

Project Study on Comprehensive
Technical Cooperation in the Field of
Energy in Indonesia

Final Report
(Summary)

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Preface

JICA has conducted a wide range of technical cooperation projects on the Indonesian energy sector in the areas such as JICA Expert dispatch, development study, technical cooperation project and acceptance of trainees. These projects have led both soft loan projects and grant-aid projects and contributed to the development of the economical and social infrastructure.

The foundational consolidation of technical data, technical transfer and human resource development was implemented through previous technical cooperation projects, consequently, certain technological competencies have already been established in Indonesia. However, in recent years, the circumstances in the Indonesian energy sector have changed dramatically and various difficult issues have emerged. The energy policy, based on abundant oil reserve, has been unsuccessful and oil amount of import exceeded that of export in 2004, thus, effective policy changes are urgently required. The Indonesian energy sector should promote the establishment of a practical energy policy and institutions to achieve sustainable development. The installation of a fair and highly transparent energy sector is essential. At the same time, the structural reform of the energy sector and decentralization policy should not adversely affect the socio-economic infrastructure environment, particularly with regard to rural development.

Based on these circumstances, it can be said that the methods of JICA's technical cooperation projects are now in a phase of diversification. The most appropriate form and method of cooperation should be presented by identifying various requirements for technical assistance, then on assessment, the projects which meet each requirement should be actively proposed. In addition to the previous assistance, a comprehensive approach that includes policy planning, institutional arrangement and human resource development are necessary.

This study assesses the difficulties in each field of the Indonesian energy sector and proposes effective practical cooperation programs for the future. Specific recommendations for cooperation projects are also presented.

This report aims to contribute to the establishment of a technical cooperation plan in the Indonesian energy sector. This study was sponsored by JICA and implemented through the study team consist of Chubu Electric Power Co., Inc and Nippon Koei Co., Ltd. However, the contents of the report are based on the investigation and the analysis of the study team involved and do not necessarily represent the views of JICA.

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List of Abbreviations

Abbreviations	Nomenclature
ADB	Asian Development Bank
ADO	Automotive Diesel Oil
BAKOREN	Badan Koordinasi Energi Nasional
BAPPEDA	Badan Perencanaan Pembangunan Daerah
BAPPENAS	Badan Perencanaan Pembangunan Nasional
BOO	Build Operate Own
BP	British Petroleum
BPH-MIGAS	Badan Pengatur Hilir MIGAS
BP-MIGAS	Badan Pelaksana MIGAS
BPPT	Badan Pengkajian dan Penerapan Teknologi
CBM	Coal-Bed Methane
CCT	Clean Coal Technologies
CDM	Clean Development Mechanism
CFBC	Circulating Fluidized Bed Combustion
CNG	Compressed Natural Gas
CSR	Corporate Social Responsibility
CWM	Coal Water Mixture
DME	Dimethyl Ether
DSM	Demand Side Management
EIA	Environmental Impact Assessment
EOR	Enhanced Oil Recovery
ESCO	Energy Service Company
FO	Fuel Oil used by local transportation companies and Indonesia's state electricity company PLN
GDP	Gross Domestic Product
GT	Gas Turbine
GTAP	Global Trade Analysis Project
GTL	Gas To Liquid
HSD	High Speed Diesel Oil
IDO	Industrial Diesel Oil
IEA	International Energy Agency
IPP	Independent Power Producer
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KONEBA	Konservasi Energi Abadi (Persero)

Abbreviations	Nomenclature
KUD	Koperasi Unit Desa
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MEMR	Ministry of Energy and Mineral Resources
MIGAS	Directorate General of Oil and Gas
MOC	Ministry of Cooperative
MOU	Memorandum Of Understanding
P3B	Pusat Pengaturan dan Pendistribusian Beban
PERTAMINA	Perusahaan Pertambangan Minyak dan Gas Bumi Negara
PGN	Perusahaan Gas Nagara
PKUK	Pemegang Kuasa Usaha Ketenagalistrikan
PLN	Perusahaan Listrik Negara PERSERO
PPA	Power Purchase Agreement
PPP	Public Plivate Partnership
PSC	Production Sharing Contracts
PSS/E	Power System Simulator for Engineering
Renja-SKPD	Renja Satuan Kerja Perangkat Daerah
Renstra-SKPD	Rencana Strategis Satuan Kerja Perangkat Daerah
RKPD	Rencana Kerja Pemereintah Daerah
RPJMD	Rencana Pembangunan Jangka Menengah Daerah
RPJPD	Rencana Pembangunan Jangka Panjang Daerah
RPS	Renewable Portfolio Standard
RUKD	Rencana Umum Kelistrikan Daerah
RUKN	Rencana Umum Ketenagalistrikan Nasional
RUPTL	Rencana Usaha Penyediaan Tenaga Listrik
SHS	Solar Home System
SSWJ	South Sumatra-West Java gas pipeline project
TOR	Terms of Reference
UBC	Upgraded Brown Coal
USAID	U.S. Agency for International Development
WASP	Wien Automatic Simulation Program
WB	World Bank

Chapter 1 Introduction

1.1 Background

The energy sector in Indonesia has confronted several difficulties, such as the deficiency of oil and natural gas, the poor reliability of electricity supply, the slow development of electricity infrastructure and delay in the introduction of systematic power conservation to reduce energy consumption.

In Java and Bali, electricity supply is insecure and P3B balances supply and demand by load shedding. The shut down of generating facilities due to fuel shortage and the load limitation of alternative fuels could result in severe undersupply issues. Comprehensive approaches, considering the supply and demand of primary energy, are needed to improve the circumstances.

The fuel shortage results from both an inadequate national oil reserve, which could be exhausted in 10 years and from the elevation of the international oil price. At the same time, natural gas fields located along coastal lines have gradually been exhausted and sometimes high-speed diesel oil is applied as an alternative fuel for natural gas fueled turbines.

To cope with the shortages of oil and natural gas, the Indonesian government promoted the utilization of coal, however, it is often the case that the use of coal, behaves differently to the specified fuel, and may cause trouble in boilers.

At the same time, stable supply of electricity concerns human security. Indonesia experienced civil unrest and protest demonstrations against previous increases in the price of petrochemical products and the riots resulted in immense harm to the population. The incidents showed that the disturbance in energy security may directly threaten the livelihoods of citizens. Presently, the Indonesian government has increased grant money to cope with the recent elevation of the international oil price. The expansion leads to a budget deficit, which requires a phased increase in the price of petrochemical products. In response to this, regular protest rallies are held indicating the growing underlying social instability. Also, the livelihood of citizens is directly affected by energy supply in terms of regional and village development. Achieving a stable energy supply would: allow people to avoid the need to collect wood for fuel; vitalize economic activity; improve productivity towards alleviating poverty; and develop accessibility to essential elements for human life, such as healthcare, food and clean water.

JICA has conducted various technical cooperation projects in diverse areas in the Indonesian energy sector, such as renewable energy, coal and energy conservation. However, a simple approach, such as an improvement and increase in facilities and maintenance, is not enough to cope with the poor reliability of electricity supply. A comprehensive approach, including stable primary energy supply, quality improvement and demand restraint, is required and a synergistic strategy should be derived. At the same time, cooperation with other sectors that are focusing on energy security, regional development and poverty reduction from the viewpoint of citizen's security is expected.

The study examines the current conditions and difficulties in each field to conduct effective cooperation projects in the Indonesian energy sector. Then the study presents the guideline on synergistic cooperation among sectors to highlight key issues. At the same time, the study examines the cooperation program aimed at regional and village development and proposes a cooperation program which relates to citizen's security and poverty reduction.

1.2 Objective

The Study consists of the following two objectives:

1. To present a practical and comprehensive cooperation program on the Indonesian energy sector. The collective difficulties in the Indonesian energy sector and previous JICA projects on the sector should be analyzed and an effective guideline for cooperation projects should be organized.

2. To propose a cooperation program which contributes to regional development. The current conditions of regional and village development in Indonesia should be analyzed and the expected role of the energy sector from the viewpoint of citizen's security and poverty reduction should be clarified.

1.3 Research Zone

Throughout Indonesia. Field studies on regional and village development were deployed in Lombok islands based on advanced study in Japan.

1.4 JICA Study Team

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Mr. Tsutomu Mori	Supply - Demand Plan for Energy / Energy Conservation
Mr. Naoya Azegami	Local Development / Rural Development

Chapter 2 Current situation of Indonesian energy sector

2.1 Current Situation and Issues of Primary Energy Balance

2.1.1 Primary Energy Policy

According to the “Indonesian National Energy Plan” published in March 2004, the primary energy policies can be summarized as follows:

(The national energy plan includes rural development, measures to combat poverty, new energies and conservation; these items are omitted in the chapter.)

