulates and coordinates national energy policies and plans, and the National Nuclear Power Body (BATAN) which conducts research, development and the beneficial applications of nuclear energy. The overall framework of the electric power sector in Indonesia is shown in Figure 2.2-1.

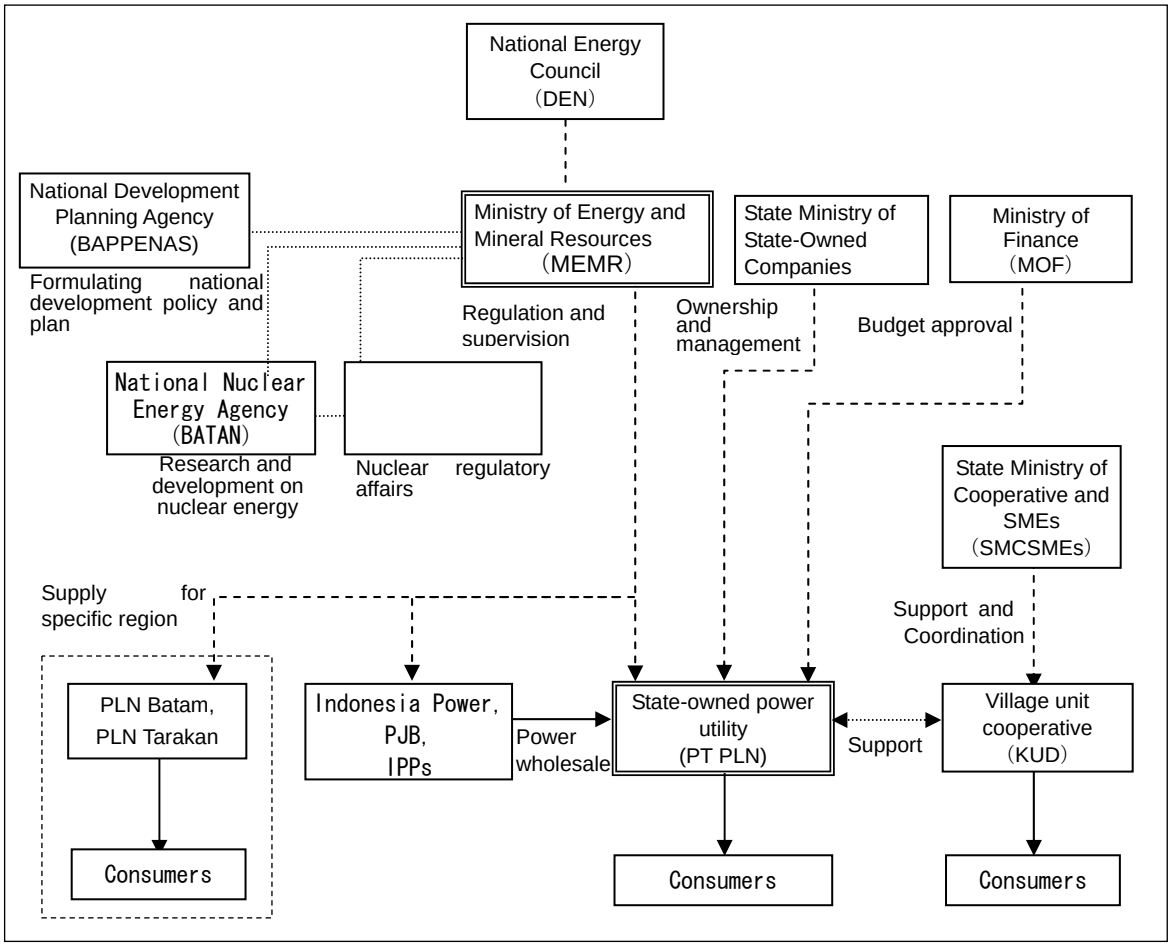


Figure 2.2-1 Overview of Electric Power Sector of Indonesia

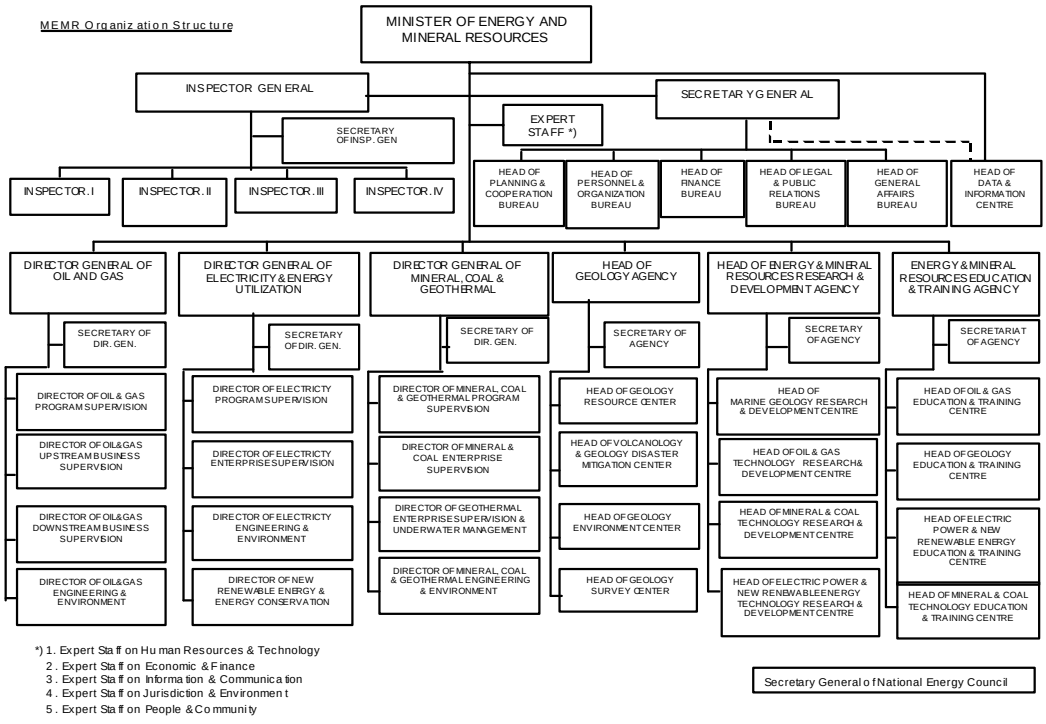
2.3. Overview of the Main Stakeholders

2.3.1. Ministry of Energy and Mineral Resources (MEMR)

Ministry of Energy and Mineral Resources (MEMR) has jurisdiction over the whole field of energy, and as for the electric power sector, is responsible for formulating the National Electric Power General Plan (RUKN) which is a general plan including an electric power demand forecast, transmission network planning, policy for investment and funds, and policy for utilization of new and renewable energy.

MEMR consists of three (3) directorates general ("Oil and gas", "Electricity and energy utilization" and "Mineral, Coal and geothermal") and three (3) agencies ("Education and Training", "Research and development" and "Geology"). Among these organizations in the MEMR, the organization for regulating and supervising the electric power sector is the Directorate General of Electricity and Energy Utilization (DGEEU), which is responsible for not only the whole field of electric power but also new and renewable energy development policy.

The DGEEU consists of four (4) directorates, "Electricity Program Supervision", "Electricity Enterprises Supervision", "Environmental Regulation of Electric Power" and the "New, Renewable Energy and Energy Conservation". The organization chart of MEMR is shown in Figure 2.3-1. The counterpart agency for the Study is the Directorate of Environmental Regulation of Electric Power, which is in charge of regulation and supervision on technical, safety and environmental matters in electric power supply and utilization.



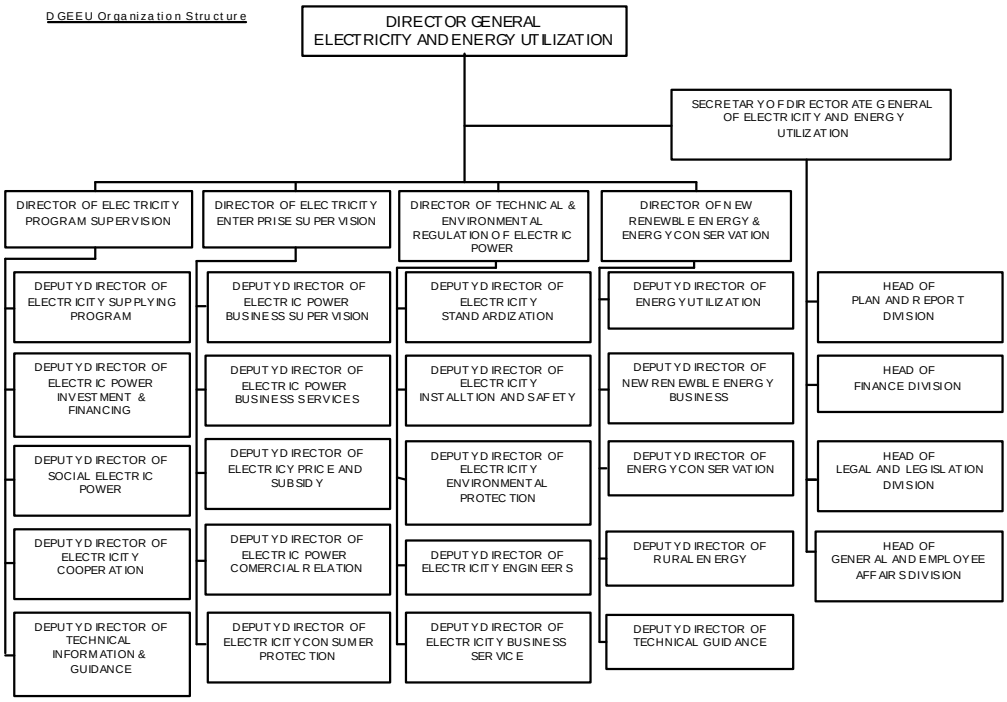


Figure 2.3-1 Organization Chart of MEMR

2.3.2. State-owned Power Utility Company: PT PLN (Persero)

Under the electric power sector restructuring that began with the introduction of IPP in 1992, PLN was moved to a state-owned company in 1994, and has been promoting unbundling and business unitization specialized for business fields and regions.

In the Java-Madura-Bali region, power generation assets were segregated in 1995, and two (2) power generation subsidiaries, IP and PJB, were established. The transmission and distribution sector were divided into the "Java-Bali Transmission and Load Dispatching Center (P3B Jawa Bali)" and five (5) distribution units (four offices in Java, an office in Bali), which were still PLN's business units, not its subsidiaries)

In other regions, two of PLN's subsidiaries, PT PLN Batam (established in 2000) in a bonded area, Batam Island and PT PLN Tarakan (established in 2003) in Tarakan Island of East Kalimantan are supplying electricity for designated regions. However, PLN are supplying electricity basically through its business units that have been regionally and functionally divided. Located in Sumatra Island, are two (2) power generation offices, the "Sumatra Transmission and Load Dispatching

Center (P3B Sumatera)" and seven (7) regional branch offices. In other regions, branch offices located in each region are managing the electricity supply business in a vertically integrated form

In the field of facility construction, PLN has established regional units for construction projects on power plants and transmission systems to promote the construction of power facilities including power plants, transmission lines and sub-stations.

In addition to these corporate split-up moves and business unitization in PLN, business unitization has also been introduced in PLN's power generation subsidiaries, which have established business units for maintenance and IT as well as power generation business units.

Table 2.3-1 Electric Power Utilities in Each Region

<table>
<tr><th></th><th>Java - Bali</th><th>Sumatra</th><th>Other regions</th></tr>
<tr><td>Generation</td><td>PT Indonesia Power,
PT PJB</td><td>North Sumatra Generation
South Sumatra Generation</td><td rowspan="4">9 regional branch office
[Vertical integrated]

PT PLN Batam
PT PLN Tarakan
[PLN Subsidiaries]</td></tr>
<tr><td>Transmission</td><td rowspan="2">Java-Bali Transmission and Load Dispatching Center (P3B Jawa Bali)</td><td rowspan="2">Sumatra Transmission and Load Dispatching Center (P3B Sumatera)</td></tr>
<tr><td>Power dispatching</td></tr>
<tr><td>Distribution and customer service</td><td>5 distribution units</td><td>7 regional branch offices</td></tr>
</table>

sources : PLN Annual Report 2004 and others

2.4. Power Supply System

2.4.1. Electric Power Supply in Java-Madura-Bali region

In Java-Madura-Bali (Jamali) region, power generation assets were segregated in 1995, and two (2) power generation subsidiaries, IP and PJB, were established. The transmission and distribution sector were divided into the "Java-Bali Transmission and Load Dispatching Center (P3B Jawa Bali)" as an in-house business unit responsible for transmission operations (500 kV, 150 kV and 70 kV transmission) and five (5) distribution units (four offices in Java and an office in Bali).

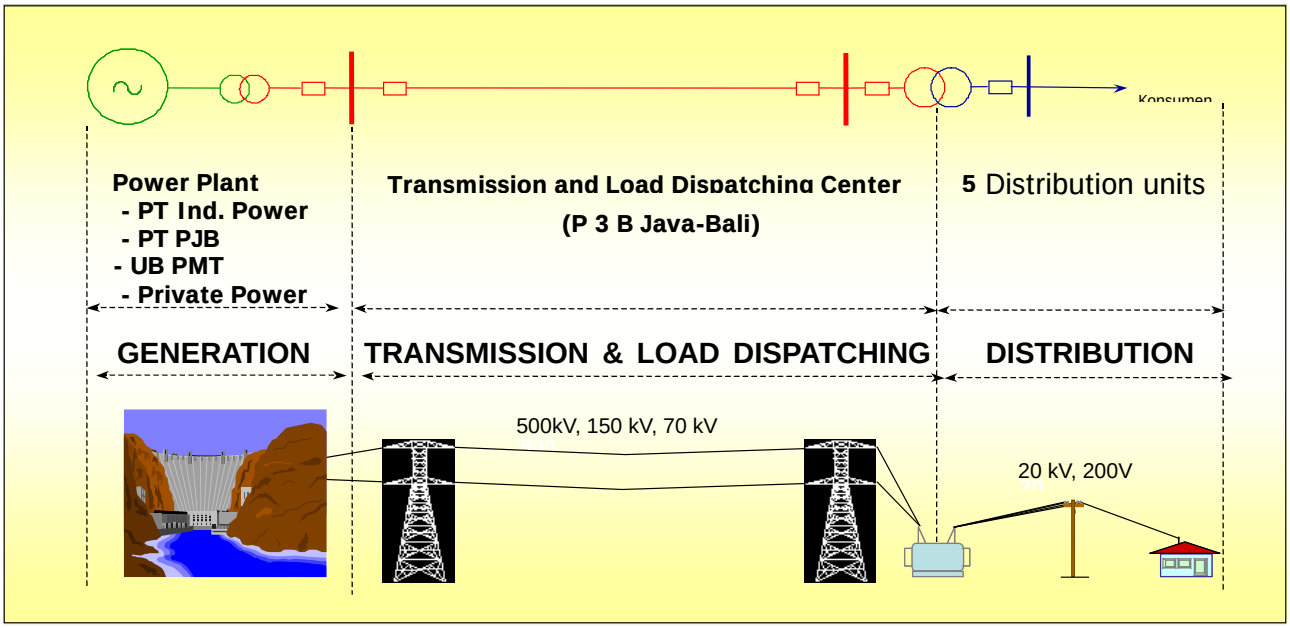
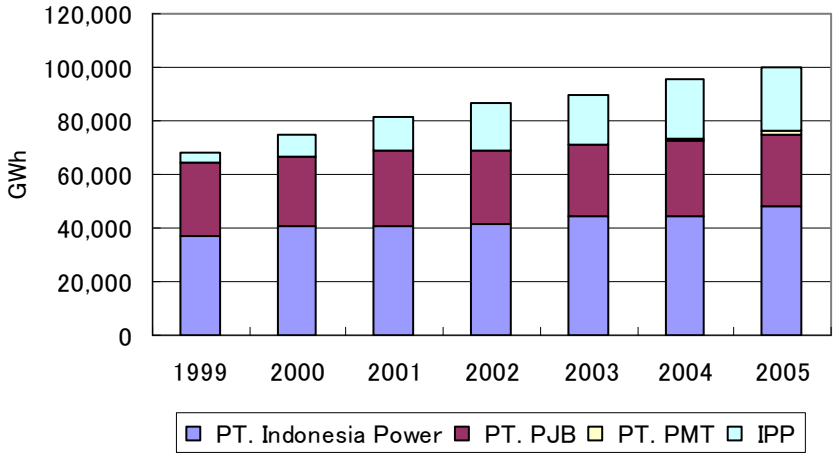