Table 2.1.1 Primary Energy Policies in National Energy Policy

	Items
Targets	<ul style="list-style-type: none"> • Increased business roles that lead towards a market mechanism to raise added values so as to deliver larger contributions to the national economy and to creating an efficient national industry. • Development of energy infrastructures that capable of maximizing public access to energy and exploitation of energy for export. • Increased strategic partnerships between domestic and international energy industries in discovering domestic and foreign sources of energy. • Increased utilization of local contents and increased roles of national human resources in the energy industry are resulting a reduction of dependence on foreign sources of energy.
Strategies	<ul style="list-style-type: none"> • Improvement of difference between domestic energy price and export price • Support to make Energy master plan • Introduce market mechanism from producers to consumers • The role share between government and private companies on large scale projects. • Support the small scale energy developers • Development and research of technologies and human resources • enhancing cooperation minds among energy related staffs • Capacity development for staffs in energy sector
Action plan Oil Upstream	<ul style="list-style-type: none"> • Measures are pursued to increase reserves and production by stepping up exploration and exploitation in mature areas through application of appropriate technologies in overlooked hunting zones and frontier areas. • Measures are pursued to increase oil production through enhanced oil recovery (EOR) processes and other advanced technologies. • Measures are pursued to develop marginal fields by offering incentives such as revisions to the patterns of production sharing and other incentives. • Measures are pursued to step up conservation of oil reserves to maintain oil reserves as long as possible.

	Items
Action plan Gas	<ul style="list-style-type: none"> • Measures are pursued to increase access to domestic and foreign natural gas to maintain an availability of supplies. • Measures are pursued to increase reserves and production through intensive exploration and exploitation. • Measures are taken to develop natural gas infrastructures to increase supplies through, among others, construction of transmission pipelines networks, LNG terminals and its re-gasification facilities, CNG transportation facilities and distribution pipelines networks. • Measures are taken to increase research and development of alternative technologies on gas transportation, such as small-scale LNG technologies and gas liquefying technologies to overcome the limited infrastructures for gas distribution. • Measures are pursued to apply gas prices in conformance to their economics values to ensure continuity in the supply of natural gas and construction of infrastructures. • Measures are pursued to enforce domestic market obligations to ensure domestic supplies of gas by requiring business entities or permanent business entities to give some their production to fulfill domestic needs. • Measures are taken to optimize consumption of natural gas to meet domestic needs with priority, in the following order, on gas as the raw material for fertilizer production, fuel for electric generations, state gas company and fuel for other industries. Consideration is given to needs, availability of natural gas infrastructures as well as technical and economic aspects. • Measures are taken to maximize flare gases through small LNG/LPG plants to fulfill domestic needs and for export.
Action plan Coal	<ul style="list-style-type: none"> • Measures are pursued to step up exploration and evaluation of coal reserves to change existing resources potential status to proven reserves; thereby the national economic value of coal is known either in deep mines or open pits. • Measures are taken to step up coal exploitation programs to meet domestic needs and for export by placing priority on deep mines in anticipation of global demands for environmentally friendly mining. • Measures are pursued to increase access to domestic and imported coal, including promotion of low-rank domestic coal to meet needs for energy through construction of mine-mouth steam-fired power plants. • Measures are taken to step up diversification of coal consumption through direct burning by small and medium enterprises, production of coal briquettes, liquefying of coal, gasification, coal upgrading and development of coal bed methane in consideration of environmental factors. • Measures are taken to enforce coal domestic market obligation on players in mining within the framework of securing domestic supplies. • Measures are taken to step up efforts at attracting investors through restructuring of regulations, integrated construction of infrastructures, particularly in isolated areas, by offering an incentive system. • Measures are taken to promote or create new industrial centers in isolated areas that possess substantial coal resources. • Measures are taken to promote industries based on coal fuel.

	Items
Action plan Petroleum	<ul style="list-style-type: none"> • Measures are taken to increase the capacities of oil refineries to fulfill domestic needs for petroleum; investors are offered opportunities to build new refineries. • Petroleum prices are established in conformance to mechanism on sound and reasonable business competition. However, in its implementation, the government social responsibility to certain group of people should not reduce. • Measures are taken to accelerate transformation of downstream oil and natural gas business climate toward a reasonable, sound and transparent business competition mechanism. • Opportunities are offered to players in the production and distribution of petroleum through price determination in conformance to market mechanism.
Action plan Pipeline	<ul style="list-style-type: none"> • Measures are pursued to accelerate construction of infrastructures to establish an integrated natural gas distribution system in Indonesia. • Measures are taken to accelerate the construction of small scale LNG, hydrate gas and gas liquefaction refineries to distribute gas to areas where pipelines networks are not available. • CNG transportation facilities are developed to deliver gas to areas where pipelines networks are not available or are difficult to connect. • Rates on transportation of natural gas through pipelines, that are attractive to investors, are established and applied in conformance to technology and economic principles. • Measures are taken to develop LNG terminals and re-gasification facilities in the island of Java in anticipation of increased demands for gas due to industrial growths and increased demands for gas by communities in Java. The foregoing is pursued since natural gas reserves outside Java are substantial but distances between producers in the outer islands and consumers in Java are extensive. • Development of ASEAN gas pipe lines
Action plan Gas • LPG utilization	<ul style="list-style-type: none"> • Measures are taken to increase consumption of liquefied petroleum gas in areas that are not reached by natural gas pipelines networks. • The government establishes and supervises the quality of liquefied petroleum gas in circulation. • Measures are pursued to increase consumption of domestic liquefied petroleum gas, hydrate gas and liquefied gas products (DME, GTL). • Measures are pursued to increase consumption of gas fuel and liquefied petroleum gas as part of efforts at environmental preservation and to gradually reduce consumption of petroleum, particularly by the transportation sector. • Measures are pursued to create a more competitive business climate for gas fuel and liquefied petroleum gas through, among others, a restructuring of the products' commercial framework.

	Items
Action plan Electricity Electrification	<ul style="list-style-type: none"> • Measures are pursued to increase generation of electric power with natural gas that is delivered either through pipelines networks or liquefied petroleum re-gasification terminals because steam-fired electric generation are more efficient than other electric generation. • Measures are pursued to increase the utilization of sources of renewable energy such as geothermal, hydropower and other sources of renewable energy, including marginal gas. The utilization of the said sources of energy will diversify energy supplies and reduce dependence on oil. • Local sources of energy are exploited in rural and isolated areas. Access to these areas is difficult and network construction requires substantial funds. The utilization of local sources of energy will reduce the price of electricity. • Measures are taken to build mine-mouth power plant to increase consumption of low-rank coal. The substantial potentials could be utilized optimally to generate electricity only. Their remote locations from consumers require extensive transmission grids. However, the electric generations can compete economically with other generations and the electricity produced may be exported to neighboring countries. • Measures are pursued to develop small-scale gas-steam power plants. • Measures are taken to step up utilization of efficient technologies such as co-generation and fuel cells. Since these technologies may reduce the costs of electric generation, they could offer a better option in comparison to other types of technologies. • Measures are focused on environmental preservation, particularly the social impacts of every phase of activity in the operations of electric power generations. These operations have potentials for creating negative impacts on the environment if they are not managed properly. Fulfillment of environmental standards is a prerequisite for electric power operations. It could preserve the environment.
Action plan Domestic use Commercial use	<ul style="list-style-type: none"> • Measures are taken to increase consumption of natural gas and coal (briquettes) through construction of infrastructures such as roads to transport and store coal and coal briquettes in consideration of environmental factors. The prices of natural gas and coal briquettes are lower than oil. However, the lack of natural gas and coal briquettes infrastructures prevent households and commercial sector from using the two products. • Natural gas prices are established for households and small subscribers in consideration of the people's purchasing power. • Measures are taken to increase use of energy-saving equipment, such as energy-saving lamps, and so forth. An increased utilization of the energy-saving equipment will reduce energy consumption by households and commercial sectors. The foregoing will save energy nationally. Furthermore, the cost of electricity that the people pay will go down. • Standards and labels on energy-saving equipment are applied. Application of the standards is designed to reach a good level of efficiency in household equipment that uses electricity. Labels are posted to provide clear information to the people on consumption of electricity and household electronic equipment. Thereby, the people can choose equipment that saves the most energy. • Measures are taken to develop transportation technologies and small-scale, economical and safe storage of gas to increase consumption of natural gas as a source of energy in households and commercial sector.