Figure 2.4-1 Electric Power Supply in Java-Madura-Bali region

The power generation sector in Jamali region has been divided broadly into PLN's power generation subsidiaries and IPPs. As shown in Figure 2.4-2, power generation by PLN's power generation subsidiaries, IP and PJB account for over half the share of total power generation, while in recent years, the power supply by IPPs has been increasing.



source : PLN statistics (PT PMT is Pembangkitan Muara Tawar)

Figure 2.4-2 Electric Power Supply by Power Generation Company in Jamali

2.4.2. Power Supply and Demand

The overview of current electric power supply in Indonesia is as follows:

- Electric Power System
  - Java-Madura-Bali Region: Well-Interconnected power system
  - Other regions: Poor/Non-Interconnected Power System/ Independent system
- Power demand growth rate until 2026: 7.1 %
- Total Installed Capacity: 30,300 MW (in 2007)
  - PLN: 25,223 MW (83.2 %);
  - IPPs: 4,562 MW (15.1 %);
  - Others: 51 MW (1.7 %);
- Electrification ratio: 63.9%
- Primary energy composition : Coal: 46.2%
  Oil: 23.7%
  Gas: 14.3%
  Hydro: 9.6%
  Geothermal: 5.3%
  Others: 0.9%

As for the recent change in electric power sales and peak demand in all of Indonesia and the Java-Bali region, the development of power supply capacity has made slight progress, while the demand for electricity has shown steady growth and the reserve margin (the difference between the installed capacity and the peak demand) trend to be smaller. Therefore, when unexpected system trouble occurs, the power supply capacity easily dips below the demand for electricity where it is very likely to cause power outage.

Figure 2.4-3 shows a change in the reserve margin that is the difference between the peak demand and total installed capacity in the Java- Bali region. In Indonesia, the desirable reserve margin (margin of power generation capacity) is set up at 30 to 35 %, but the reserve margins in recent years is much smaller than this with the number of power outages tending to increase.

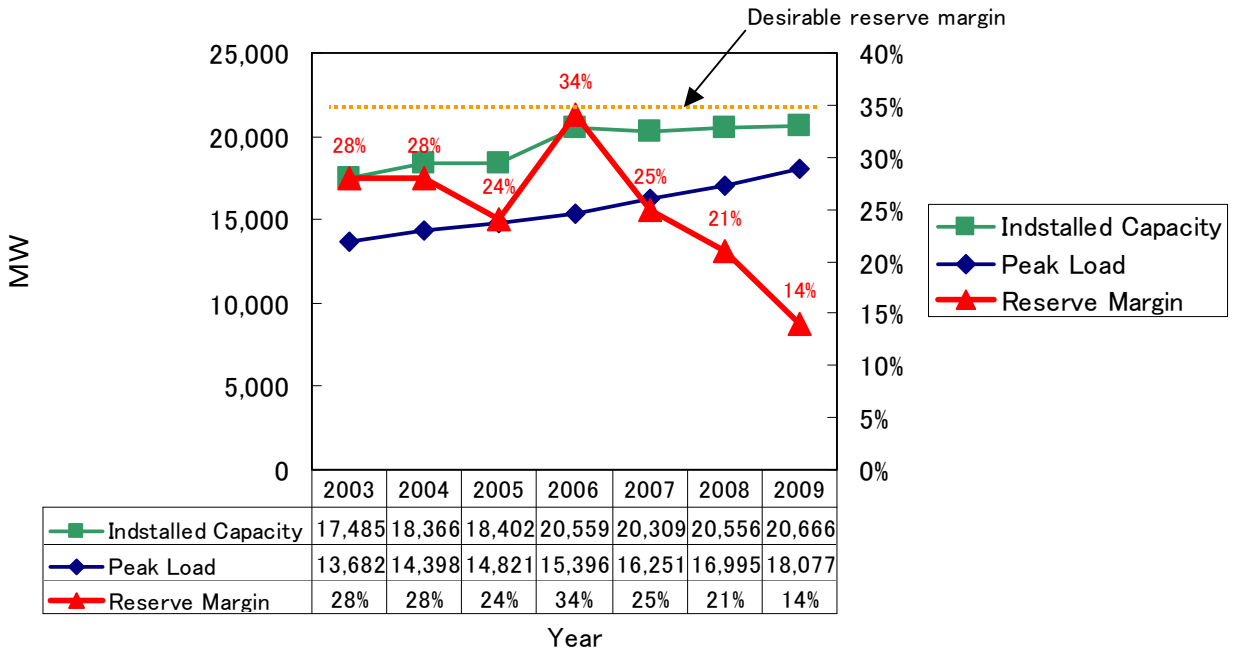


Figure 2.4-3 Change of Reserve Margin in Java-Bali region

Japanese power utilities manage to supply electricity with a minimum approximate 8% reserve margin in the summer, the season when the demand for electricity peaks, while the reserve margin needed for stable power supply in Indonesia stabilizes at 30 to 35 % as mentioned above, which is relatively very high, but the reserve margins in recent years are much smaller than this and the number of power outage tends to increase. Although the need for a higher reserve margin has been attributed mainly to capacity de-rating due to the aging of old power plant facilities, it has also been pointed out that one of its reasons is lack of the capacity of personnel in charge of the operations and maintenance of the facilities. In order to ensure a stable power supply by operating the facilities stably and efficiently under physically harsh conditions with lack of power supply capacity, there is an urgent need for the skill enhancement of electric power engineers and technicians.

Chapter 3 Current Status of Safety Management on Electrical Facilities

3.1. Legal Structure Related to Safety Management on Power Facilities

3.1.1. Establishment of New Electricity Law and Development of Related Regulations and Decrees

The electric power utility business in Indonesia has been conducted based on the "Electricity Law No.15/ 1985" as a fundamental law. However, due to the fact that the actual implementation of decentralization has been ongoing since January 2001 based on the "Law No. 22/1999 on Regional Governance" and "Law No. 25/1999 on the Fiscal Balance between the Center and the Regions", the electric power sector needed to adopt the concept of such decentralization. Further, it was required to clarify both the rules of the central government and the local government within the electric power sector. In order to cope with the change, the new electricity law No.30/2009 was established in September 2009 so that the electric power sector could deal with the trends of decentralization.

The new electricity law (No.30/2009) basically covers up the contents of the old electricity law (No.15/ 1985), however, the following points have been modified and the new law stipulates that detailed articles be stipulated in the governmental regulations which are under development.

- Procedures of national electric power development planning
- Procedures of electricity tariff change.

The following table are the major articles stipulated in the new electricity law.

Table 3.1-1 Major Articles in Electricity Industry Law (No.30/ 2009)

Article	Outline of Article
Article 2	・ Principle and Purposes of Electric Power Development
Article 3	・ Responsibilities in Power Supply Businesses (Central Government & Local Government)
Article 5	・ Authority of government in utility business (Policy development, regulation/guideline development, RUKN development, approval, etc.) ・ Authority of state government in utility business (Local policy development, local RUKN development, approval, etc.)
Article 7	・ Methodology/process of RUKN development
Article 8	・ Structure of utility business (supply and support
Article 28	・ Obligation of power supply business entities (power quality, reliability, compliance with safety requirements, priority use of national products
Article 36	・ Obligation of power utilization side (protect from dangerous, maintain safety)
Article 44	・ Comply with safety regulation in utility business activities ・ Purposes of safety compliance (maintain dsafety and reliability of facilities, safety against human body and others, environmental protection) ・ Items to be included in safety regulation (satisfaction of national standard)

Articles 28, 36, 44 of the new electricity law regarding the safety compliance of the electrical facilities have been extracted from articles 9, 15, 17 in the old electricity law, and it could be concluded that there are no differences between the new and old law regarding the basic ideas for safety. However, the number of articles has more than doubled from 28 to 58 in comparison with the conventional law and the contents become more detailed. In the new electricity law, article 44 stipulates the following contents which have not been included in the conventional law.

1) Each electric power facility shall obtain certification regarding the appropriate operation capability
2) All electric appliances and equipment shall satisfy the relevant Indonesian National Standard (SNI)
3) Each engineer working within the power industry shall obtain a competency certification.

Since, these articles have been covered in the subordinate existing regulation such as government regulations, Ministerial decrees, etc. under the conventional electricity law, even though the new

electricity law has been legislated, there are no changes regarding the safety regulations governing the electric power industry. The following is a detailed explanation of article 44.

Article 44:

1. All electric power business activities shall comply with the safety regulations governing the production and utilization of electric power.
2. The purposes of the safety regulation mentioned in (1) is to achieve the following:
   1. reliable and safe electric power facilities
   2. safety measures to protect living humans and living animals
   3. environmental friendly

(3) Safety regulation shall cover

a. satisfying the national standards that govern electric appliances and equipment

b. securing the safety of electric power facilities

c. securing the safety of electric appliances

(4) any electric power facilities shall obtain a certification regarding appropriate operations capability

(5) Electrical appliances and equipment shall satisfy Indonesian national standards.

(6) All engineers working within the power sector shall obtain a competency certification

(7)Details regarding safety regulations, certification for operations, national standards, and competencies mentioned above (2) – (6) have been stipulated in the governmental regulations.

Based on the new electricity law mentioned above, new governmental regulations which are presently development is expected to cover the following contents.

- Safety requirements of the electric power facilities
- Safety system for securing the safety of electric power facilities

The new governmental law is presently being drafted by DGEEU based on the legislation of a new electricity law that follows Indonesian regulation regarding legislation procedures.

3.1.2. Legal Structure under the Old Electricity Law

As described in 3.1.1, the power sector shall follow the electricity industry law No.30/, 2009 as a

fundamental law, and new government regulations and a Ministerial decree based on the new law are to be developed. However, as of February 2010, existing regulations and decrees are still effective. So here in this report, the JICA Study Team describes the analysis based on the conventional legal structure which the Team studied in order to propose a new legal framework for the electric power industry. Our view is that our study results are not affected regardless of whether the law under consideration is old or new because they point to a proposal based on eternally foundational concepts for electric power safety.

The technical standards for the electric power industry in Indonesia are stipulated in the "Power Supply & Utilization (Government Regulation No.10/1989 and revision No.3/2005)" and "Electrical Facilities (Ministerial Decree No.45/2005 and revision No.46/2006)" which are based on the "Electricity Law No.15/1985 (Old)". Although these regulations and decrees will be replaced based on the new law, since the basic concept for the safety of electric power facilities has not been changed, the study result has been summarized based on existing regulations and decrees in this chapter.

Figure 3.1-1 depicts an outline of the legal structure of electric power technical standards in Indonesia.

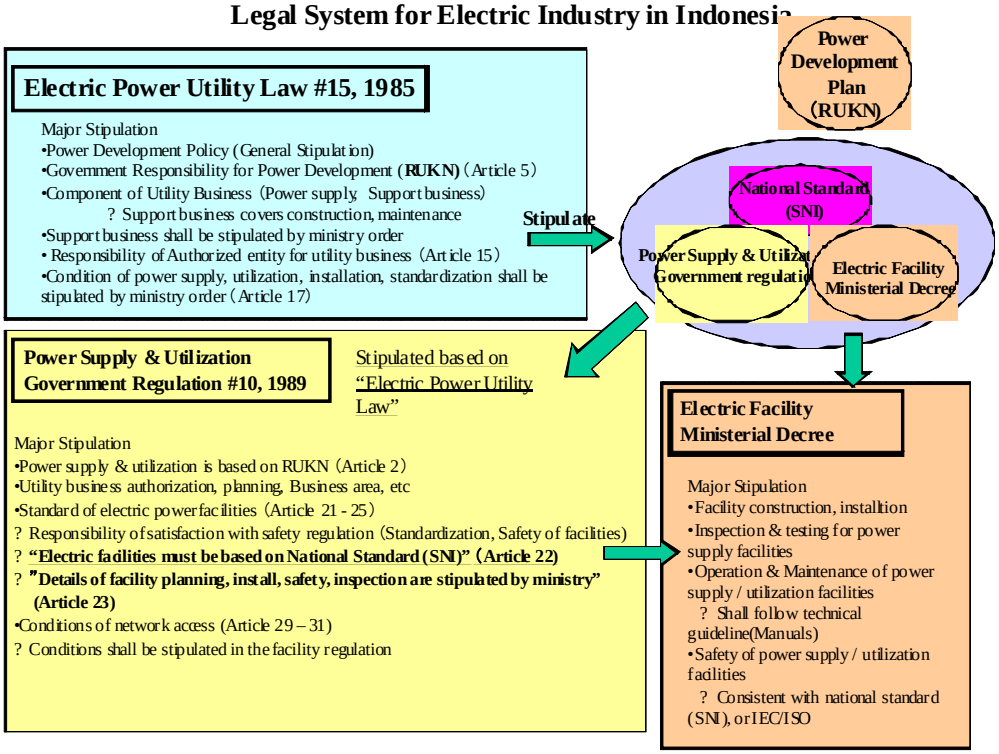


Figure 3.1-1 Legal structure related to electric power technical standard (Old structure)

As shown in the above figure, the “Electricity Law No.15/1985” stipulates the fundamental policies required for a solid business operation. Regarding the specifics of how the electric utility business shall be implemented, the electricity law stipulates that “Government regulations of power supply and utilization No.10/1989” shall stipulate the basic regulations for the electric power industry.

The following are the main items which have been described in law No.15/1985 as the “absolutely essential articles” in the subordinated regulation.

- Importance and purpose of electric utility business
- Total planning of electric utility business
- Right and obligation of utility business entities
- Power supply and utilization
- Worker and public safety, and capacity building
- Penalties, etc.

In the “Government regulation of power supply and utilization No.10/1989” which is legislated by stipulations in the electric utility law, the basic concept of regulations for the electric utility business is stipulated. The regulation covers items that the utility shall comply with including facility safety, environmental issues, power quality, power supply reliability & continuity, compliance with national standards, public safety and a commissioning test.

Table 3.1-2 shows the main items stipulated for electric power facilities.

Table 3.1-2 Government Regulation for Power Supply & Utilization (No.10/1989) (Main Items)

Article	Outline of Article
15	・ Obligation of power supply with securing power quality and reliability ・ Detailed regulation for power quality and reliability is provided by Minister
21	・ Shall satisfy the safety regulation for power supply ・ Power facility install, operation & maintenance shall be done by certified entities ・ Inspection & examination of HV & MV facilities shall be done by the inspecting entities certified by national administrative agency（For LV facilities, done by independent NPO） ・ Shall obtain certification as approved technician for work in power sector
22	・ Shall satisfy SNI for power industry ・ Shall obtain operating permission for electric power facilities
23	・ Regulation for facility planning, construction, maintenance, inspection & testing is provided by Minister
24	・ Give authority to Minister regarding the issue of SNI ・ Shall comply to national standard of electric equipment
35	・ Supervising authority based on the power facility locations under the electric power utility business operation (Minister, Governor, Mayor, etc.）
36	・ Shall confirm the satisfaction of safety requirements based on the range of supervising authority ・ Order to inspector to implement inspection works

In this government regulation, “power supply facilities” owned by the electric utility company and “power utilization facilities” owned by users are defined.

“Ministerial decree of electrical facility (No.45/2005 & No.46/2006)” that considers both power supply facilities and power utilization facilities is stipulated based on the aforementioned government regulation. It stipulates the following issues regarding the construction or installation of electrical facilities.

- National standards for the electric power industry (SNI)
- Technical standards for facility development
- Facility safety
- Operations & maintenance rules
- Details of commissioning test

Based on this Ministerial Decree, the construction, operation & maintenance regulations for electric power facilities for both the supply side and the utilization side are legislated. Table 3.1-3 shows the major stipulated items in the decree regarding the power facilities. This decree has detailed regulation for construction, operation & maintenance of electric power facilities.

Table 3.1-3 Outline of Ministerial Decree for Electric Power facility(Major Items)

Article	Outline of contents
Chapter 1 Article 5	Policy making and planning for electric power supply& utilization facilities
Chapter 2 Article 6	Construction and installation for electric power supply& utilization facilities
Chapter 3 Article 7～10	Inspection and testing for electric power supply facilities
Chapter 4 Article 11～15	Inspection and testing for electric power utilization facilities
Chapter 5 Article 16	Operation and maintenance for electric power supply& utilization facilities
Chapter 6 Article 17	Securing the safety for electric power supply& utilization facilities

Under existing government regulations, the authoritative permission for the power supply business has been extended on a local government level based on facilities installation. So the detailed legislation for power supply facilities is stipulated at the local governor level instead of a ministerial decree.

Table 3.1-4 below is the authority given for the permission of the power supply business based on the facility installation.

Table 3.1-4 Authority of permission for power supply business (Article 6 of regulation)

Installation of power facility	Authority
Province/City level power supply business (no connection with national transmission network)	Provincial Governor/Mayor
Inter-province or inter-city power supply business (no connection with national transmission network)	State Governor
Inter-State power supply business or state-wide business connecting with national transmission network	Minister

Based on the rules above, regulations regarding electric power facilities have been decided and supervising responsibility has been reallocated to the central/local government levels.

Based on the aforementioned legal system, the obligation of the electric utility regarding the installation, operations & maintenance and management of the electrical facility is clearly stipulated, and the current electric utility business is implemented. The following figures provide a basic breakdown of the legal system at a glance.

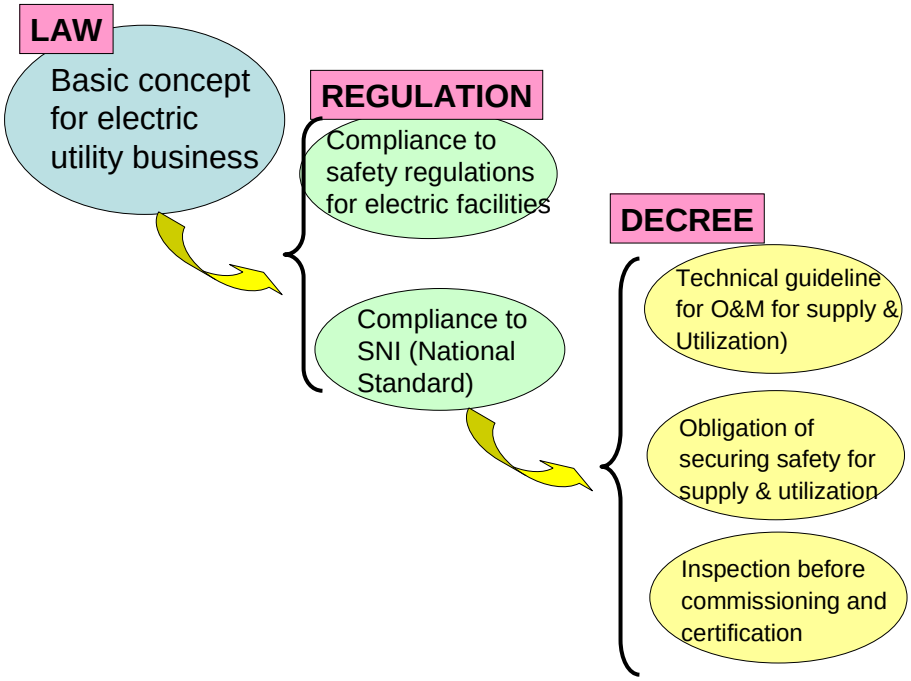


Figure 3.1-2 Basic Breakdown of the Legal System in the Electric Utility Business

3.1.3. Related Laws under Jurisdiction of Other Ministries (Ministry of Public Works, Ministry of Manpower and Transmigration)

(1) Ministry of Public Works

Information obtained as Laws and regulations concerning electrical facilities under the jurisdiction of the Ministry of Public Works are as follows:

"Minister of Public Works Regulations for Dam Safety No.72/PRT/1997"

Given the existing risks inherent in the dam building for social and environmental safety, special treatment is required at the design, construction and management stages. Hence such a Decree was enacted in 1997.

Targeting the Dam (height more than 15m with a capacity of more than 10 million cubic meters, height less than 15m with a capacity more than 50 million cubic meters, or the dimensions specified by the Dam Safety Committee), the Decree states the contents required for the permit of the construction, implementation of construction, water storage, operation plans, inspection and so on.

(2) Ministry of Manpower and Transmigration

Information obtained as laws and regulations concerning the electrical facilities are under the jurisdiction of the Ministry of Manpower and Transmigration is as follows:

"Ministerial Decree of Manpower and Transmigration for pressure vessels No.PER-01/MEN/1982"

Manufacture, installation, utilization and maintenance of pressure vessels involve risks, so the decree was established in 1982 to maintain health and labor safety.

The decree applies to the manufacture, design, utilization and maintenance of pressure vessels (pressure not lower than 2kg/cm2 and capacity not lower than 220cm2) except boilers and stipulates the strength, structure, test methods etc. in detail.

"Ministerial Decree of Manpower and Transmigration for qualification of welder No.PER-02/MEN/1982"

Certain competency level is required due to the progress of welding techniques, so a decree was established in 1982 to stipulate welder qualifications..

The decree stipulates the three levels of welder qualifications, category of practicable works, qualifications of the candidacy for an exam (age, completion of training), examination method for theory and skill, and judging standard etc.

"Ministerial Decree of Manpower and Transmigration for boiler water qualifications of a boiler operator No.PER-01/MEN/1988"

There is the possibility that there will be a boiler accident or even explosion causing major facility damage or injuries to nearby workers. A boiler operator's responsibilities are to prevent such mishaps from occurring. Hence, within this context a decree was established in

1982 that requires boiler operator certification.

The decree stipulates two levels of certification, the category of the operating boiler (Amount of steam generation 1st level: not lower than 10t/h, 2nd level: less than 10t/h), necessary experiences (educational background, operating experience of boiler, pass the exam etc.), required number of operator depend on boiler capacity, and contents of training etc.

3.2. National Standard of Indonesia (SNI)

(1) Significance of SNI

The Government of Indonesia has recognized the necessity of regulating standardization in various fields and has an obligation to legislate the standardization of industry fields as the WTO member. The motivation is to

- Strengthen the competitiveness of Indonesia
- Improve productivity, service quality,
- Develop the capacity of human resources

Under these circumstances, the Government of Indonesia has put forth legislation titled "Government regulation on national standardization (No.102, 2000)"

According to this regulation, national standardization will be targeting the following points.

- Strengthen the protection framework for consumers, business entities, workers, etc. in order to secure safety, relief, assurance, environmental protection, etc.
- Assist in smooth business operations
- Achieve solid business competitive ability.

For the promotion of the aforementioned standardization, BSN is the responsible agency, and implements policy creation for the standardization and manages the process of standardization. Each industry field is expected to proceed in adherence to the standardization process.

Upon the national movement of standardization, the "Electricity Utility Law (No.15/1989)" stipulates the article that gives authority and promotes standardization throughout the power industry.

(2)Development of SNI (PUIL) in Electrical Power Sector

(2-1) Background of SNI development

In Indonesia, nationwide standardization is required by government regulation, and the national standardization process is making headway within various industries. The national standard is called SNI, and has also been developed within the electric power fields. Under the legal system for the electric power industry, SNI is the basic standard for electrical facility development. Currently, based on the "Electricity Utility Law (No.15/1985)", the following points are stipulated in the "Government regulation on Power Supply & Utilization (Amendment)"

Government Regulation No.3, 2005 Article 22 (1)	Electric facility for power supply and utilization shall be developed based on the national standards of Indonesia in power sector (SNI)
Government Regulation No.3, 2005 Article 24 (1)-(2)	・ Minister has authority to issue the enforcement of SNI in power sector ・ Any electric equipment shall satisfy the enforced SNI and be sealed with the SNI mark

Based on the aforementioned regulation, the facility development for power supply & utilization shall comply with the SNI.

SNI is mainly focusing on the equipment or material for power facilities and is basically following the IEC standard.

(2-2) Policy for SNI Development

SNI in power sector is still under development. For the purpose of SNI development in the power sector, the electric utility in Indonesia, PLN, has as its responsibility to standardize its own in-house guidelines for the implementation of governmental regulation (No.3, 2005), and PLN has established groups of standardization. The group is currently implementing the following standardization works as part of the SNI development.

(a) Implementing the standardization for SCADA, Generation, Transmission, Distribution fields and general provisions
(b) For the purpose of revision/review of existing PLN standards, namely SPLN, implementing a verification of SPLN contents
(c) For the purpose of SNI development, considering the necessity of new SPLN contents
(d) Review the proposal or revision of existing and new SPLN items and prepare SNI development

(e) Others

SNI is to be developed based on the concept of SPLN, PLN's internal standards, and the technical committee of SNI development.

(2-3) Development Status of SNI

Regarding the SNI for electric power facilities including generation, transmission, and distribution, etc., they have not yet been completely. Among the electric power supply facilities, the SNI for "spillway", civil facility, as one of the hydro power facilities has already been developed. On the other hand, there are is no information regarding whether or not the SNI for thermal power facilities has been developed. As far as we have studied, there is no existing SNI for thermal power.

The SNI for distribution facilities (medium-low voltage distribution system and in-house wiring) has already been developed and SNI covers the installation rules in addition to those of equipment and materials.

The SNI for the distribution system including the in-house wiring is called the PUIL 2000 (Peraturan Umum Instalasi Listrik : General Provisions of Electric Facilities) which covers the following areas.

- Design of electrical facilities
- Construction and installation
- Maintenance
- Inspections and tests

As mentioned before, PUIL 2000 refers to SNI for electric power supply materials or IEC (in case SNI is not available) and the PUIL 2000 exists as one of the SNI for the distribution system's development.

The following picture is the PUIL 2000 that was obtained during our study.

Figure 3.2-1 PUIL2000 (Distribution and in-house wiring)

Outline of PUIL2000

Purpose

PUIL2000 is developed for the purposes of: securing to prevent human body from electric shock, safety of electric facilities and attachments, prevent fire caused by electric abnormality and protect the building and objects inside, and securing the utility business without trouble.

Target facilities

PUIL2000 is applied to facility design, install, inspection, testing with the voltage up to 1500V (AC) for LV facilities and up to 35kV for MV facilities.

Major Items

- Basic condition
- Safety protection
- Design of electric facilities
- Construction of electric facilities
- Switch, control equipment
- Conductor, grounding
- Electric facility business
- etc.

Figure 3.2-2 Outline of PUIL2000 (Purposes and Traget)

(3) The JICA Study Team's Evaluation on the Status of SNI (PUIL)

The SNI has been developed mainly for specifications of electric power equipment and materials except for distribution and in-house wiring facilities). SNI is developed based on the standards which PLN, the main utility in Indonesia, has developed so far, namely SPLN. Under the current circumstances, the SNI development is still being conducted based on the contents of SPLN, or the

IEC, the International Standard. SNI contents cover only the appropriate specifications of equipment and materials for the use of electric power facilities

On the other hand, regarding the laws or regulations that stipulate only what the electric power business entities have to follow for power facility development. For example, the regulation has stipulated that utility shall follow the SNI or IEC. This stipulation does not specifically indicate how electric power facilities shall be developed and it is not clear how inspectors will be able to judge whether or not a facility is good or bad..

In order to develop the electric power facilities in an appropriate manner in the Indonesian power sector, it is recommended that a conceptual common platform of technical requirements which any utilities shall follow so that power facilities can be developed minus any misunderstanding.

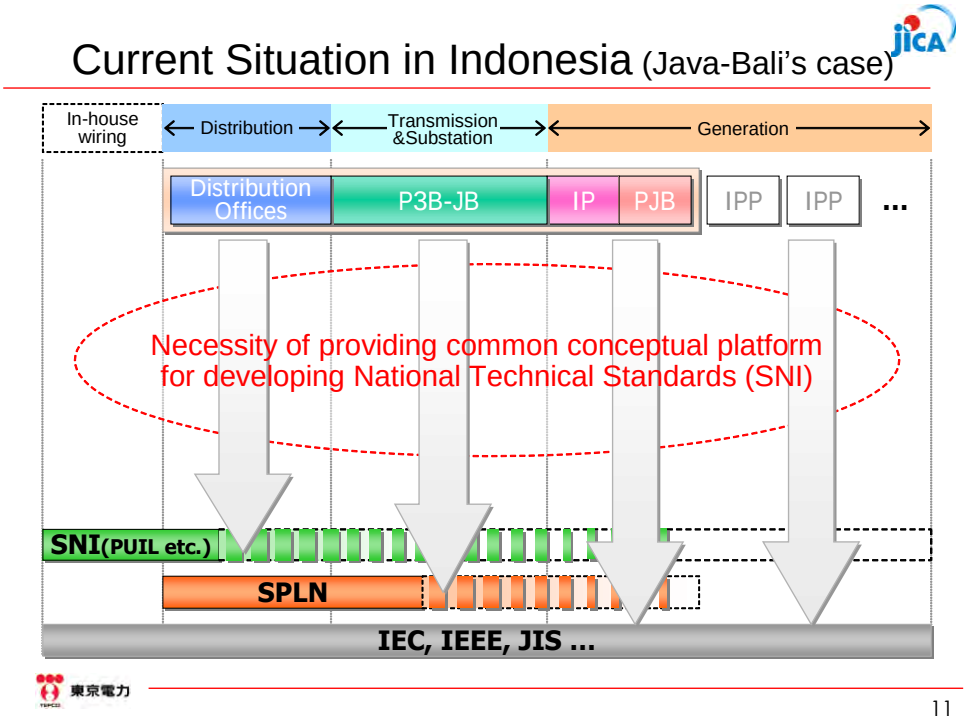


Figure 3.2-3 Current Situation in Indonesia (Java-Bali)

3.3. Power Utilities' Application of Technical Standards

3.3.1. PLN's Own Technical Standards (SPLN)

The Aforementioned National Standard (SNI) is still insufficient as standards that cover all the power facilities, though still under development. In this situation, as a major utility player, the

PLN has developed and has been maintaining its own power facilities' standard named "Standar PLN (hereinafter SPLN)". PLN practically applies this SPLN to perform inspections on their power facilities required by ministerial decree s.