	Items
Action plan Industry use	<ul style="list-style-type: none"> • Measures are pursued to increase supplies of electricity from electric utilization to replace captive power. • Measures are pursued to increase consumption of natural gas as fuel and as a raw material for industries through construction of energy infrastructures. • Measures are taken to promote researches on and development of conversion technologies in the gas sector to substitute oil. • Measures are pursued to promote co-generation of electric power not only to fulfill energy needs but also to increase efficiency. • Measures are pursued to increase consumption of local energy to meet needs for electricity and heating in areas where electricity is not available. • Utilization of local energies in un-electrification area • Measures are pursued to increase consumption of coal briquettes, particularly by small and home industries that consume energy for extended periods, such as to dry area, rubber or to heat poultry farms and so forth.
Action plan Transportation	<ul style="list-style-type: none"> • Measures are taken to increase consumption of fuel gas (CNG and LPG) in land transportation. Increased consumption of fuel gas in transportation will reduce oil consumption and environmental pollution caused by oil consumption. An increase in fuel gas consumption is appropriately accompanied by an increase in the construction of infrastructures. • Measures are pursued to increase consumption of gas in transportation through consumption of alternative sources of energy, such as LNG, hydrate gas and DME. • Measures are pursued to promote bio-diesel as an alternative fuel. • Measures are pursued to use electricity in the development of modes of mass public transportation in urban areas and in inter-city transportation. • Energy efficiency standards are applied on motor vehicles. Application of energy efficiency standards reflects an accurate volume or level of consumption and supports efforts at using efficient motor vehicles.
Action plan Capacity Development	<ul style="list-style-type: none"> • Efforts are pursued to create energy education and training institutions that are accredited nationally and internationally. • Measures are pursued to enhance national human resources competencies in the energy sector through technical education and training conducted by appropriate and accredited institutions. Thereby, these human resources possess capacities to compete in the era of globalization. • Community development funds for the energy sector are provided to train national human resources in areas where energy projects are present. • Measures are pursued to create link-and-match programs that establish a synergy between utility companies and energy education and training institutions.

Under the above energy policies, characteristics are as follows:

- ① Introducing market-oriented system of energy business
- ② Promoting oil-substituting energies
- ③ Improving energy utilization efficiencies
- ④ Promoting foreign investment

⑤ Development of capacity of native experts

2.1.2 Significant issues related to primary energy supply and demand balance

(1) Issues on oil

■ Primary energy production

In Indonesia, the energy production of the main oil and gas companies is in decline owing to the fact that no new oil or gas reserves have been discovered and the existing plants become older. The exploration of new oil and gas reserves are now concentrated in a small area of offshore reserves in Sumatra, Java and Kalimantan. And it is required to vital investment from foreign companies.

When considering Indonesian energy importation, most imports consist of petroleum products such as gasoline, kerosene and diesel. Hereafter, there are concerns to increase import petroleum products in company with domestic demand increase. For decreasing the importation, it is important to introduce oil substitution energies and energy conservation in final energy consumption. And as petroleum products are derivatives, it is expected that the production of the petroleum products and the demand meet in a country. For realizing it, the government is required to make a suitable energy policy.

■ Oil subsidy

Indonesian oil consumption share in the total energy consumption is so high (63% in 2003). Most of the people use oil products in their lives. And the oil subsidy of the government has been suppressed oil prices lower than international market prices for protecting the lives of low income persons and rural area dwellers. Indonesia's oil price subsidy amounted to US\$8.9 billion in 2005, while the financial deficit of the government was US\$3 billion in 2005. The financial deficit includes the oil price subsidy. The government has implemented reduction of oil subsidy for improving government budget and aiming reduction of oil consumption by oil price increasing. As shown Table 2.1.2, the government carries out to increase oil prices by the oil subsidy cut. By the policy, the lives of low income persons are affected. It becomes important policy how to introduce oil substitution energies in final consumption.

Table 2.1.2 Petroleum Product Prices (1998 ~2005) (unit: Rp/liter)

Year	Month	Gasoline	Kerosene	ADO	IDO	FO
1998-05	S-Price	1,200	350	600	500	350
2001-05	S-Price	1,150	350	600	550	400
	M-Price50%	1,150	1,165	1,150	1,115	825
	M-Price100%	1,970	2,330	2,300	2,230	1,650
2002-05	M-Price75%	1,750	1,410	1,400	1,390	1,120
	M-Price100%	1,750	1,890	1,900	1,860	1,500
2003-05	Retail price	1,810	1,800	1,650	1,650	1,580
	Check-price	1,980	1,930	2,080	2,030	1,580
2005-09before	Retail price	2,400	2,200	2,100	2,200	2,300
2005-10after	Retail price	4,500	HH 2,000 CO 6,200	4,300	5,500	3,500

S-price: Subsidy price M-price : Market price

Source: Petroleum Report Indonesia 2003 written by American Embassy in Jakarta

HH: kerosene used in household、 CO : kerosene used in industrial use

(2) Issues on natural gas

■ Natural gas pipeline and domestic supply

Regarding the effective utilization of natural gas, a gas shortage has occurred around Jakarta due to a shortage of domestic-use gas pipelines. For the purpose of supplying natural gas to the factories and other consumers, PGN is implementing five transmission pipeline plans (SSWJ1,SSWJ2, Dumai—Medan, East Kalimantan -Central Java, East Java – West Java) and seven distribution pipeline plans (Bontam, Batam, Pekanbaru, Jambi, Lampung, Banten/West Java, Semarang Central Java). There is an urgent requirement that the transmission and distribution pipeline plans should be completed quickly.

PLN has to make a purchasing contract with PGN when PLN wishes to use natural gas through PGN gas pipelines. However, PLN and PGN have not agreed on the contract owing to the fact that the sales price is not acceptable to the two sides, even though negotiations have been in progress for one year. The government does not currently have any intention of intervening in the negotiations.

As electric power supply has high public visibility, PGN needs to have not only a market-oriented mechanism but also a public orientation concept. BP-MIGAS and BPH-MIGAS must recognize the importance of public relations orientation by business entities.

The balance between LNG exportation to retain the foreign incomes and domestic consumption of LNG is other important issue for the government, and then energy balance model for solving the issues is required by the government.

■ Issues on natural gas development

Natural gas exports increased in the 1990s, but since 2000 such exports have not increased and have remained at the level of 30,000kTOE. Hereafter as considering that domestic demand and export increase rapidly, plant rehabilitation, exploration and exploitation of natural gas fields are expected. The possibility of Tungguh LNG project is expected highly. For achieving the project, huge capital funds from foreign companies are required.

For the purpose of attracting foreign capital funds, the government is entering into a Production Share Contract with foreign companies based on the joint venture system for developing oil and gas upstream. Since 2002, BP-MIGAS has had exclusive competency in the exploration and exploitation of oil and gas in Indonesia. At present, 20 foreign companies are operating oil and gas fields in Indonesia under the PSC system. According to the new PSC system in new oil and gas regulations in force since 2002, the government share has decreased to 65% for oil and gas production. This means that the share of the counterpart companies has increased. However, the PSC share is actually decided on a case-by-case basis in line with access conditions, regional risk conditions and differences between onshore and offshore.

In Indonesia, the PSC ratio has been improved in order to promote foreign investment, but it appears that other kinds of difficulties such as gas shortage in factories, 25% domestic market obligation, the need for foreign enterprises to build up infrastructure by themselves to construct their factories, and high priority given to domestic companies in special districts are preventing foreign investment in primary energy development. Recently, domestic market obligation for natural gas has been discussed by the government. If this regulation is implemented, it is afraid that foreign investment will be discouraged. Regarding foreign investment in primary energy, it is essential for the government to introduce more incentives and gas price mechanism decided by cost + suitable return. And it can be considered to introduce Public Private Partnership on capital investment of foreign companies.

(3) Issues on coal

Indonesia has rich coal resources. The high quality coal such as anthracite coal and bituminous coal have been important international trade energies to retain foreign income. Coal exports will have

increased by more than average growth rate of 13% from 2000 to 2003. In particular, high-quality coal from Kalimantan can be exported to India and China. Meanwhile, the investment environment for coal development is delayed due to transportation issue and instability of political issues, especially in Central Kalimantan.

On the other hand, for low quality coal such as sub-bituminous coal and lignite, technical transfer including Clean Coal Technology (CCT) that can use it safely and usefully is expected.

■ Comprehensive energy plan

MEMR-MIGAS makes oil and gas policies, BP-MIGAS regulates the up stream of the oil and gas business and BPH-MIGAS regulates the down stream of the oil and gas business including gas pipelines and the gasoline service business. MEMR-MIGAS leads and advises BP-MIGAS and BPH-MIGAS on important issues. As imbalance of oil and gas export and domestic demand is happened in recent Indonesia, MEMR-MIGAS requires comprehensive econometric energy balance model for making good energy balance between energy export and domestic demand. Especially MEMR-MIGAS wants to make primary energy balance models. Table 2.1.3 shows trail future primary energy balance, and MEMR-MIGAS should be made energy policy using by such kinds of the simulation model.