There are about 300 SPLN presently covering the power facilities, as described in Figure 3.3-1. The PLN R&D division has responsibilities to create new standards and to supervise editing works. All the SPLN are compliant with international standard IEC. In this way the Indonesian standards for power facilities are defined by SNI and SPLN.

SPLN refers to the management / construction / planning / design / development and O&M of power facilities briefly, stipulating the precise material specifications, functions and unit tests for each generation, transmission, distribution, and automatic system power device of, SCADA. SPLN is almost equivalent to the Japanese industrial standard JIS in that it provides standards for comparatively low voltage networks such as distribution facilities. SPLN in the generation facilities are under development.

The DGEEU of MEMR established a Power Facilities' Standardization Group and this group is developing and maintaining SPLN to reach more substantial standards and they are converting SPLN to SNI in 2005.

Because of the shortage of budget and manpower, however, the working process has been significantly delayed from the original plan. The DGEEU of MEMR has decided decided to develop SPLN again according to the PLN board meeting on 21st Oct. 2008 that concluded with an articulation of its needs, working programs and an order of priorities. The project is to be accomplished by the end of 2009.

Table 3.3-1 SPLN by Areas

General(management/construction/planning/design/development and O&M)	37
Generation	64
Transmission	73
Distribution	133
SCADA	13
Total	320

DGEEU at MEMR is conducting a SPLN to SNI conversion. In particular, the Technical Committee

named “RSIN” was formed by the director of DGEEU. The RSNI has been organized by Steering Committee and 11 working groups listed below;

1. Power facilities working group（KK-IK）
2. Insulator working group（KK-IS）
3. Electric meter working group（KK-ML）
4. Overhead transmission line and battery Working group（KK-SU）
5. Substation working group（KK-TR）
6. System reliability and power devices working group（KK-KS）
7. Switchgear working group（KK-HB）
8. Cable and bare conductor working group（KK-KK）
9. Insulator material working group（KK-MI）
10. Electrical facilities working group（KK-PM）
11. Turbine working group（KK-TB）

(4) General Issues

In the Volume General Issues, there is a brief description regarding the management / construction / planning / design / development and O&M related to electrical facilities and as a whole, distribution facilities are technically detailed, but generation and transmission facilities descriptions are not fully covered.

The primary descriptions are as follows,

- ✓ Commissioning test of steam turbine
- ✓ Guide for operation and maintenance of diesel engines
- ✓ Guide for operation and maintenance of hydro power turbine
- ✓ Guide for planning on high or ultra high voltage power line
- ✓ Guide for operation and maintenance of oil transformer
- ✓ Hot maintenance on high or ultra high voltage power line
- ✓ Regulations about noise level
- ✓ Regulations about vibration level
- ✓ Safety equipment and safety indication

(5) Power Generation Facilities

The 63 terms of the SPLN for generation fields was established between 1977 to 1997 and only one term has been established since 2005.

An example of SPLN terms for the thermal power generation field

- Operation standards for Steam turbine, Gas turbine and Diesel engine power plant
- Commissioning standards for the Boiler, Steam turbine, Gas turbine and Diesel engine
- Maintenance standards for the Diesel engine power plant, Generator etc.

Example of SPLN terms for the hydropower generation field

- Commissioning standards for the Hydropower station
- Guidelines for Commissioning, Operation and Maintenance of the Hydro turbines
- Guidelines for adoption of IEC60193 “Hydraulic Turbines, Storage Pumps and Pump-Turbines Model Acceptance Tests” etc.s

A part of the PLN, the generation division has been split into two subsidiaries as PT. Indonesia Power (IP) and PT. Pembangkitan Jawa - Bali (PJB) in 1995. They adopted the SPLN as their technical standards when it provides an adequate precept. For the terms not mentioned above, International Standards such as ISO and IEC etc. or the manufacturer's manual for all equipment is utilized. In the case of IP, the head office evaluates and approves new company standards when established.

Yet, the SPLN is not applicable to Independent Power Producers (IPPs) because it is PLN’s in-house standards. Paiton Energy, one of the thermal power IPPs, is managed to comply with international standards and manufacturer's manual etc.

(6) Transmission and Substation Facilities

SPLN has 73 volumes in total, including 61 developed before 1997 and 12 inserted recently. Its main contents are commissioning tests for functions or materials of the equipment and power equipment specifications .

- Lighting Arrester（2 Volumes）
- Transformer（8 Volumes）
- Switchgear （7 Volumes）
- Insulator（11 Volumes）
- Overhead wire（10Volumes）
- Underground Cable（35 Volumes）

(7) Distribution Facilities

Distribution facilities in Indonesia are installed based on SPLN (Technical standards by PLN which covers electrical equipment, cable and other materials) and are based on new construction standards for distribution. There are different types of construction standards depending on the region. This is because of the different policies brought about by international aid from developed countries in the past.

The following are the main items covered by SPLN.

- Standard voltage
- Grounding system for distribution network
- Guideline for the 3 phase-4 wire 20kV distribution network
- Fundamental standards for the 20kV MV network
- High or low resistance grounding distribution system
- Specification of the distribution transformer
- Safety guideline (Transmission & Distribution)
- Others (Cable, equipment, etc)

“Electric facility Ministerial Decree” stipulates facility inspection, of which criterion following the construction standards.

Figure 3.3-1 and Figure 3.3-2 shows the SPLN and construction standards respectively obtained during the first site visit in February 2009.

Figure 3.3-1 SPLN (Dist. Transformer)

Figure 3.3-2 Construction Standard

3.3.2. IPPs Position

Since it is impossible to survey all IPPs in Indonesia, the JICA Study Team selected PT Cikarang Listrindo, the first thermal power IPP in Indonesia that commenced operations in 1993. The largest thermal power IPP in Indonesia is Paiton Energy.

Both thermal IPPs have been established with foreign capital so they conform to IEC or international standards or the manufacturer's manual as the technical standard for installation, operations and maintenance. Further, they also confirm province restrictions and local regulations etc. to prevent nonconformity to the regulations.

They desire to reform redundant regulatory bodies for plant operations such as the boiler operator under the jurisdiction of the ministry of manpower and MEMR. Further, they requested to secure the transparency of Indonesian national standards and to apply international standards, such as the IEC, JIS or ASME that are globally standardized and recognized in the world, to the Indonesian national standards in order to secure an alternative equipment supplier.

3.4. Rules of the Facility Operation

Regarding the operation of electric power facilities, it is designated as "It establishes Standard of Operation (SOP) for all equipment" by the Ministry of Labor and workers of all corporations has to follow the SOP which has been established by each company.

SOP is a job manual which establishes the normal operations for all equipment and operational standards. Further, there are many descriptions which are referred to as "Observing SOP" as technical work standards and is referred to as "Following SOP, respectively" as Competency Standard Units in the NQF.

However, the SOP differs for every company, and since it is generally disclosure, only those employed at the company in question knows it. Moreover, a duty of the presentation to the government (Ministry of Labor) has not been imposed and since there is no penalty when it is performed that it is contrary to SOP, it cannot be considered to be the systematic standard.

As an example, according to SOP, three managers (operations, maintenance and management) are prepared in order to appropriately carry out the work in the plant of PT. PLN.

In addition, in PLN, SPLN refers to not only the technical standards of the equipment but also the standards of operation as touched on "3.3.1 PLN's Own Technical Standard (SPLN) ". An example is shown in Table 3.4-1. And sample content is shown in Table 3.4-2, 3.

Table 3.4-1 an example about the standard of operation in SPLN

Standard title	Number of pages
The operation indicator of an oil immersed transformer	18
Water turbine starting, operation, the introductory indicator for maintenance	8
Starting of a diesel engine, operation, the introductory indicator for maintenance	7
Electric power center maintenance management Part I: General	15
Electric power center maintenance management Part IV PLTD maintenance management	25

Table 3.4-2 SOP of New low-voltage line

No	Explanation	Supervisor	Operator	Control center	Target time	Remark
1	Report of works and Preparation of operation					
2	Verification and Confirmation of work site					
3	Report of Verification					
4	Trial line changing					
5	Report of Trial line changing					

Table 3.4-3 Explanation of New low-voltage line' SOP

No	Explanation	Remark
1	A) Reporting work result from worker to Supervisor B) Reporting work result from Supervisor to Control center	Necessary information: Organization of work and operation stuffs, Design plan
2	Verification and Confirmation of work site	Confirmation point: Technical standard, Design base on SPK, Low-voltage switchgear Capacity of NH Fuse Phase
3	Report of Verification Request trial line changing from Control center Instruction of trial line changing	
4	Trial line changing	Install NH Fuse and switch on Check voltage by voltage meter or tester
5	A) Reporting Trial line changing result from Operator to Supervisor Control center B) Reporting Trial line changing result from Supervisor to Control center	Final check point • The level of voltage drop : less than 10%(220V: less than 5%) • Confirmation of worker's and facility safety, • Recording work results

3.5. Facility Inspection

3.5.1. Power Supply Facilities and Utilization Facilities

Based on Ministerial Decree No.45, 2005 of the electrical facilities and the Ministerial Decree No.46/2006 on electrical facilities, the facilities should be inspected and tested to confirm conformity with present standards after construction, installation or maintenance. (Refer to Table 3.5-11 and 3.5-2)

Table 3.5-1 Decree of the Ministry Energy and Mineral Resource No.45, 2005 for Electrical Facilities (abstract)

(Inspection and test for electric power supply facilities)
Article 7 (1) The electric power supply facilities that have undergone completion of construction, installation, maintenance, capacity change or relocation are required to undergo inspection and tests in order to ensure that in terms of consistency, they meet present standards.
Article 9 (1) Inspections and tests for electric power supply facilities described in Article 7 (1) consists of generation facilities, transmission facilities and distribution facilities. (2) Inspections and tests for generation facilities mentioned above (1) shall be performed at least based on the testing terms describes in Appendix I of this Ministerial Decree. (3) Inspections and tests for transmission or distribution facilities mentioned above (1) shall be performed at least based on the testing terms described in Appendix II of this Ministerial Decree.
Article 10 (1) A technical inspection body shall issue the operation license for electric power supply facilities based on the report of the operational qualification test results describes in Article 9 (4). (2) The operational license for the aforementioned generation facilities (1) is in force for a maximum of 5 years and is able to extend the same duration every time after passing the test. At the same time, the operation license for transmission and distribution is in force a maximum of 10 years and is able to extend same duration every time after passing the test.
(Inspection and test for electric power supply facilities)
Article 11 (1) The electric power utilization facilities whose construction and installation have been completed are required to undergo inspections and tests in terms of consistency with the present standards. (5) Inspection and tests for electric power utilization facilities of low voltage consumers is performed by non-profit independent bodies nominated by the minister.

Article 14 (1) Inspection and tests for electric power utilization facilities of high or medium voltage consumers shall be performed at least based on the testing terms described in Appendix V of this Ministerial Decree. (2) Inspection and tests for electric power utilization facilities of low voltage consumers shall be performed based on the testing terms described in Appendix VI of this Ministerial Decree.

Table 3.5-2 Decree of the Ministry Energy and Mineral Resource No.46/2006 for electrical facilities (abstract)

(Inspection and test for electric power supply facilities)
Article 15 (1) Technical inspection body shall issue an operational license for electric power utilization facilities of high or medium voltage consumption based on the report of the operational qualification test results described in Article 14 (3). (2) The operation license above mentioned in (1) is in force for a maximum of 15 years and is able to extend the same duration every time after passing the test.
Article 15A (1) Non-profit independent body shall issue an operational license for electric power utilization facilities of low voltage consumers based on the report of the operational qualification test results described in Article 14 (4). (2) The aforementioned operation license in (1) is in force for a maximum of 15 years and is able to extend the same duration every time after passing the test.

The inspection flow is shown in Figure 3.5-1.

Table 3.5-3 Work flow of facility inspection

Item	Utility	Inspector	Gov(State)	Remarks
1. Construction	●			
2. Test/inspection		●	△	Government or state inspector attend inspection for the inspection itams stipulated in Ministerial Decree.
3. Certification		△	●	Only one organization is certified by

				government among 18 inspecting organizations.
4. Start Operation	●			Certification of operation need renew due to expiry.

(1) Inspection/testing items

Inspections and tests are performed in accordance with the aforementioned proper test items for operating facilities in article 9 and article 14 of Ministerial Decree No.45, 2005. As it only refers to the test items, judgment standards remain unclear.

Article 22 of the Government Regulation No.3, 2005 for power supply and utilization stipulates that electrical facilities shall comply with the National Standards of Indonesia (SNI). SNI for the electric power sector, however, has developed specifications only for in-house wiring facilities, some parts of the transmission and distribution facilities so far. SNI for generation facilities has not been developed yet. Therefore, IEC, SPLN and/or manufacturer's standards are adopted as technical standards for each facility in the fields that do not have SNI.

As mentioned above, inspection/testing items are stipulated in the Ministerial Decree, though, there is no description regarding how the inspection/testing shall be done. This is the reason that inspectors cannot implement the testing/inspections uniformly on all electric power facilities.

Although the related government organization recognizes the need for certain level of guidelines for inspection/testing, it is impossible to develop the guideline of inspection/testing due to the amount of work.

(2) Roles of government/ state

The Electricity Installation and Safety section in the Directorate of Technical and Environmental Regulation of Electric Power manages the inspections and tests for electrical facilities at Directorate General of Electricity and Energy Utilization (DGEEU) in the Ministry of Energy and Mineral Resource (MEMR) as a supervisory organization. Inspectors belong to this section.

In the Ministerial Decree (No.45/2005) stipulates the items to be inspected by government or state inspectors among items designated to be inspected by inspection bodies. Regarding the electric facilities connected with the nation-wide network, government inspectors shall conduct inspections

based on the Ministerial Decree. Regarding other facilities such as the independent network such as networks in island, a state inspector shall inspect based on the State Decree. After the inspection, inspectors shall issue the certification of operation including those for the facilities that do not need visual inspection.

The process of state decree development is as follows:

- Upon activation of new Ministerial Decree, the Secretary General of MEMR holds a meeting for the explanation of the new Decree.
- Secretary General of MEMR decides the place of meeting. The Manager of MEMR who is responsible for the Decree explains.
- After the explanation meeting, the State Decree is drafted by deleting the unnecessary items in the Ministerial Decree.

In order to become a Government or State Inspector, the following requirements shall be satisfied.

- Shall hold an engineering degree from an accredited university
- Shall be a public officer
- Shall be trained

The training is implemented by National Educational Training Center every year and lasts for about three weeks. The training shall be implemented not only to Both the Government Inspector and the State Inspector shall undergo this training. There are three grades for inspectors (Beginners, Intermediate, advanced). For promotion, document examination must be conducted and achievement points are added every time an inspection is conducted. After a certain amount of points is accumulated, he or she is promoted to an upper grade.

For example, one can acquire 0.5 points by taking the document examination. When the total number of points obtained comes to 150 points, he or she is promoted from the beginners level to the intermediate level. This process is described in the Ministerial Decree (No.1059, 2004) which goes into the details about inspectors.

(3) Registered organization for inspection

Electrical facilities are categorized as electric power supply facilities, which are generation, transmission, substation and distribution facilities, or electric power utilization facilities. The Inspection and test for electric power utilization facilities of low voltage consumers are performed

by non-profit independent bodies nominated by the minister. Eighteen technical inspection bodies certificated by an authorized organization perform the inspection and tests for electric power supply facilities.

Table 3.5-4 Technical inspection bodies registered in DGEEU

PT Depriwangga	PT Gamma Iridium Perkasa
PT Indospec Asia	PT Wide & Pin
PT PLN (Persero) unit Bisnis Jasa Sertifikasi	PT Radiant Utama Interinsco
PT Koneba (Persero)	PT Indo Karya Senior
PT Sucofindo (Persero)	PT Indopower System

3.5.2. In-house Wiring Facilities

Article 11 of the Ministerial Decree No.45, 2005 describes the non-profit independent body nominated by the minister, performs inspections and tests for the electric power utilization facilities of low voltage consumers. KONSUIL has been nominated as the inspection body for low voltage consumer's facility by a Decree of MEMR No.1109.K/30/MEM/2005.

KONSUIL performs the inspection and issuance of the operations license for electric power utilization facilities of low voltage consumers between 450VA to 197kVA.

Originally PLN, which has the authority of the electric power business, must perform the inspection for electric power utilization facility based on the Decree of the MEMR No.01.P/40/M.PE/1990 for electrical facilities. MEMR, however, has revised the aforementioned Ministerial Decree No. 01.P/40/M.PE/1990 by Decree of the MEMR No.45, 2005 because there was a possibility of a clash of interests. Therefore, KONSUIL, that is a non-profit independent inspection body, has been established for the electric power utilization facilities of low voltage consumers.

3.6. Field Survey on the Existing Power Supply Facilities

In this study, in order to grasp and understand the actual situation of electric power facility operations, the JICA Study Team has investigated the facilities and implemented the information collection by meeting with the local staff of electric power facilities.

3.6.1. Thermal power generation plant

(1) PT PJB Muara Tawar thermal power plant

- Location: Desa Segara Jaya, Kecamatan Taruma Jaya, Kabupaten Bekasi, West Java
- Plant capacity: 920 MW
- Annual gross generation: About 3,130 GWh
- Unit configuration (power generation capacity) :
  Block 1: Combined cycle [GT (140 MW) x 3+ST (220 MW) x 1]
  Block 2: Open cycle [GT (140 MW) x 2]
  Manufacturer: Siemens
- Fuel: Natural gas/oil
- Power transmission: 500kV system
- Start of commercial operation: December 15, 1997

【Organization】

- Regarding the plant general manager below, there are 7 sections (operations, maintenance, engineering, safety and environmental, accounting, personnel affairs, general affairs) and auditors, and about 160 staff. The outline of an organization is as in Figure 3.6-1.

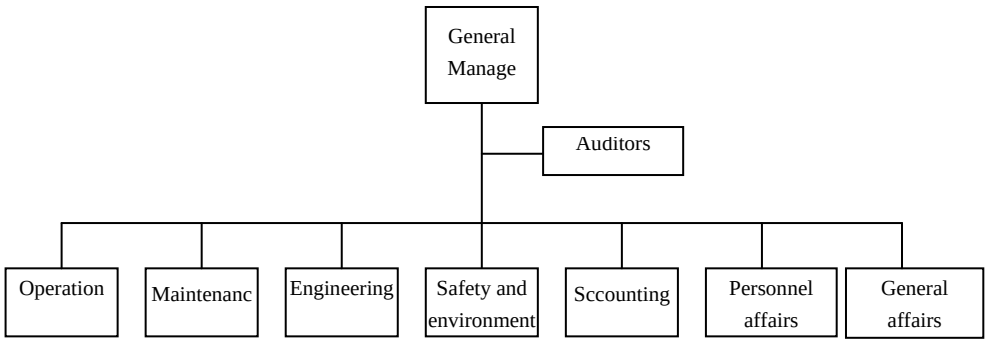


Figure 3.6-1 Muara Tawar power plant organizational chart

【Safety Management】

- It is based on Technical Standards of PLN.

【Human-resources development (company-qualifications system)】

- There is grade system (Grade 42-58) which corresponds to PLN's grade system (Basic (Level 6) - Integration (Level 1)).

- Inside a plant possessing a large amount of power generation capacity, a grade of a higher order is required even in the same job.
- During the annual Performance Appraisal, those staff that has achieved high grades in turn grades those staff with low grades.
- The rates of the capability categories (Leadership, Management tasks, Technical) called for by position and rank differ, low grade needs Technical capability and high grade needs Leadership capability, and each capability element that has been deemed importance is evaluated.
- The consultants from the PJB head office administers Grade authorizations.
- The Competency of the NQF is taken into consideration as one of the evaluations at the time of the Performance Appraisal.

Figure 3.6-2 GT/CC generation facility

Figure 3.6-3 Admin Office

(2) PT Indonesia Power Tanjung Priok thermal power plant

- Location: Jl. Laks. Laut RE. Martadinata, Tanjung Priok, Jakarta
- Plant capacity: 1,180MW (1,248MW include EGT)
- Annual gross generation: About 7,025GWh
- Unit configuration (power generation capacity) :
  Block 1&2: Combined cycle [GT (130MW) x 3 + ST (200MW) x 1]
  Manufacturer: ABB
- Fuel: Natural gas/oil
- Power transmission: 150kV system
- Start of commercial operation: January 18, 1994

【Organization】

- Regarding the plant general manager below, there are 6 sections (operations, maintenance, engineering, accounting, personnel affairs, and general affairs) and auditors, and about 350 staff.

The outline of an organization is as shown in Fig. 3.6-4.

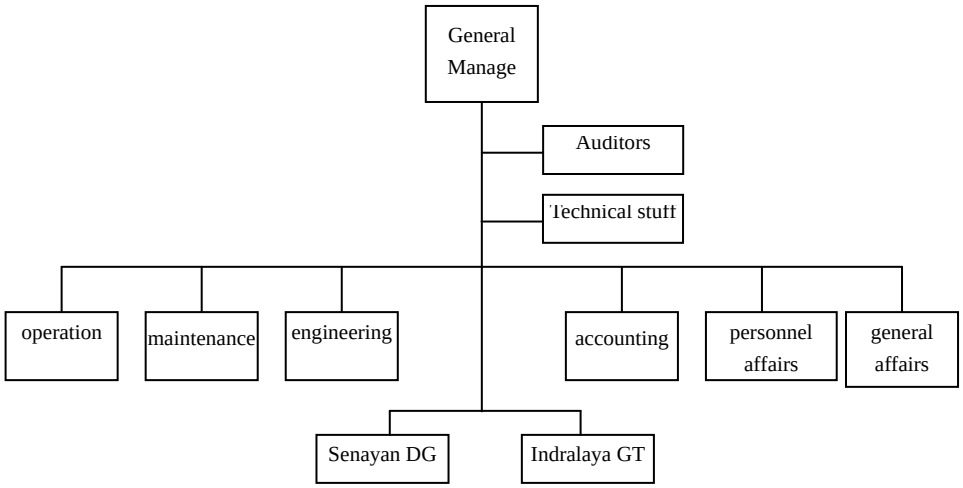


Figure 3.6-4　Tanjung Priok power plant organizational chart

【Safety Management】

- It is based on the ISO, OEM manuals, SPLN and etc. and when new standards and manuals are drawn up, the IP head office performs an evaluation and recognition.

【Human-resources development (company-qualifications system)】

- There is a grade system (Level 1-13(each has an a and a b) which corresponds to PLN’s grading system (Basic (Level 6) - Integration (Level 1))
- Level 1-3 of company qualifications mostly corresponds to Competency Standards level 1-3 of NQF mostly.
- The authorization of Competency Standards of NQF is mainly carried out in IATKI.
- Key Performance Indicator (KPI) is used for merit ratings via directions from the IP head office.
- The rates of the capability element called for by the position rank differ, and each capability element deemed important is evaluated.

Figure 3.6-5 CC generation facility

Figure 3.6-6 Central operation room

(3) PT. PLN(Persero) Sektor Pembangkitan Belawan thermal power plant

- Location: Belawan, , Sumatera
- Plant capacity: 1,080MW
- Unit configuration (power generation capacity) :
  Block 1: Open cycle [Boiler/ST]
  Block 2: Combined cycle [GT x 2 + ST x 1]
- Fuel: Natural gas/oil
- Power transmission: 150kV system
- Start of commercial operation: January 18, 1994

【Organization】

- Regarding the plant general manager below, there are six sections (operations, maintenance (Boiler), maintenance (CC), engineering, personnel affairs, general affairs) and auditors, and about 261 staffs. In addition 57 persons of OJT (On the Job Training) are in it.
- General Affairs takes charge of human safety, and the AM of engineering takes charge of facility safety.

【Safety Management】

- It is based on the Technical Standards of the PLN.
- During an inspection, the AM of engineering takes charge of facility safety.
- With regards to the boiler, a safety valve and a lift, Ministry of Manpower conducts inspections after the periodic check. Other facilities are checked by Jasa Sertifikasi.

【Human-resources development (company-qualifications system)】

・ Completion of OJT training, authorization of NQF Competency Standards is primarily carried out at IATKI.

3.6.2. Hydropower generation plant

(1) Saguling GBU（PT Indonesia Power）

・ Indonesia Power (PT Indonesia Power) was established in the electricity producer of the Bali Java area which became independent of Indonesia National Power Corporation (PT PLN) (Persero) in 1995. At present, the thermal power plants, geothermal power plants, diesel power plant and hydropower plants (water turbine: 133 sets, the total installed capacity:8,888 MW) are operated by IP through eight Generation Business Units (GBU). In addition, consulting services are also conducted in the Maintenance Service Business Unit (MSBU)

・ Saguling GBU is one of the GBU, which operates and maintains eight hydropower plants (water turbine: 29 sets, the total installed capacity: 797 MW) located in West Java.

Table 3.6-1 Hydropower plants in Saguling GBU

Name	No. of water turbine	Total installed capacity
Saguling	4	700
Bengkok	4	3.85
Plengan	5	6.87
Lamajan	3	19.56
Cikalong	3	19.20
Ubrug	3	18.36
Kracak	3	18.90
Parakan Kondang	4	9.9

【Organization】

・ Regarding the plant general manager below, there are six sections and auditors. The outline of an organization is as in Fig. 3.6-7.

・ Each plant is divided into two groups, operations and maintenance and are under senior supervision (24-hour shift service).Within a group, there is no distinction between engineering works, electricity, and machines as an operations group manager (Operation Supervisor) has responsibility for both operations of both the plant, and dam operations. Moreover, the contents of the maintenance work are also reported to the operations group manager, and grasp possess an

objective overview of the situation.

- Under the technical section, there is a Safety Senior Supervisor, who has a license which is issued from the Ministry of Labor and is responsible for the safe management of the power plant.

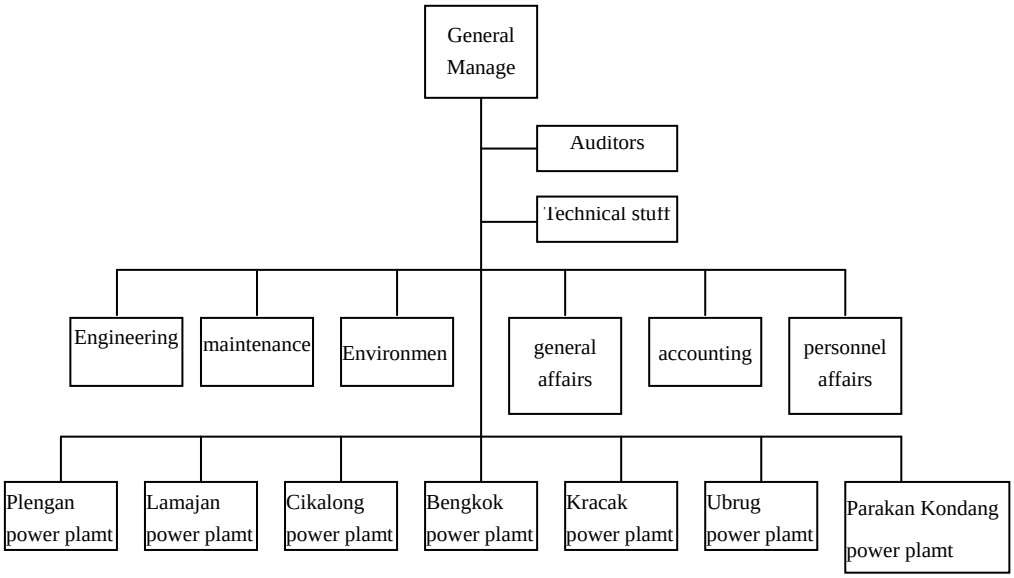


Figure 3.6-7 Saguling GBU organizational chart

【Safety Management】

- It is based on the SNI, SPLN, IEC, JIS, TEMA and other international standards. These have been summarized as the Manual Book and stored along with the manufacturer's manuals.
- Regarding the inspection conducted at the construction work's completion, MEMR is responsibility for the whole power generation system; on the other hand, the PLN JASA Sertifikasi has responsibilities for each facility.
- The machine's check intervals (management by operation time) and the time necessary for completion are summarized in the document for every plant, and recognition is received in the head office. After submitting the monitoring data of the established equipment which is used as the basis for decision-making, the approval of the head office is needed for further changes. The conversion to CBM (state standard preservation) from TBM (time base preservation) is under examination.

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【Human-resources development (company-qualifications system)】

- The skill levels which are classified into I-XIII differs from position and rank. For example, even if an operator raises his or her skill level, it does not necessarily lead to an immediate

promotion. Moreover, certification by certification bodies (level 1-3) is a license, and shouldn't be linked it with a company's decided skill level. Evaluation of the skill level is performed once every half a year.

- The KPI personnel evaluation system has been introduced from 2009.