Table 2.1.3 Trail Future Primary Energy Balance in Indonesia

		Growth	2003	2010	2015	2020	2025	2030
Production	Coal	10	64	124	200	321	518	834
	Natural Gas	3	66	81	94	109	126	146
	Crude oil	-5	56	39	30	24	18	14
	Other	3	64	79	91	106	123	142
			250	323	415	560	785	1,137
Import		3	33	41	48	55	64	74
Export	Coal	9	52	95	146	225	347	534
	Natural Gas	2	33	38	42	47	52	57
	Crude oil	-5	23	16	12	9	7	6
	Other	0	0	0	0	0	0	0
			108	149	201	282	406	596
PES			175	215	262	333	443	614
	Power	7	22	36	50	70	99	138
	FEC	3	153	188	218	253	293	340
EC			175	224	268	323	392	478

PES: Primary Energy Supply FEC : Final Energy Consumption, EC : Energy Consumption

Source : Calculated by JICA Study Team

< Pre-conditions >

- ① Primary energy demand is separated in power sector and in other sector
 Energy demand of power sector by 2030 7.0% up (5% up from 2000 to 2003)
 Energy demand of other sector by 2030 3.0% up (2% up from 2000 to 2003)
- ② The growth rate of energy production
 Coal production by 2030 10% up (15% up from 2000 to 2003)
 Natural gas production by 2030 3% up (3% up from 2000 to 2003)
 Crude oil production by 2030 5% down (5% down from 2000 to 2003)
- ③ The growth rate of energy import
 3% up to 2030 in company with decreasing crude oil production
- ④ The growth rate of energy export
 Coal export by 2030 9% up (14% up from 2000 to 2003)
 Natural gas export by 2030 2% up (2% up from 2000 to 2003)
 Crude oil export by 2030 5% down (4% down from 2000 to 2003)

2.2 Current Situation and Issues of Renewable Energy

2.2.1 Current Situation of Renewable Energy

(1) Policy on renewable energy

The current situation of renewable energy is an important consideration, given the need for an alternative to oil due to the rapid escalation of the oil price and the progress of deregulation and decentralization. Since 2003, the need for renewable energy development as an alternative source to oil has come into greater focus. In 2004, "The National Energy Policy" was issued with an emphasis on the promotion of oil alternatives. Table 2.2.1 shows the contents of renewable energy in the Policy.

Table 2.2.1 Renewable Energy Policy in The National Energy Policy

<p><u>Current Situation</u></p> <ul style="list-style-type: none"> • Hydro and geothermal, which have similar potential reserve to LNG and coal, have not attained their optimal utilization. • New and renewable energy sources are not progressing due to their prices being less competitive than fossil fuels. A financial incentive is required for their promotion. • The huge potential of geothermal power is not being utilized.
<p><u>Target</u></p> <ul style="list-style-type: none"> • Renewable energy, excluding large hydro, is estimated to supply 5% of national energy needs by 2020. It is important for achievement of the target to promote the development of geothermal, biomass and mini/micro hydro.
<p><u>Action Plan</u></p> <p>【Geothermal】</p> <ul style="list-style-type: none"> • Conduct Potential Survey • Modify the Law for the promotion of large-scale development • Develop small-scale geothermal plants where alternatives are poor • Promote geothermal utilization in industrial sector. <p>【Hydro】</p> <ul style="list-style-type: none"> • Promote development as alternative energy • Optimize development plan in Java where there are many hydro potential sites • Assist a sustainable development of region due to hydro development • Promote mini/micro hydro which contributes to the progress of local economic development through government incentives <p>【Others】</p> <ul style="list-style-type: none"> • Financial assistant • Assemble renewable facilities in Indonesia • Oblige power utility to power purchase form renewable energy • Select districts to utilize mini/micro hydro and photovoltaic development

Source : The National Energi Policy 2003-2020、2004

The Green Energy Policy (2003) is a guideline for green energy development, which mainly focuses on renewable energy development and energy conservation. The policy states that the term 'renewable energy' in the Green Energy Policy means energy that can be renewed and if managed properly, such resources will not be exhausted. Table 2.2.2 shows the guideline of the policy.

Table 2.2.2 Guideline in the Green Energy Policy (2003)

<u>Opportunity and Barriers</u>	
<ul style="list-style-type: none"> • Classified into three types, namely; <ul style="list-style-type: none"> a) already developed commercially (biomass, geothermal and hydro energy); b) already developed but still limited (solar, wind); c) still at the research stage (ocean energy); • Biomass is converted into energy in the form of liquid, gas, thermal and electric fuel. • Biomass energy has been utilized for a long time and it is estimated that 35% of the total national energy consumption comes from biomass. • The potential of wind energy is relatively small. It is estimated that 0.5 MW has been installed, especially for rural electricity. • Having a relatively good potential of solar energy, two technologies have been applied, namely thermal solar and photovoltaic. • Thermal solar energy is used for cooking, drying of agricultural products and water heating. The use of thermal solar energy for cooking and drying of agriculture products is still very limited, while use for water heating has reached the commercial phase. Photovoltaic solar energy is used to meet rural electricity requirements, water pump, television, telecommunication and refrigerator in Community Health Center. The utilization of solar energy especially in the form of SHS (Solar Home Systems) has reached the semi-commercial phase. • The potential of hydropower throughout Indonesia is theoretically estimated to be around 75,000 kW spread over 1,315 locations. • The potential of mini-hydro (200 up to 10 MW) and micro-hydro (up to 200 kW) is around 460MW; the 64 MW of which has been utilized, is generally used for rural electrification. • Regarding geothermal, there are 70 areas which have the prospect to be developed as the source of energy with a total potential of 19,658 MW, specifically, 5,331 MW on Java Island, 9,562 MW on Sumatra Island and the remaining 4,765 MW spread over Sulawesi and other islands. The development of geothermal sources which are far from consumer centers and most of the sources are located in the preservation forest area. • Geothermal energy can be utilized directly as well as indirectly. Direct utilization among other uses, includes drying of agricultural products, sterilization of the media for planting mushrooms and tourist pool-water heating. While indirect utilization involves geothermal energy being converted into electricity. 	

As shown above, the policy regarding renewable energy development is mainly focused on geothermal, hydro and biomass.

On January 26, the Presidential Decree of No.5 2006 referring to the target for renewable energy implementation was launched. The Decree indicated new target values for renewable development, which were approved by BAKOREN in April 2004.

Regarding renewable energy, the following numerical provisions are outlined:

- Geothermal energy to account for 5% share of the primary energy supply by 2025.
- Bio-fuel energy is also to account for 5% share of the primary energy supply by 2025.
- Target for new and other renewable energy sources, including nuclear power generation, is a 5 % share of the primary energy supply by 2025.

The transitions for the numerical targets are shown in Table 2.2.3.

Table 2.2.3 Target of Renewable Energy

Issued year	Authority	Target year	Target
2004	Minister	2020	Overall renewable 5%
2005	Minister	2025	Geothermal 3.8%、 Others 4.4%
2006	President	2025	Geothermal 5%、 Biofuel 5%、 Others 5%

(2) Law and regulation

The most recent law on renewable energy is the Geothermal Law enacted in 2003. Now, an Energy Law for the promotion of renewable energy utilization is being prepared for submission to the parliament.

Compared to previous Decrees, this Law aims to be more practical for stakeholders regarding their responsibilities and obligations.

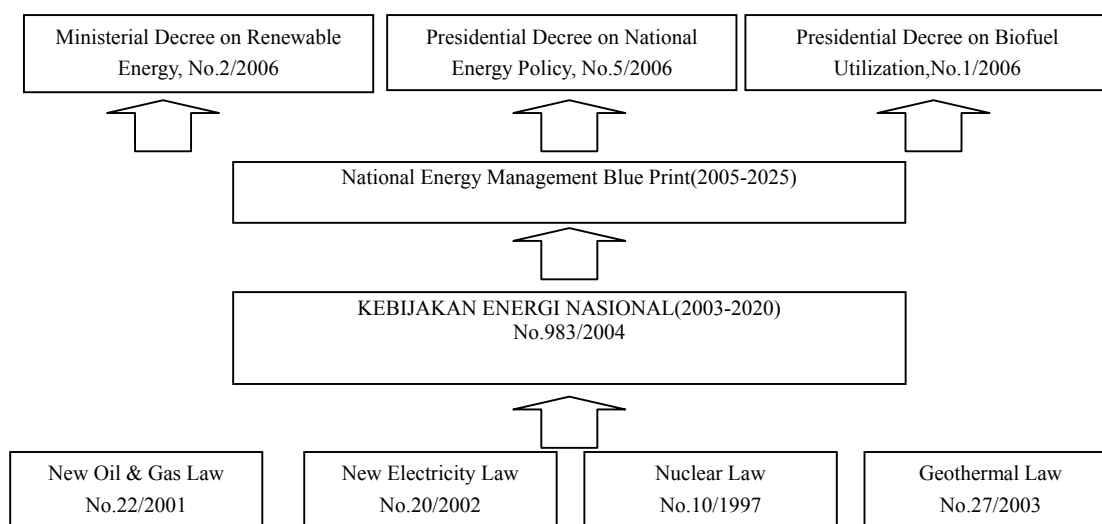


Figure 2.2.1 Laws and Regulations Encompassing Renewable Energy

(3) Power Purchase from Renewable Energy Sources

The Ministerial Decree on renewable power purchase No.2/2006 was issued in January 2006. This Decree expands the capacity and the duration of renewable energy purchases procured by the state utility company. Compared to the existing regulation, the capacity is expanded from 1 MW to 10 MW and the duration is extended from one year to ten years. The Decree appeals to power utilities to increase power purchases from renewable energy sources, but offers no compensation for the supplemental cost of purchases from renewable energy. Table 2.2.4 shows the comparison of the regulations.