(2) Saguling hydropower plant

- Operation was started in 1986 (head: about 350m, flow: about 220 m/s3, capacity: 700 MW (175MW x 4, vertical shaft Francis turbine)). It was built on the Citarum River and collected the Java Bali 500kV system through the 16.5/500-kV main transformer.
- Electric and mechanical facilities are made in Japan. Therefore, they were based on IEC standards. But there was no display of conformity standard practices in a water wheel name plate. Moreover, conformity standard practices were not able to undergo overload relay inspections considered to have been exchanged after starting commercial operations.

Figure 3.6-8 Saguling hydropower plan

Figure 3.6-9 Control room

Figure 3.6-10 Generator room

Figure 3.6-11 Water turbine

Figure 3.6-12　Protection relay panel

Figure 3.6-13　16.5/500kV main transfomer

Figure 3.6-14　500kV Switching station

Figure 3.6-15　Situation of an inspection

3.6.3. Transmission facility

(1) P3B (Penyaluran dan Pusat Pengatur BebanJawa Bali) office（Jawa Bali Transmission and Load Dispatching Center）

【Organization】

- P3B belongs to the PLN, which is a function of the central dispatching center, and takes charge of the long-term and short-term power supply plan of all of Indonesia.
- In the Java Bali system, the demand-and-supply balance adjustment and operations management of 500 kV bulk systems are carried out by the JCC (Java Control Center), and operations management of the 150 kV system are carried out by every place region control center:RCC1 (Jakarta), RCC2 (Bandung), RCC3 (Semarang), and RCC4 (Surabaya). 500-kV bulk systems are shown in Fig. 3.6-16.
- The organization of P3B each has a section under the head (General Manager), and the auditor staff independently. The organizational chart and district map are shown in Fig. 3.6-17 at

reference at about the "Java Bali dispatching center (P3B JB)." In addition, classifications are called transformation and transmission does not exist, but one section is transmission.

- There is the duty range of the P3B from the plant step-up transformer secondary coil to the transformer secondary cubicle in the distributing substation.

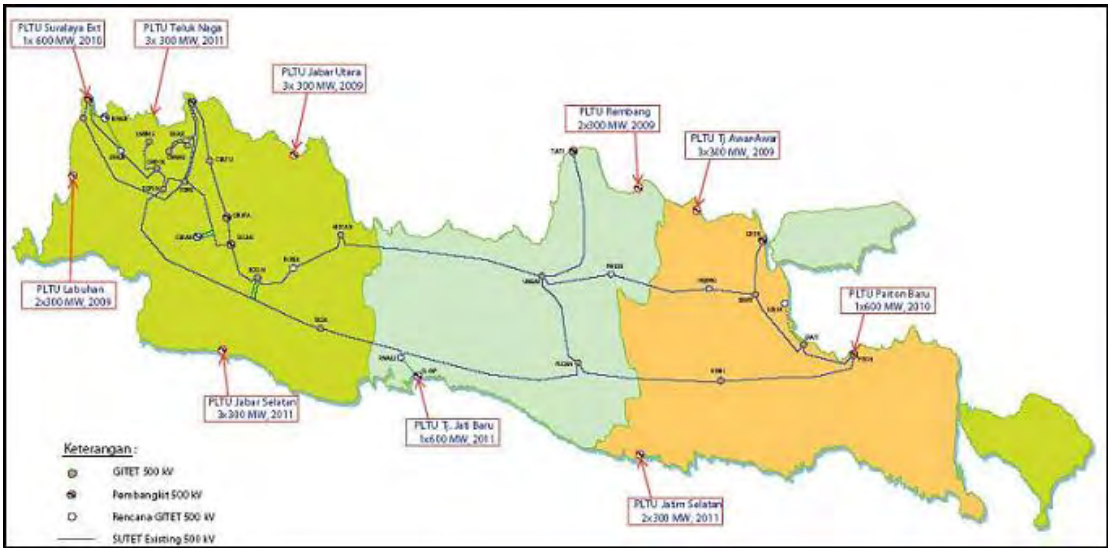

Figure 3.6-16　500-kV bulk systems

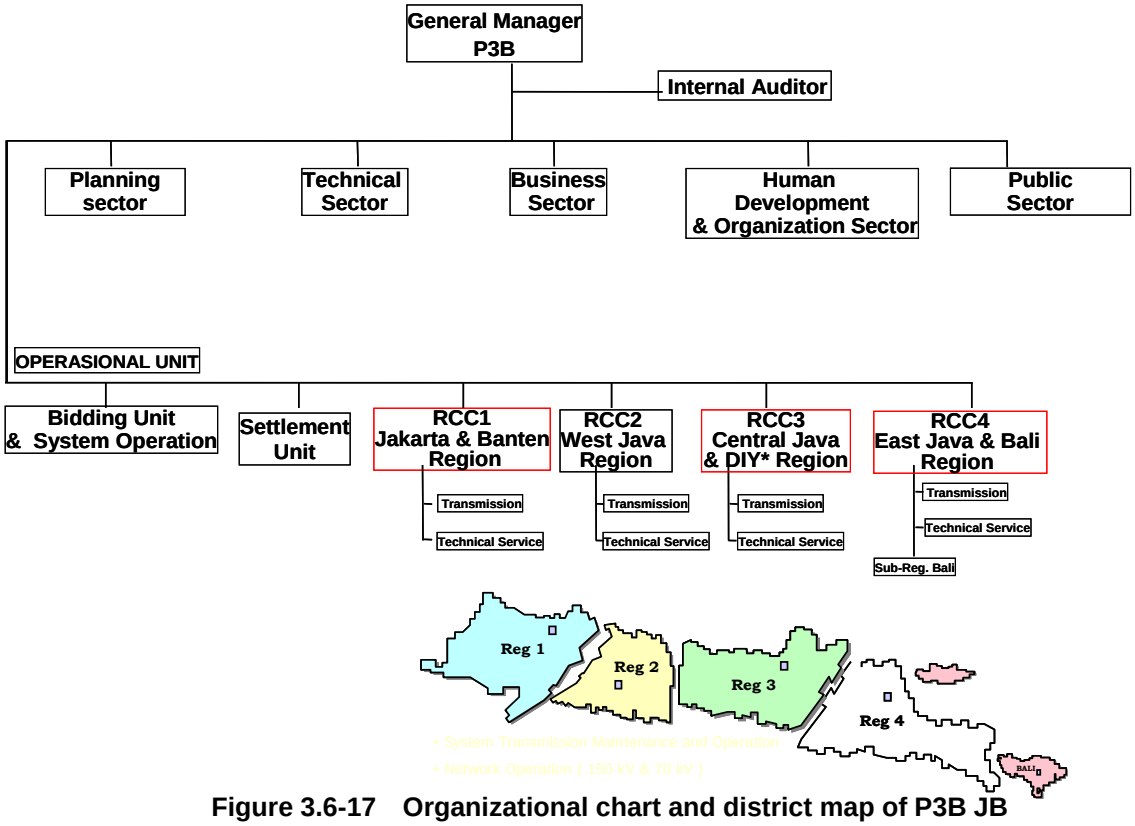

Figure 3.6-17 Organizational chart and district map of P3B JB

【Safety Management】

- It is based on SPLN. Because there is no SNI for the transmission section (only the distribution section). Now the SNI for transmission section is scheduled to be drawn out. The R&D section of the PLN is doing this work and the P3B is taking out the members to each WG.
- Regarding the specification of the facilities, specifications are based on a donor's standard. Although fundamentally based on the IEC, the standard of each country and a manufacturer's manual are also being referred to.
- Regarding the new construction, PLN-Jasa-Engineering (Jakarta) designs and Unit-PLN-Proyec-Induk (Semarang) builds the installation of facilities. And PLN-Jasa-Manajemen-Konstruksi which has managed these are in Jakarta. But the P3B takes charge of repair work from design to construction. In addition, PLN-Jasa-Certification is in the process of carrying out a completion inspection.
- A verification of the transmission main line and the substation is carried out every day based on a check sheet.

【Human-resources development (company-qualifications system)】

- Authorization concerning the personnel training of transmission and transformations is performed by GAMA of Semarang. At Semarang, the P3B engineer conducts examinations and field operations, and receives authorization.
- A training center for the P3B is located at two places, Bogor and Surabaya, there are courses in "Transmissions", "Substations", and "Protection" and three levels of "Basic", "median", and "advanced". One training period is three months long..

(2) Gandul Substation（500/150ｋV, 150/20ｋV）

- The double bus 1.5CB system and two banks (500kVA) have been adopted, and an extension 1 bank is in the works now (in future 3 bunks).
- On the facilities side, although there are circuit air blast breakers made from BBC, and gas insulated circuit breakers are made from ABB, an exchange is advanced to the insulated gas circuit breaker one by one from the accidents of an outdated air blast circuit breaker having occurred frequently. Transformers are made from ELIN whose capacity is 500/150 kV, and are generally put through a lot of work, with failure due to bad insulation occurring.
- A daily inspection is conducted every day based on the check list. Furthermore, a check of the insulation oil is carried out by the gas analysis in oil (DGA: Dissolved Gas Analysis) once per year. Other periodic checks are carried out by each facilities apparatus manufacturer's standard.
- The protection relays of a 500kV system make up the primary protection (distance relay + earth fault directional relay) and back-up protection (distance relay).

Figure 3.6-18 500kV transmission facility

Figure 3.6-19 500/150kV transfomer

Figure 3.6-20 Protection Relay

Figure 3.6-21 Work shop

Figure 3.6-22 Safety check

Figure 3.6-23 Inspection

(3) PT. PLN(Persero) Unit Pengatur Beban Sumbagut

【Organization】

- Below in P3B Sumatra at padang, there are 3 dispatching centers (UPB) (Palenbang, Padang, Medan) and 8 maintenance centers(UPT).
-

【Safety Management】

- The technical standards which PLN enacted are used as technical standards (SPLN).
- The assistant manager of operation has the responsibility of facility's safety. The K2(safety and environment)LH post has the responsibility of other safety and hygiene.

【Human-resources development (company-qualifications system)】

- Authorization concerning the personnel training of transmission and transformation is performed by GAMA of Semarang. At Semarang, the engineer of P3B performs examination and field operation, and receives authorization.

(4) PT. PLN(Persero) UPT Medan

【Organization】

- Regarding the general manager below, there are three assistant managers (Operations & Maintenance, Planning & Evaluation, Administration).
- 17 substations, 125 steel towers and 800km line are maintained.
- A 100-kV electric power system (Medan) is shown in Fig. 3.6-24

【Safety Management】

- The technical standards which PLN enacted are used as technical standards (SPLN).
- The assistant manager of operation is responsible for the facility's safety. The K2 (safety and environment) LH post has the responsibility for safety and hygiene.
- Facility maintenance is carried out based on preventive maintenance, a condition based maintenance and trouble maintenance

【Human-resources development (company-qualifications system)】

- The training center of PLN Medan is in Medan city. Moreover, with regards to the authorization of qualifications, staff representing certification bodies are invited to Medan to carry out such duties.

Keterangan :

: Tragi Binjai
: Tragi Paya Pasir
: Tragi Glugur
: Tragi Sei Rotan

Jumlah Tower : 1.214
Jumlah Sirkit : 37
Panjang kmr : 416,755
Jumlah Gardu : 17

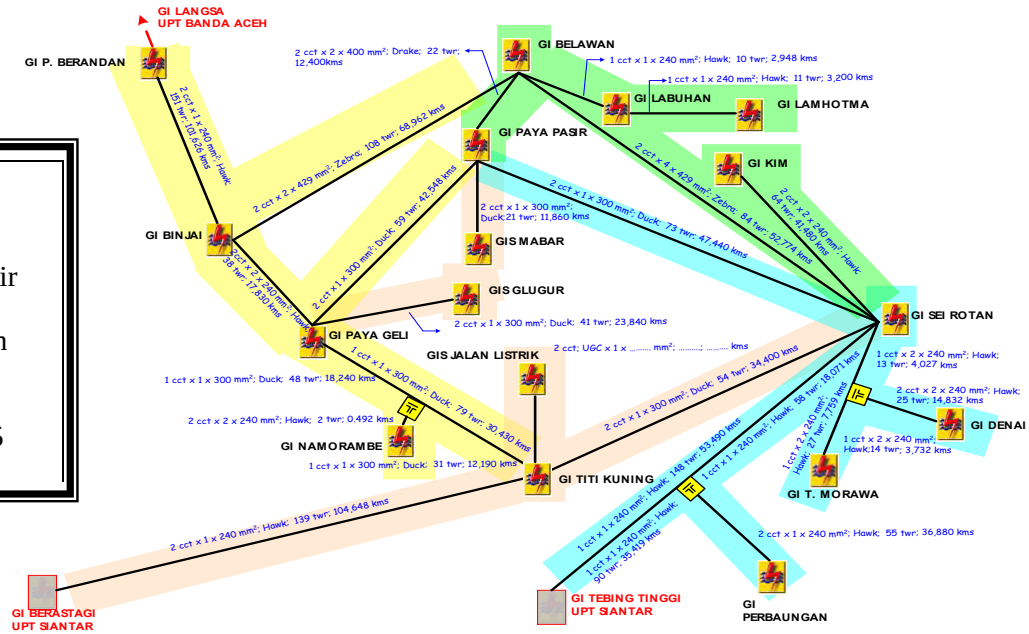

Figure 3.6-24 150kV systems(Medan)

3.6.4. Distribution facility

(1) PT. PLN(Persero) Jakarta

【Organization】

- The power distribution facility is building and operating the distribution unit, which is located in every place and region and is affiliated with PLN in Indonesia. The distribution facility itself adopted the technical standards which change with a change in the areas, and facility formation has been carried out. This deference is based on the donor's standard which has supported country power facility formation in the past. By this visit to PLN, it has been confirmed that it was in the following situations about formation of the distribution facility of Indonesia.

  ○Java Island : West Java : It is based on the standard of the European system.
  ○Java Island : Central Java : It is based on the standard of the U.S.A.'s system.
  ○Java Island : East Java : It is based on the standard of Japanese system.
  ○Sumatra Island : It is based on the standard of Japanese system.

- Based on the aforementioned standard, facility construction is carried out in the every place and region according to the grounding system of the following distribution systems.
  ○Java Island : West Java : Low resistor grounded system
  ○Java Island : Central Java : Direct grounded system
  ○Java Island : East Java : High resistor grounded system
  ○Sumatra Island: High resistor grounded system

【Safety Management】

- Operations and maintenance of the distribution facility in PLN are carried out according to the manual regarding operations and maintenance which PLN has. The manual is stipulated by each facility which is divided into high-voltage and low-voltage lines, overhead lines and undergrad lines.

Figure 3.6-25　20kV distribution facility of the Jakarta suburbs

(2)　PT. PLN(Persero) UPT Medan

【Organization】

- It is the same as that of PLN Java Bali. The person in charge of facility safety is also the same.

(3)　PT. PLN(Persero) Siantar Branch

【Organization】

- It is the same as that of PLN Java Bali. The person in charge of facility safety is also the same.