Table 2.2.4 Regulation of Renewable Power Purchase

Decree No./year	No.1122/2002	No.2/2006
Capacity	up to 1MW	from 1 MW up to 10MW
Duration of Contract	one year	ten years
Price	Low Voltage Connection: 60% of Production Cost Medium Voltage Connection: 80% of Production Cost	

This Decree promotes the replacement of the existing diesel power plants in the areas of local grid. MEMR is planning further energy regulation for rural electrification. According to the interview, the rural electrification program will prioritize renewable energy utilization. For 2006, there will be no more diesel power plants constructed for rural electrification as they will be replaced by renewable energy-based power. It is concluded that MEMR is looking for participation by the private sector in the areas of rural electrification. However, the discrepancy between existing and new regulations was pointed out for the micro-hydro development in rural areas.

2.2.2 Issues Related to Renewable Development

The essential renewable energy issue in Indonesia is the lack of commitment from the public. In the view of consumer's items, people are quite unaware of renewable energy compared to oil. However, the government has issued the Ministerial Decree for distributed power generation. This Decree, as mentioned earlier, is aimed at increasing renewable energy utilization for power generation and to encourage business entities to become involved in renewable energy development for electricity generation.

In terms of reviewing the numerical target of renewable energy development, it is difficult to explain problems based on the numerical data. Each individual renewable energy problem is described in the following. The problems of each renewable energy development are measured by comparing a benchmark that is regarded as a target of geothermal development in the Blue Print.

■ Geothermal

Geothermal potential in Indonesia is estimated at 27 GWe, out of which the current utilization of geothermal is 807 MWe, due to large investment costs and low accessibility to the grid.

The Government of Indonesia enacted the Geothermal Law No. 27 in 2003. The objective of the Law on Geothermal is to promote the utilization of geothermal energy for supporting sustainable development and to contribute additional energy value.

Moreover, it aims not only to increase government revenue and improve the economic development of Indonesia but also to give opportunities for IPP's participation. A development study on geothermal development is to be prepared through a JICA technical cooperation program. It is hoped that the JICA development study will successfully promote public involvement in geothermal development.

The numerical target of geothermal development by 2025 is 9,500 MWe, that is equivalent to a 3.8% share of total energy consumption. The geothermal potential is located in the areas where it is relatively easy to connect to the national grid, such as Java and Sumatra. In the other islands, geothermal power plants will be used as a power source to replace diesel generators. The main barrier for geothermal development is the considerably high production cost requiring a higher level of investment.

■ Biomass

Current utilization of biomass is 445 MW, but biomass potential in Indonesia has a larger installed electricity capacity than geothermal and is estimated at 49.81 GWe. On January 25, the Presidential Decree No.1 2006 outlining biofuel utilization targets for fossil substitution was launched. This Decree instructs related public sectors to take necessary initiatives and actions for biofuel development from supply side to the demand side.

MEMR considers the alternative energy from renewable energy resources for fuel substitution such as bio-diesel, bio-ethanol, bio oil and so on. Since these alternatives relate directly to the livelihood of urban people, public involvement is the key to promotion. However the Decree does not instruct the private sector on the utilization of biofuel. In order to boost the interest in renewable energy, the promotion of the biofuel policy is considered a necessity for the private sector area.

The numerical targets for bio-diesel, bio-ethanol and bio oil up to 2025 are shown, but a numerical target for biomass electricity has not been indicated. It is considered that the main utilization of biomass is direct combustion, but some alternatives should be prepared according to the condition of biomass resources. Biomass development has just commenced only for the practical bio-diesel approach, the promotion of other biomass utilization should be undertaken immediately.

■ Hydro

Hydropower potential in Indonesia is estimated at 75 GW, of which 500 MW is small scale. Current utilization of mini/micro hydro is 84 MW. The target of mini/micro hydro is similar to the potential. The expansion of the mini/micro hydro potential is the urgent issue to for the achievement of the development target. Generally, hydropower is considered to be sustainable and technically mature, but social environmental issues such as resettlement and deforestation is the barrier to the development. Acting on the Ministerial Decree on Distributed Power Generation enacted in December 2005, environmentally friendly hydropower, up to 10 MW, should be designated as Renewable Hydro in order to expand the capabilities of hydropower development.

The classification of hydropower in Indonesia is not clearly defined, therefore comprehensive efforts for the promotion of hydropower development less than 10 MW should be made in order to achieve the development goal.

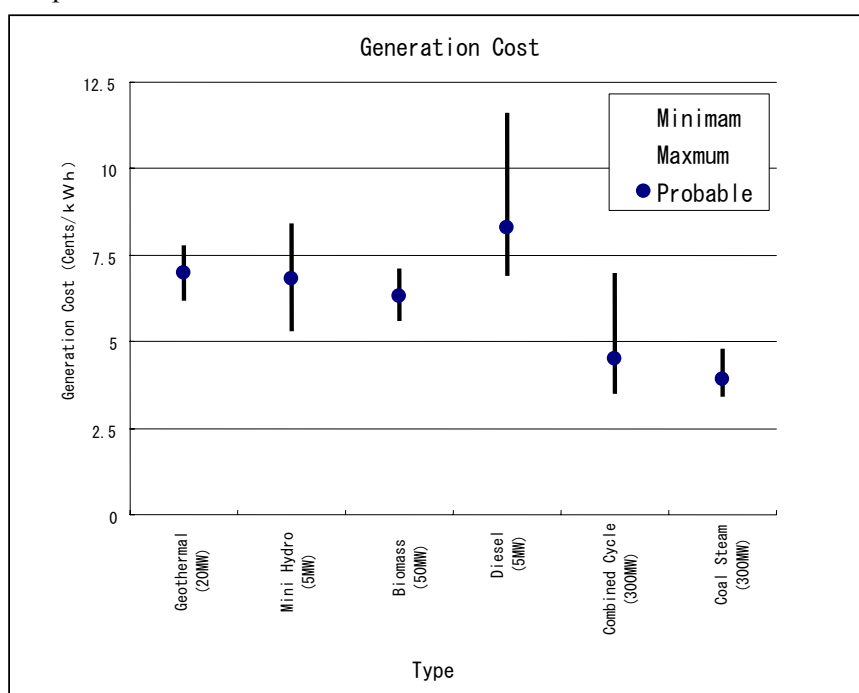
■ Wind, solar and other energies

According to the National Energy Management Blue Print (2005-2025), nuclear, biomass, mini/micro hydro, wind and solar are regarded as other renewable energy sources. After the Presidential Decree on the national energy policy, 'other' renewable energy is considered to be nuclear, biomass for electricity and mini/micro hydro.

In the field of grid-connected electricity, the main renewable sources are biomass and hydro. However, their respective generation costs are more expensive than conventional thermal power plants. A comparison of the generation costs is shown in Figure 2.2.2 The higher cost of renewable electricity is a barrier to the introduction of renewable power facilities. As for wind and solar, which are utilized for rural electrification, technical assistance including institutional and educational programs should be provided.

Nuclear power will be one of possible alternatives to supplement Indonesia's future electricity demand. As Indonesia is located in a significant outstanding seismic area, Japanese technical transfer is of great importance for the preparation of nuclear power development not only in terms of safety management but also risk management.

As the problem for operation and maintenance by time dependent defectives clearly exists for solar and wind power plants utilized in rural electrification, institutional reform and human resource development are important fields for technical assistance.



Source: Off Grid, Mini-Grid and Grid Electrification Technologies ,World Bank

Figure 2.2.2 Generation Cost of Electrification Technologies

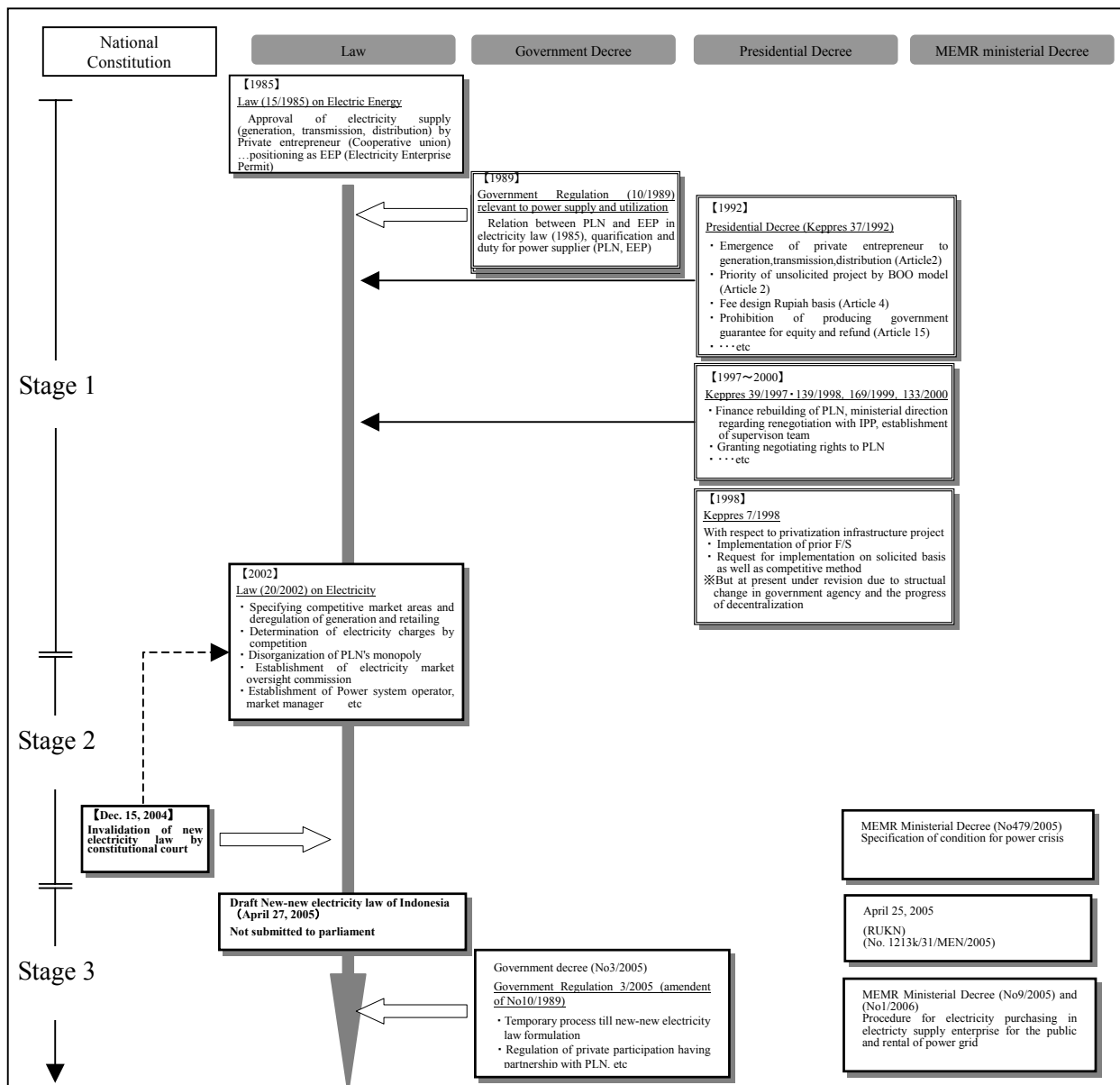
2.3 Current Situation and Issues in the Power Sector

2.3.1 Power Sector Policy

(1) Progression of electricity-related laws in Indonesia

The deregulation of electric utilities, in terms of governing laws, is organized into the following three time frames:

- (Stage I) The term from the establishment of the Electricity Law (1985) to the enforcement of the new Electricity Law (2002): During this time 27 IPP contracts were concluded. However, after this, the Asian economic crisis hit the Indonesian economy.
- (Stage II) The term from the enforcement of the new Electricity Law (2002) to the time of its invalidation on the grounds of being unconstitutional as adjudged by constitutional court
- (Stage III) The term from the invalidation of the new Electricity Law to the present (reinstatement of Electricity Law (1985) and government decree (No3/2005))



Source: Compiled by JICA study team in reference to Indonesian government data

Figure 2.3.1 Outline of Laws Relevant to the Power Sector from the Historical View Point

(2) Unconstitutional adjudgement on new Electricity Law and the temporary decree

New Electricity Law (No.20/2002) implemented on Sep. 2002 was declared unconstitutional to be abolished by the constitutional court. On Jan. 16 2005, to avoid confusion in law enforcement, the government of Indonesia established government regulation (No3/2005), which was an amendment of government decree (No10/1989) relevant to electricity supply and utilization. This is a temporary decree until a new electricity law replaces the law (No20/2002). Preparation for this new electricity law has been conducted¹. Table 2.3.1 outlines the points of amendment in the government decree (No.3/2005).

Table 2. 3.1 Points of Amendment in the Government Regulation (No.3/2005)

Related articles
「Electric enterprise is conducted nationally. And actual tasks are conducted by national enterprise. Government decree stipulates the national enterprise as holding a stake conducts electric enterprise for public service.」 <Article 3 (1)>
「Enterprise holding an authority of electric utility can purchase electricity from cooperative unions, local public utilities, private companies, citizens' organizations and individuals」 <Article 11 (3)>
「Power purchase is conducted by public tender」<Article 11 (5)>
「Power purchase can be conducted by nominating the following directly. a. Renewable energy, marginal gas, coal at colliery, generation from indigenous energy b. Surplus power c. In case of local power system in danger」<Article 11 (6)>

In the MEMR ministerial decree (Article16/No9/2005), in addition to the renewable energy and mine mouth generations, PKUK and PLUKU can purchase electricity directory from power suppliers without bidding process in case the local power system is in a power crisis. For this purpose, MEMR ministerial decree (No.479-12/43/0600.2/2005) (Table 2.3.2) indicates the areas where electricity supply is insufficient in the Java-Bali and Madura outer islands. These measures are almost exclusively for areas outside Java-island. This nomination is revised annually.

Table 2. 3. 2 Decree of Ministry of Energy and Mineral Resources on Specification of a National Power Supply Crisis

<p>Second: Order to make following efforts to overcome insufficient electricity supply in the areas indicated in the “first” to PT PLN (Persero) as an enterprise holding an authority of electric utility</p> <ol style="list-style-type: none"> 1. Suppression of demand at peak time 2. Prompt conduct of repair of power plants 3. Capacity improvement of existing power plants 4. Prompt conduct of interconnected transmission lines 5. Power purchase from power suppliers without bidding process in accordance with government decree (No3/2005) and MEMR ministerial decree (Sep. 2005)

2.3.2 Issues on Electric Power Supply

(1) Fuel procurement

The final JICA report of the previous study "the study on the optimal electric power development

¹ The preparation of new-new electricity law has been conducted after unconstitutional judgment on Dec. 2004. As of Feb. 2006 it is under interministerial consideration. Some newspaper says that this law will be submitted to parliament on Jun., 2006

and operation in Indonesia" stated that the most important issue for avoiding the predicted power crisis was secure fuel procurement. However, PLN still cannot secure enough fuel for power stations in west Java. Therefore, HSD and LPG are used as supplemental fuels in some of these power plants. From a critical viewpoint, case studies on power plant operation and development plan should be prepared based on the scenario that new gas supply for PLN should be obtained only from SSWJ and LNG terminals which PLN plans to construct with independent financing.

One of the reasons why new gas supply contracts between PLN and gas suppliers cannot be concluded smoothly is considered to be that the suggested gas price offered by suppliers, who importantly have no regulations restricting their activity, is not affordable to the PLN who is restricted by a budget regulation in terms of electricity tariff. Figure 2.3.2 shows a brief outline of the current situation.

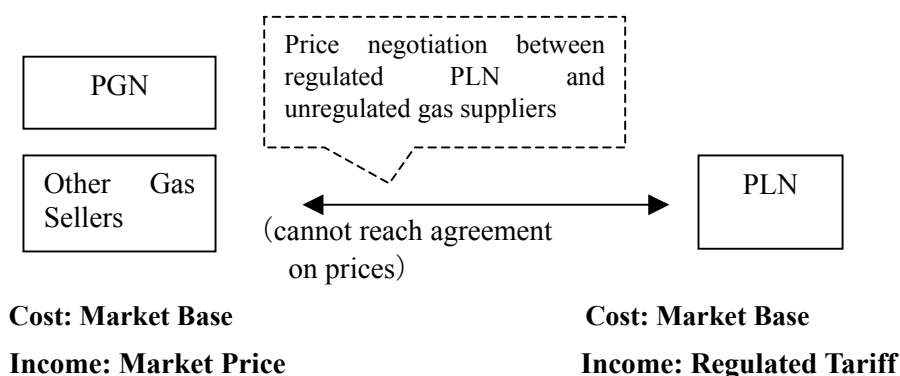


Figure 2.3.2 Fuel Procurement Contract Issue

(2) Power development plan

The annual average rate of power demand increase from 2005 to 2025 is forecasted at about 7%. The estimated maximum demand for 2010 is 41,309MW and that of 2025 is 79,920MW. This is about four times higher than that of 2005. Table 2.3.3 shows the power development plan. The additional capacity is specified only by 9,319MW in the decade ahead. Then the additional capacity in the new power supply plan does not meet the increase of demand. In addition, there is an opinion that demand estimation in RUKN is relatively high. Public information disclosure relating to the basis of estimating demand is necessary for encouraging private investment to the power sector.