【Human-resources development (company-qualifications system)】

- The training center of PLN Medan is in Medan city. Moreover, with regards to the authorization of qualifications, staff of certification bodies are invited to Medan to carry out such duties..

3.7.　Problems Observed by the JICA Study Team

As described previously, the electric utility business complies with the “Electricity Utility Law (No.15/1985)”, “Government Regulation on Electric Power Supply & Utilization (No.10/1989, revision No.3/2005)” and the “Ministerial decree of electrical facilities (No.45/2005 & No.46/2006)” in Indonesia. Under this legal framework, electric power facilities are being developed based on the national standard SNI. The following figure is a depiction of the legal system in Indonesia for the electric utility business.

Figure 3.7-1 Current Laws and Regulations on Electrical Power Supply Facilities

Under the above legal system, securing the safety of the electric power facilities is stipulated. Regarding safety management in the electricity supply, Article 21 of the Government Regulations on Electric Power Supply and Utilization (No.10/1989, its revised No.3/2005) stipulates the obligation of conformity to "ordinances" and the rough outline of contents to be comprised in the "ordinances" as follows:

[Article 21]

(1) All the facilities for electricity supply must conform to the ordinances on electrical safety

(2) The ordinances on electrical safety stipulated in (1) shall comprise of standardization, security of electrical facilities, and the security of electricity utilization, for materializing power supply reliability, safety of facilities, safety against human bodies, and environmental friendliness.

(3) Authorization of facilities for supplying and utilizing electricity must be done by an electric power support business entity that was qualified by an accredited certifying body.

(Omit the rest)

According to the Indonesian counterpart, the term "ordinance" here refers to MEMR Ministerial Decree on Electrical Facilities (No.45/2005, its revised: No.46/2006). However, this Ministerial Decree has been stipulated for the procedures of the inspecting power supply facilities and not for defining how electrical facilities should be designed and installed for assuring safety.

The following Article 22 of the Government Regulation stipulates the obligation of electrical facilities' conformity to SNI as follows:

[Article 22]

(1) Electrical facilities mentioned in Article 21-(3) must conform to the Indonesian National Standard (SNI)

(Omit the rest)

Here only the reference to SIN is indicated but there is no clear description of why the conformity to SNI can assure a safe electricity supply and what should be defined in SNI for security.

SNI are Indonesia's national rules on industrial standardization like JIS (Japan Industrial Standard) and in the field of electric power, detailed specifications are stipulated for low voltage power appliances. Regarding electric power supply facilities, specifications for installation are partially defined in PUIL (Peraturan Umum Instalasi Listrik, meaning "General Rules on Electrical Facilities"), which has been prepared as an affiliate rule of SNI.

Even if specifications for electrical facilities are covered by SNI, though incomplete, no clear description is presented regarding the fundamental concept to explain the background of these specifications and no close relations can be observed in the description between SNI and super-ordinate laws and regulations.

As discussed above, the current legal system for the Indonesian electric power sector has not been designed systematically for securing a safe power supply, though it only presents rough stipulations on securing safety and specifications on electrical appliances and installation.

It also needs to be noted that so far SNI and PUIL have developed specifications on low voltage electrical appliances and wiring regarding electrical utilization and a specification on the part of installing transmission and distribution facilities, but still many fields have been undeveloped such as the installation of power generation facilities. In addition, there are no stipulations on the penalties against the violation of Article 22 of Government Regulations, and hence inconformity to this article cannot be penalized. MEMR says that SNI will be expanded so that its will cover all the items related to electric power supply facilities in the future, that it will take considerable time to complete, thus tentatively the application of other standards is acceptable such as SPLN, which is PLN's in-house technical standard, and IEC that is widely accepted in the world. That is, circumstances have not been developed for strictly observing this Article.

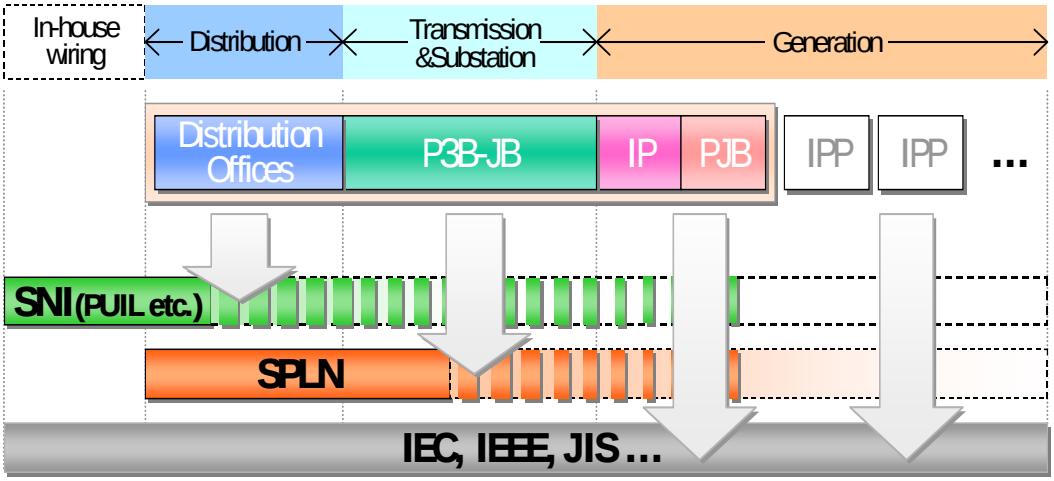

Figure 3.7-2 Application of Standards for Electrical Facilities Installation (SNI etc.)

Taking into account that it takes a considerable amount of time to develop SNI to cover all the items regarding electric power supply facilities and that there are already existing extensive facilities that have been installed and operate by not conforming to other standards than SNI, it is a more realistic approach to prioritize stipulating minimum requirements that all facility must comply with, while tentatively accepting the application of other technical standards.

The development of “minimum requirements” are also needed to effectively operate the inspection of newly installed (or modified) power supply facilities. Current regulation provides a checklist for inspection but no clear criteria and standards are referred to for each inspection item. Hence there is a possibility that a dispute may occur between the owner/operator of a facility and the inspection body on the interpretation of facility specifications due to their reference to different standards. The minimum requirements of the “common platform” that any facility must conform to will serve to arbitrate between such disputes. Figure 3.7-3 shows the image of legal system strengthening

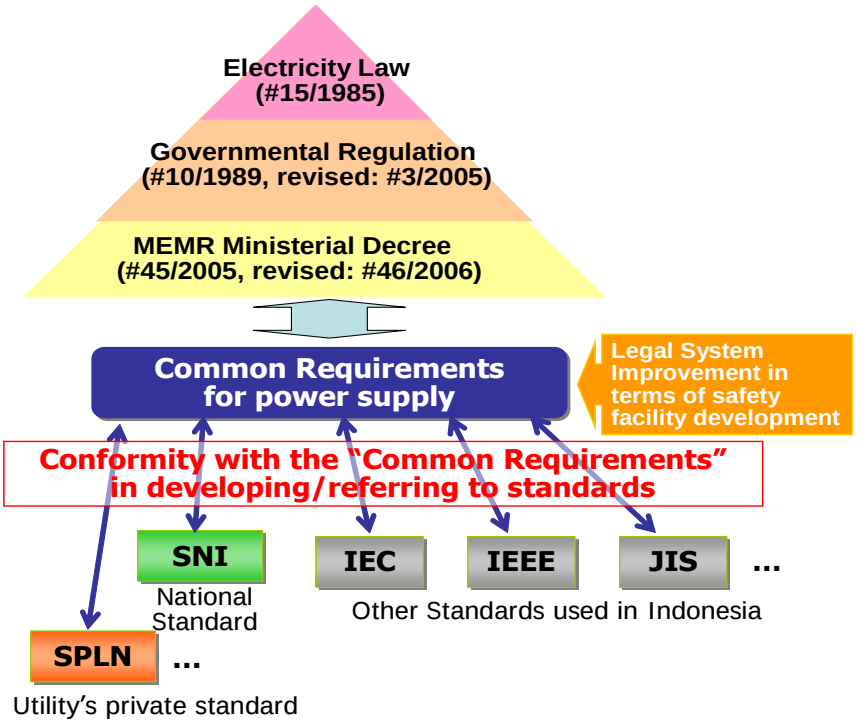

Figure 3.7-3 Image of Legal System Strengthening

3.8. Appendix

[Appendix 1] Safety Management Systems on Electrical Facilities in Japan

[The basis of Safety Management system (Electric Utility Law)]

The current electric power industry law came into force in 1965. The purpose of this Act was to protect the interests of electricity users and achieve a sound development of the Electricity Businesses are to realize appropriate and reasonable management of Electricity Businesses, and to assure public safety and promote environmental preservation by regulating the construction, maintenance and operation of Electric Facilities. It regulates two main areas, "business regulation" and "safety regulation" of which the Technical Standards are based on.

[The outline of Safety Management system]

In the current Electric Utility Industry Law of Japan, power utilities are obliged to comply with the following three main pillars to ensure the safety of electrical facilities.

(1) Obligation of conformance to Ministerial Ordinance for Determining Technical Standards for Electrical Facilities
(2) Nomination of Chief Qualified Engineer
(3) Establishment of Safety Rules, notification to the regulatory agency, observance of Safety Rules

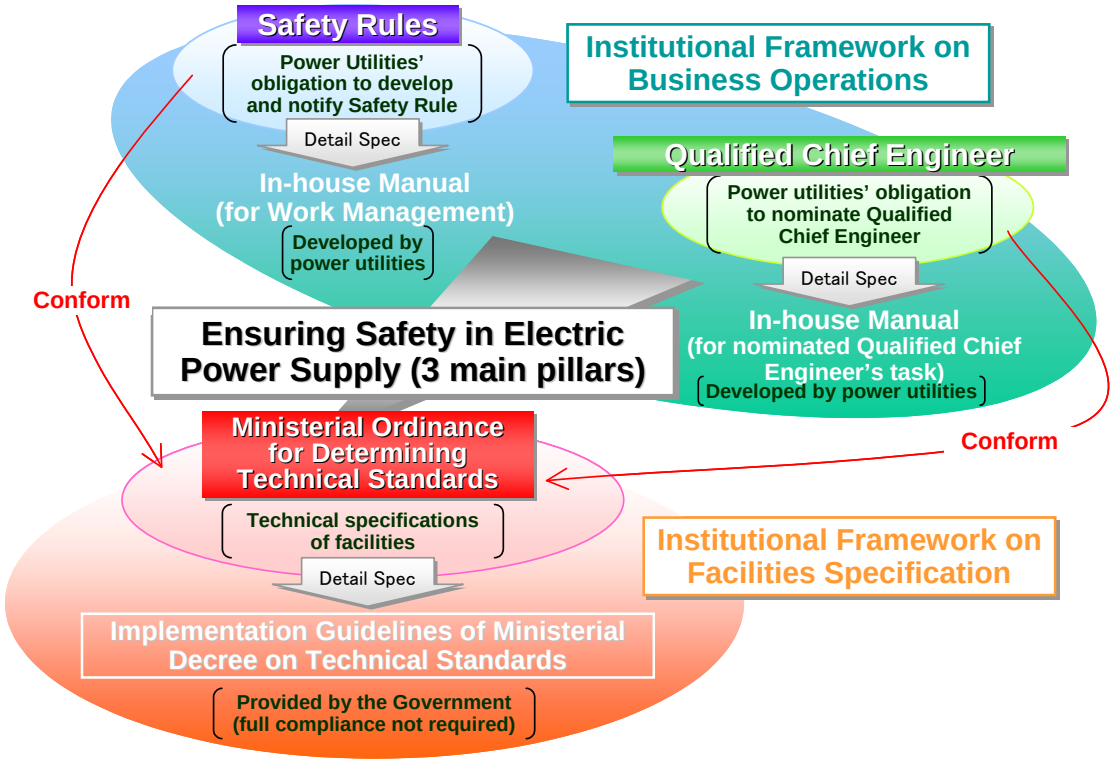

Figure 3.8-1 Three Pillars for Securing Electrical Safety in Japanese Legal System

[(1) Obligation to conform to the Ministerial Ordinance for Designating Technical Standards for Electrical Facilities]

The Technical Standards, which are legally binding ministerial (Ministry of Economy, Trade and Industry) ordinances, shall regulate the design, construction and maintenance of electrical equipment to ensure public safety and a stable supply of electricity. (Fig. 3.8-2) And the Technical Standards specify, not quantitatively but qualitatively, the required functions and performance of electrical equipment. On the other hand, "The Interpretations of the Technical Standards" are introduced to specify numerical standards. Concretely, a violation of the Technical Standards, which are legally binding, would be subject to administrative punishment. While compliance with the Interpretations of the Technical Standards ensures compliance with the Technical Standards themselves, electrical equipment can be installed in accordance with Technical Standards along technical grounds, rather than the Interpretations of the Technical Standards, which will ensure safety. The Structure of Laws and Regulations are shown in Fig. 3.8-3.