Table 2.3.3 Power Development Plan

										(MW)
System	Power station	Type	2005	2006	2007	2008	2009	2010	2011 ~ 2015	Total
Java-Bali	Pemaron	C/C			50					50
	Cilegon	C/C		730						730
	M.Karang	C/C				270				270
	T.Priok	C/C					720			720
	M.Tawar	C/C				225				225
	Not determined	C/C				400				400
	Jawa	GT			400				2,000	2,400
	T.Jati B	Coal		1,200						1,200
	Cilacap	Coal		600						600
	Kamojang#5	Geo						60		60
	Kamojang	Geo		60						60
	Patuha	Geo		60		120				180

System	Power station	Type	2005	2006	2007	2008	2009	2010	2011 ~ 2015	Total
	Wayang Windu	Geo			110					110
	Derajat#3	Geo			110					110
	Dieng	Geo			60	60				120
	Bedugul	Geo			10					10
	Subtotal		0	2,650	740	1,075	720	60	2,000	7,245
Sumatra	Keramasan	C/C							86	86
	Keramasan	GT						100		100
	Teluk Lembu	GT		20						20
	Arun	GT					60			60
	Sengkang	GT			65					65
	Cerenti	Coal							600	600
	Sibolga A Sicanang	Coal			70	35		200		305
	Labuhan Angin	Coal					200			200
	Tarahan	Coal			100	100				200
	Ulubelu	Geo							110	110
Subtotal		0	20	235	135	260	300	796	1,746	
Kalimantan	Tanjung Batu Mel	GT			20					20
	Not determined	Coal		50						50
	Subtotal		0	50	20	0	0	0	0	70
Sulawesi	Amurang	Coal						105	110	215
	Lahendong	Geo					20	20		40
	Subtotal		0	0	0	0	20	125	110	255
Other	Ulumbu	Geo			3					3
	Subtotal		0	0	3	0	0	0	0	3
Total			0	2,720	998	1,210	1,000	485	2,906	9,319

Source: RUKN (2005)

(3) Condition of IPP tender

Now Cirebon thermal power plant, a coal fired unit with the capacity of 600MW, is under tender with the conditions of ① No government guarantee, ② Land acquisition by bidder, ③ Burden of transmission expenses. These conditions are very severe for IPP investors. To encourage IPP investors, promotion of PPP (Public-Private-Partnership) is important.

In order to promote these IPPs, government guarantee seems to be essential. However, Indonesian government takes a policy that a government guarantee is provided for projects that satisfy the relevant criteria in several risk assessments, contingent liabilities of public sector etc. in terms of financial sustainability considering the macro economy.

One of the purposes of the new electricity law was to introduce the market mechanism to the power sector in order to encourage private investment in the electricity market. As a huge investment is required for developing power sources, promotion of private investment in the long and medium term is necessary. Enacting the new electricity law is the first step for establishing a trustful investment environment for foreign investors, and also for wiping out distrust by investors regarding renegotiation of electricity selling price of past IPP projects. Therefore, early establishment of the new electricity

law² is desirable for encouraging investment in the electric sector.

(4) Issues on Transmission and Distribution System

Stretching from east to west with heavy demand in the west, the Java-Bali system has issues with stability due to full-time heavy load flow to the west. Figure 2.3.3 shows the Java-Bali power system. In principle, the power flow is westward from large-scaled power plants in East Java (Paiton coal-fired plan, etc) to the load center in west Java. The restriction³ of power generation is conducted due to stability issues. To alleviate this situation, 500kV south route transmission line is under construction. However, it is yet to be completed due to the compensation problem involving transmission lines between Pedan substation and Depok substation. PLN has set the target date for completion as Apr. 2006 based on the ministerial decree (No.975/1999) relevant to compensation under transmission lines and presidential decree (No.36/2005) relevant to appropriation of land.

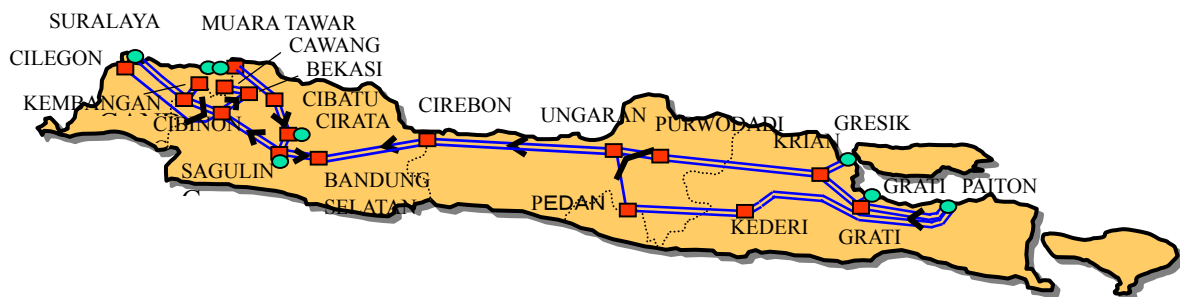


Figure 2.3.3 500kV Java-Bali Power System

In order to achieve a robust power system in terms of stable power supply from the aspect of transmission lines, power system planning with power system analysis such as load flow analysis and stability analysis should be carried out respectively. At present, the stability analysis is not conducted accurately due to the insufficient level of staff in the power system planning division of PLN. Therefore, power system analysis specialists should be brought up in PLN.

For the distribution system, the existence of three different sets of technical standards is ineffective. Therefore, technical transfer relevant to distribution planning is necessary for the consolidation of three technical standards.

(5) Issues of Power Sector as a Part of Energy Sector

■ Electricity Share

The electricity share is generally used as the index for expressing the positioning of the power sector in the energy sector quantitatively. The electricity share is the ratio of final consumption of electricity to the total final consumption of energy and is calculated as below.

$$* \text{Electricity share (\%)} = \text{Final consumption of electricity} / \text{Total final Energy consumption}$$

Table 2.3.4 shows the transition of the electricity share in Indonesia. The electricity share in 2002 was 10.3%. It is considerably lower compared to the value (14.7%) in Japan in 1971. Figure 2.3.4 shows the transition of electricity shares in Asian countries, etc. The electricity share in Indonesia is expected to increase more drastically than that of the growth of GDP, considering the electricity share of 19.3% (Asian countries) and 23.6% (Japan).

² A newspaper has reported that submission of this new law to the parliament will be scheduled for June.

³ For stable supply the load flow should be within 1,300MW by the JICA study "the study on the optimal electric power development and operation in Indonesia (2002.8)". But the practical accomplishment of load flow is around 1,800MW.

Electric power is vital for the use of lighting, air-conditioning and communication and at the same time is produced by a variety of resources, such as coal, renewable energy, nuclear energy and so on. Electric power also plays an important role in avoiding the use of petroleum and natural gas. Consequently, increase of electricity share is very important for the diversification of energy in Indonesia.

Table 2.3.4 Electricity Share in Indonesia (Mtoe)

	1971	1980	1985	1990	1995	2000	2002
Final consumption of electricity	0.153	0.536	1.05	2.33	4.28	6.81	7.49
Total final consumption	6.78	20.6	24.7	33.5	49.0	70.0	72.9
Electricity share	2.26%	2.61%	4.26%	6.95%	8.73%	9.73%	10.3%
(Ref.) Japanese electricity share	14.7%	18.9%	20.7%	22.5%	23.1%	23.7%	23.6%
" Asian electricity share	9.69%	11.6%	12.2%	13.9%	15.6%	18.3%	19.3%

Source : Hand book of energy & economic statistics in Japan (2005)

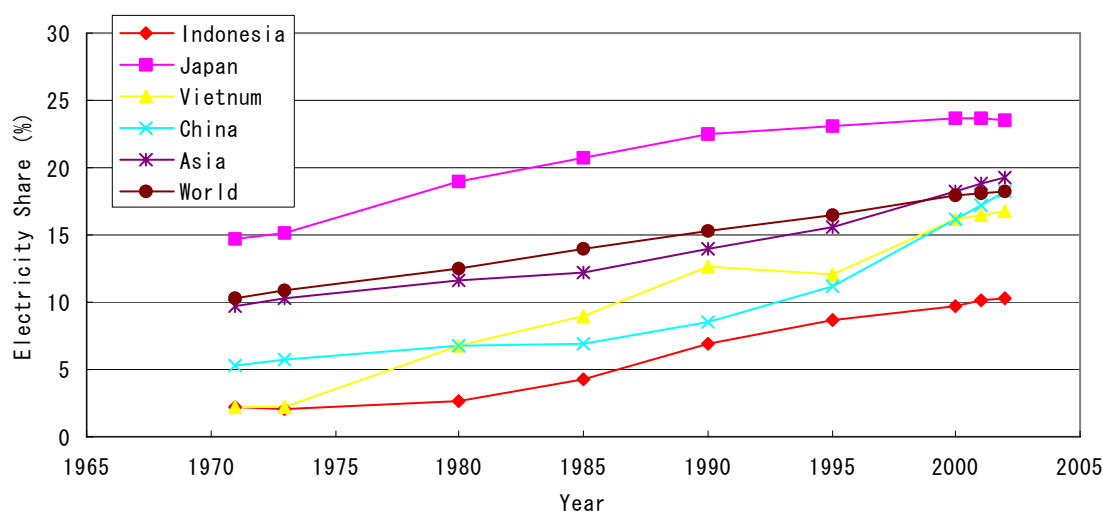


Figure 2.3.4 Transition of Electricity Share

■ Long-term Fuel Requirement

Views are held that the only new gas fuel sources available for PLN are the SSWJ (Phase 2) project and the LNG terminal project implemented by PLN's own financing. This is a critical but fairly realistic assessment considering the present situation of gas procurement negotiation between PGN and PLN. Therefore, a lot of coal thermal power plants will be constructed as alternatives, however, power development concentrating on coal-fired thermal plants should be avoided in terms of CO₂ emission and energy security. Renewable energy including geothermal energy is expected to developed more, however, considering the generation cost and renewable energy potential as alternatives, large scale hydropower and nuclear power offer realistic options to meet energy requirements in Indonesia.