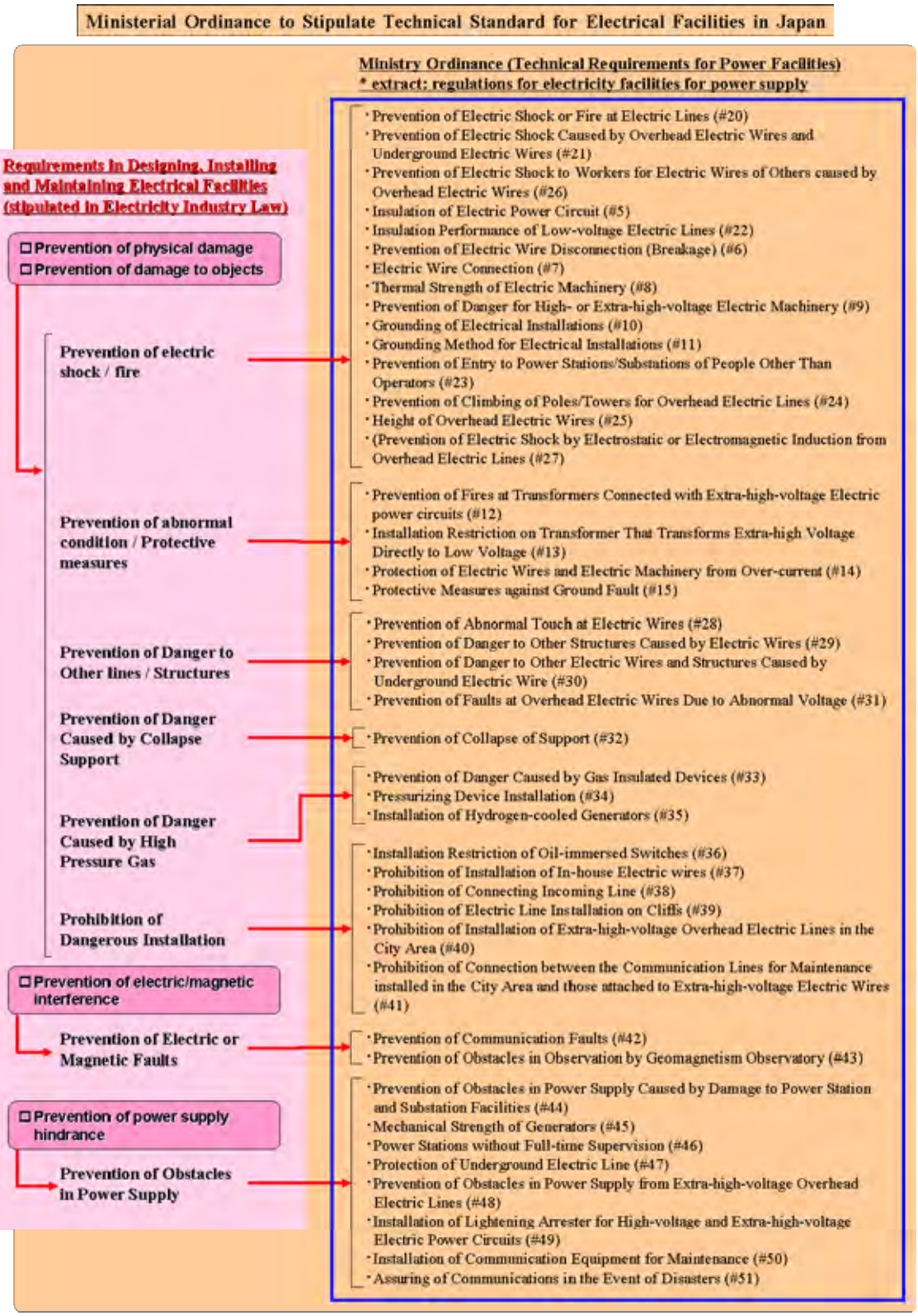

Figure 3.8-2 Positioning of Technical Standards of Power Equipment

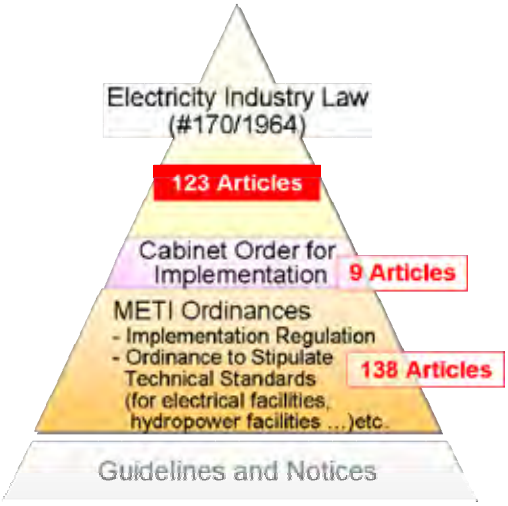

Figure 3.8-3 Structure of Laws and Regulations

[(2) Nomination of Chief Qualified Engineer]

The Electric Utility Law dictates that a chief qualified engineer with a license must be assigned as a superintendent of security to oversee the Electric Facilities for Business Use (Electric Facilities other than Electric Facilities for General Use) . The kind of qualification and the range which can be superintended are as in Fig. 3.8-4.

<table>
<tr><td colspan="3">Electric Facilities for Business Use</td></tr>
<tr><td>All Electric Facilities for Business Use</td><td>Electric Facilities for Business Use which voltage is below 170,000V</td><td>Electric Facilities for Business Use which voltage is below 50,000V (except for the plant of 5000 kW or more of outputs)</td></tr>
<tr><td colspan="2"></td><td>Third-Class Chief Electricity Engineer</td></tr>
<tr><td></td><td colspan="2">Second-Class Chief Electricity Engineer</td></tr>
<tr><td colspan="3">First-Class Chief Electricity Engineer</td></tr>
</table>

Figure 3.8-4 Kind of Chief Electricity Engineer

[(3) Establishment of Safety Rules, notification to the regulatory agency, observance of Safety Rules]

The “Safety Rules” are the autonomous rules that each power utility must develop to stipulate the basic policies on business operation to notify to the government.

The relations among these three main pillars are as follows: *Ministerial Ordinance on for Determining Technical Standards* is conceptual outline for securing the safety of Electrical Facilities, *Safety Rules* are the arrangement of operational tasks to ensure the safety performance, and *Chief Qualified Engineers System* is a scheme to ensure the quality of staff capacity to ensure the implementation of the other two with the autonomy of a power utility.

[Appendix 2] Status of Electric Power Technical Standard in Japan and Other ASEAN Countries

In order to establish National Safety Requirements of the existing legal system which contributes to the stable electric power supply and the security structural reinforcement of Indonesia, we have sorted out and analyzed Japan's and ASEAN's statutory framework and Technical standards through reviewing following reports.

- Comparison of Electric Power Technical Standards and Policy Making for technical Cooperation (2006/03)
- Comprehensive Analysis of Electric Power Technical Standards within the Asian region (2008/01)

Since the decision or updating of the Technical Standards was performed by the Japan International Cooperation Agency for Laos, Cambodia, and Vietnam, we have sorted out and engaged in investigations on not only whether a set of Technical Standards has been laid down but also the problems prior to standard establishment in Laos, Cambodia, and Vietnam.

(1) Lao People's Democratic Republic

[Problems before standard establishment]

Since the standard equivalent to electric power technical standards did not exist but was applied only in accordance with the design manual of the Laos National Power Corporation (Electricite du Laos: EDL) which is a national electric power supplier, the power equipment built by foreign capital did not have a unification standard, but caused complications and difficulties during operations, maintenance, and the management of power equipment along with the problem of equipment security, such as the public security danger connected to electric supply reliability, electric shocks and fires, supporting structure collapses were produced as a result.

[Status of Technical Standards]

In February of 2004, the Lao Electric Power Technical Standards (LEPTS), which were prepared and arranged by the JICA project-type technical cooperation “The Project on Electric Power Technical Standard Establishment in Lao P.D.R.”, were formulated and were made legally binding in accordance with the Electricity Law. The contents refer to the technical standards of Japan, the articles overlapping for each piece of equipment summarized, classified the article into separate categories of equipment, and made into a common article. This is all 184 of the articles and is considered as an adaptation exclusion of the existing electric installation technical-standards violation part. It is positioned in the basis of the Electricity Law as Decrees (what the prime minister recognizes after adjustments with related administrative bodies), and deciding a fundamental portion.

(2) Cambodia

[Problems before standard establishment]

According to the Electricity Law, which was issued in February 2002, the Electricite du Cambodge (EDC) and all other power companies are required to acquire a license from the Electricity Authority of Cambodia (EAC). In order to issue the license, the EAC needs to make sure the electrical equipment based on Technical Standards is issued by the Ministry of Industry, Mines and Energy (MIME).

However, the Technical Standards have not actually been issued yet. Therefore, the situation where clear requirements did not become settled continued and since the assistance organization had fixed power equipment haphazardly, the problem was that it was vulnerable and low electric power supply reliability and stability had produced the power supply system.

[Status of Technical Standards]

In July 2004, the General Requirements for the Electric Power Technical Standards (GREPTS), which were prepared and arranged by JICA project-type technical cooperation “The Study for Establishment for Electric Power Technical Standards and Guidelines in Cambodia”, were formulated and given legally binding by the Electricity Law. It is positioning itself as a compulsive standard based on Electric Utility Law, and is the compulsive standard and level equal of advanced nations fundamentally. Although it was considered as a qualitative regulation with regards to the necessary minimum performance standard based on law and based on the actual conditions in Cambodia, a part of the numerical standards were taken in. Moreover, in July 2007, specific Requirements for the Electric Power Technical Standard, which were prepared and arranged by the JICA project-type technical cooperation “Project for Capacity and Institutional Building of the

Electric Sector in Cambodia", were formulated and issued by MIME.

(3) Vietnam

[Problems before standard establishment]

Although the electric power technical standards created by support from the Soviet Union in 1984, did not conform to the present conditions, an international standard and the technical standards of the Vietnam National Power Corporation (Vietnam Electricity: EVN), etc. were applied individually. However, the existing electric power technical standards of which EVN has had much dissatisfaction from electric power suppliers other than EVN in the in-company manual of EVN closely. Further, the inspection of the power equipment by the Ministry of Technology (Ministry of Industry: MOI) based on electric power technical standards had not carried out.

[Status of Technical Standards]

The electric power technical standards, which were prepared and arranged via the JICA project-type technical cooperation of "Viet Nam's Technical Standard for Electric Facilities", were reviewed and revised. The standards that were carried out were mainly in operations, maintenance, and management of power equipment. On the other hand, a part of the design / installation standards and inspection standards which are not included in the control subject of MOI is out of scope. In addition, according to this revision, the technical standards changed from quantitative regulation to qualitative regulation, because they have been anxious about the technical barriers preventing new entrants into the electric power sector and an increase and obsoleteness of incongruent cases to various technologies.

(4) Thailand

[Status of Technical Standards]

The laws that regulate the electric enterprise and the technical standards of the electrical facility that regulated by the government do not exist. The in-company standard of the Electricity Generating Authority of Thailand (EGAT) is applied as domestic only technical standards. The EGAT standard has quoted overseas standard practice, such as the ANSI Standards. The equivalent to the IEC or JIS in Thailand is the Thailand Industry Standard (TIS).

In addition, in the event of an emergency or other necessity, a licensee is authorized to enter the land or the premises of any person at any time for inspection or repair of the power network system. If the owner or occupying person is present at the site, they are to be notified prior to such entrances.

(5) Philippines

[Status of Technical Standards]

Based on the republic Act No.9136, also known as the “Electric Power Industry Reform Act 2001” and the “Implementing Rules and Regulations” (IRR2), "The Philippines Electricity Code" which are the technical standards of installation for electric installation, operations, and maintenance is specified as the compulsory electric safety standards to the system equipment owner and the operator. Further, a distribution utility is required to provide distribution services and connections for any end-users within its supply area consistent with the Distribution Code.

Furthermore, The Grid Code requires the grid owner and grid users to adopt and utilize a set of Safety Rules and Local Safety Instructions (SR&LSI) for implementing safety precautions on high voltage (HV) and extra-high voltage (EHV) equipment. In addition, the Philippine National Standard exists as a national standard.

(6) Singapore

[Status of Technical Standards]

The Electricity Act stipulates that all electricity licensees shall comply with the codes of practice and other standards of performance issued or approved by the Energy Market Authority

The (EMA) and directions given by EMA. The Transmission Code sets out the technical requirements to be met by those who are connected to the transmission system, from the perspective of maintaining the stability, security and reliability of the power system. Further, the Transmission Code establishes the inspection and maintenance requirements for the electricity licensees. All electricity licensees, including the transmission licensees, generation licensees and retail licensees, are required to inspect, test, monitor and maintain their own electrical facilities and installations in order to determine whether such facilities and installations comply with all applicable technical standards and requirements. In addition, the Electricity Act stipulates that only licensed electrical workers can carry out electrical installation, maintenance and repair work.

(7) Malaysia

[Status of Technical Standards]

Department of Electricity Supply (DES), which is founded based on the “Electricity Supply Act 1990” and “Electricity Supply Regulations”, is also responsible for the regulation of the power industry in both Malay Peninsula and Sabah. And the IEE Wiring Regulations Edition 16 has been

enacted to establish a set of technical standards for the electric power industry. In addition, the Factory and Machinery Regulations under the Occupational Safety and Health Act of 1994 obligates electric licensees to implement periodic inspections, as well as pre-use inspections, of their electric facilities including boilers and turbine-generators. Further, electric licensees are required to formulate and observe their own internal safety rules. When an electricity accident occurs, the electric licensee concerned must report to both the Energy Commission and the Department of Occupational Safety and Health.

(8) Myanmar

[Status of Technical Standards]

The two main laws governing the power sector in Myanmar are the Electricity Act of 1910 and the Electricity Supply Act of 1948. However, they do not regulate the design, construction and maintenance of the electrical equipment. A variety of foreign standards and codes are concurrently being used. Currently, the IEC standards and BS standards are the most extensively used, while other local standards and codes are used in some projects on a case-by-case basis.

In order to establish the National Safety Requirements in the existing legal system that contributes to the electric power stable supply and the security structural reinforcement of Indonesia, we have investigated Japan’s and ASEAN’s statutory framework and Technical standards. As a result of the investigation into the electric power technical standards relevant to the main electric power field (power generation, power transmission, power distribution),small differences exist via legal positioning and the regulation method. However, the standard is equivalent to the technical standards in seven nations excepting Indonesia., Myanmar, and Brunei have also been enacted. Moreover, in six nations minus Thailand, a duty of observance is imposed based on the electric power method of a country. The list of ASEAN countries is shown in Table 3.8-1. The technical standards of Japan and industrialized nations that contribute to security structural reinforcements are shown in. Table 3.8-2.

Table 3.8-1 the list of Technical Standard which contribute to security structural reinforcement in ASEAN countries

	Indonesia	Singapore	Cambodia.	Philippine	Vietnam	Laos	Malaysia	Thailand	Myanmar
Electric Power Utility Law	Electric Power Utility Law	Electricity act	Electricity law	Republic act	Electricity act	Electricity law	Republic act	Electricity law	Electricity act
Regulation for Technical Requirement for Power Facilities	—	Transmission Code	Regulation for Technical Requirement for Power Facilities	Philippine Electrical Code	Regulation for Technical Requirement for Power Facilities	Lao Electric power Technical Standard	Energy Commissin Act 2001	EGAT (Utility's Regulation)	–
Regulation institution	Ministry	Energy Market Authority	Ministry	Energy Regulatory Commission	Ministry	Ministry	Energy Commissin	EGAT	–
Technical Guidelines for Power Facilities	—	—	Technical Guidelines for Power Facilities	—	Guidelines	Technical Guidelines for Power Facilities	—	EGAT	–
Standard (Reference)	SNI, SPLN (IEC)	Singapore Standard (IEC,BS)	– (IEC)	National Standard (ANSI)	Vietnam Standard (IEC)	– (IEC)	— (IEC)	TIS (ANSI)	- (IEC, BS)
Certification of electric equipment	SNI	CAB	–	PS	VS	–	SIRIM	TIS	-

Source: Create based on Comparison of Electric Power Technical Standards and Policy Making for technical Cooperation (2006/03)

Table 3.8-2 the list of Technical Standard which contribute to security structural reinforcement in industrialized nations

	Japan	U.S.A.	U.K.	Germany	France	Australia (Victoria)
Electric Power Utility Law	Electricity Industry law	State Administration Code	Electricity act 1989	Energy Economy Act 2005	Administration Code	Electricity Safety Act
Regulation for Technical Requirement for Power Facilities	Regulation for Technical Requirement for Power Facilities	NESC (National Electrical Safety Code)	The Electricity Safety, quality and Continuity Regulations 2002	DIN-VDE	Government and Minister Order	Electricity Safety Regulation
Regulation institution	Ministry (METI)	State Government(IEEE)	Ministry (DTI)	Ministry (DKE)	Ministry (DIDEME)	State Government (ESV)
Technical Guidelines for Power Facilities	Technical Guidelines for Power Facilities	—	Standard of ENA	—	NF	AS
Standard	JIS	ANSI	BS	DIN-VDE	NF	AS
Certification of electric equipment	JIS(PSE)	UL	-	-	NF	AS

Source: Create based on Comparison of Electric Power Technical Standards and Policy Making for technical Cooperation (2006/03)