As large scale reservoir type hydropower projects sometimes have residential and environmental issues, etc., Yen loan applications for such projects seem to become temporarily suspended. To solve residential issues such as relocation of residents, the dialogue with the residents on support for removal and secure of livelihood is important. To solve the environmental issues, the implementation

of appropriate EIA and cooperation with NGOs and experts is necessary. Provided efforts are made to solve the issues proactively, Yen loan studies should resume.

As for nuclear power plants, the national and international consensus on development of nuclear power plant is needed. The step-by-step studies are necessary with related law enactment, capacity development in construction technology, waste treatment technology reactor operation and maintenance technology.

Although the picture of the power sector in future should be outlined in RUKN prepared by MEMR, previous RUKN was prepared by modifying RUPTL and prepared by PLN. Therefore, capacity development in power development plan for MEMR is necessary in order to provide capability for establishing power sector policy independently based on the national energy policy.

WASP-IV is used in the power development plan by PLN and there is no issue in operating this software. However, further capacity development is necessary to acquire the knowledge and experience for handling the scale merit of power plants, long-term fuel prices and demand forecasting.

2.4 Current Situation and Issues of Energy Conservation

2.4.1 Policy on Energy conservation

Indonesia's energy policy is defined in the National Energy Policy 2003-2020, which was formulated in March 2004 (refer to “Energy Systems and Policy,” described later). Prior to formulating a national energy policy related to energy conservation, the Ministry of Energy and Mineral Resources formulated its “Policy on Renewable Energy Development and Energy Conservation (Green Energy)” in December 2003.

The Green Energy policy forecasts a 30% energy reduction if appropriate measures are implemented in both the supply and demand sides. Table 2.4.1 shows short-term programs for the next five years and long-term programs to be implemented by 2020, as follows

Table 2.4.1 Energy Conservation Program in Green Energy

Program	The main contents in connection with energy conservation
Short Term Program (5 years)	
Investment	<ul style="list-style-type: none"> ➤ Promote of program to the funding institutions, bank, and guarantors in-country ➤ Cooperation with international donor institutions ➤ Providing access assistance to the funding sources
Incentive	<ul style="list-style-type: none"> ➤ Imposing regulations on incentive-giving, in the form of fiscal incentives ➤ Providing free interest loan for engineering part of development
Energy Price	<ul style="list-style-type: none"> ➤ Continue energy price subsidy elimination
Standardization and Certification	<ul style="list-style-type: none"> ➤ Promoting the formulation of national standard ➤ Implementation of goods and services certification ➤ Promoting the formulation and enforcement on a competence standard for technical executors
Human Resources	<ul style="list-style-type: none"> ➤ Conducting local and overseas training and education, seminars, technical guidance ➤ Improving quality of human resource in the regions

Program	The main contents in connection with energy conservation
Short Term Program (5 years)	
Information	<ul style="list-style-type: none"> ➤ Developing data base and its data management center ➤ Developing a clearing house ➤ Disseminating information on the utilization of energy conservation technology ➤ Holding seminars, workshops, etc ➤ Effort on put information on a website
Research and Development	<ul style="list-style-type: none"> ➤ Developing priorities ➤ Expanding fund sources for development ➤ Establishing a partnership program between research institutes and industries
Institution	<ul style="list-style-type: none"> ➤ Creating networking at national and international level ➤ Promoting coordination among central and regional institutions for the implementation of an integrated program
Regulation	<ul style="list-style-type: none"> ➤ Draft joint decree of MEMR and MOF on incentives ➤ Draft law on energy utilization ➤ Energy conservation specifications
Long Term Program (2020)	
<ul style="list-style-type: none"> ➤ Application of mandatory to save energy ➤ Application to utilize efficient and environmentally friendly technology ➤ Establishment funding institution in order to energy conservation program 	

The “National Energy Management (Blueprint) 2005-2025” formulated in 2005 also covers programs related to energy conservation based on the above policy, but no specific approach, means, and goals are defined in their individual programs.

Specific energy conservation programs have been implemented thus far by presidential decrees. A recent example is the “Presidential decree concerning an urgent energy conservation measure (No. 10/2005),” announced on July 10, 2005. The contents of the presidential decree are as follows:

- Implementation of energy conservation programs that target electric lights and air conditioners used in buildings of governmental bodies and corporate offices
- Implementation of energy conservation programs that target energy-consuming equipment used in buildings of governmental bodies and corporate offices
- Energy conservation measures that target official vehicles owned by governmental bodies and private corporations
- Energy conservation promotion efforts that target private enterprise and the general populace
- Implementation of energy conservation monitoring in six-month intervals

In accordance with the presidential decree mentioned above, the Ministry of Energy and Mineral Resources announced "Energy Conservation Guidelines (No. 31/2005)" on July 22, 2005. This ministerial ordinance outlines energy conservation measures to be implemented in commercial buildings and facilities of governmental bodies, and in the household, industrial, and transport sectors (see Table 2.4.2).

Table 2.4.2 Description of Energy Conservation Guidelines (No. 31/2005)

Sector	Description
Commercial buildings	<ul style="list-style-type: none"> • Setting the lowest temperature of air conditioners to 25°C • Reducing the use of room lighting to a maximum of 15 W/m² • Limiting the time for operating air conditioners and escalators from work starting times until one hour before work ending times • Restricting elevators to stop only at every other floor

Sector	Description
Offices of governmental bodies	<ul style="list-style-type: none"> • Setting the lowest temperature of air conditioners to 25°C • Reducing indirect lighting • Limiting the time of operating air conditioners and escalators from work starting times until one hour before work ending times • Restricting elevators to stop only at every other floors
Ordinary households	<ul style="list-style-type: none"> • Allowing use of energy-conserving electric bulbs only • Reducing at least 50W of electricity consumption during the load peak time from 5:00 p.m. to 10:00 p.m. • Setting the lowest temperature of air conditioners to 25°C
Transportation	<ul style="list-style-type: none"> • Requiring private cars with 2000 cc or larger engine displacement to use Pertamina, especially in Sumatra, Java, and Bali • Promoting the use of natural gas fuel in official vehicles
Industry	<ul style="list-style-type: none"> • Implementing energy audits of industries that consume large amounts of energy • Promoting the use of energy-conserving equipment and technologies
Other	<ul style="list-style-type: none"> • Promoting the use of high-efficiency lighting systems for public roads, advertisements, and other facilities • Ceasing the use of diesel oil in mixtures of oil fuels

2.4.2 Issues of Energy conservation

(1) Promotion of energy conservation activities

To promote energy conservation, PT. Konservasi Energi Abadi (KONEBA), a government-owned corporation, was established in 1987 with a subsidy from the World Bank.

The DSM Action Plan was formulated in 1992 with assistance from USAID. The plan aims to reduce the cost of electricity and to improve the quality of the power grid. An example was the implementation of a pilot project that uses high-efficiency lighting fixtures, which was forced to be suspended at the time of the Asian Economics Crisis in 1997.

Indonesia, a producer of oil and other primary energy resources, has little awareness of energy conservation because the nation is rich in energy resources and the domestic price of energy is inexpensive. Specifically, in accordance with the First Long-Term National Development Plan (fiscal 1969 to 1993), the Government of Indonesia had the following policies of primary energy:

- 1) Available energy resources are abundant in Indonesia.
- 2) Fossil fuel resources can meet the needs of domestic demand and their export will earn foreign currencies.
- 3) The price of energy is to be maintained lower than its true economic value.

Subsequently, since the Second Long-Term National Development Plan (fiscal 1994 to 2018), energy conservation has been introduced into the concept of effective use of energy. However, it is difficult to say that the idea of promoting energy conservation has been well recognized because the government has not worked aggressively in this regard. Moreover, energy consumers have little awareness of energy conservation and such technology is sparsely available. In other words, Indonesians generally are apparently not conscious of controlling their use of energy. Hence, the Indonesian government, private corporations, and industries need to establish circumstances that urge governmental bodies, private enterprises, and industries to cooperate in promoting the efficient use of energy.

Policies: Energy conservation laws, guidelines (technical standards), preferential measures for conservation of energy

Promotion: Compiling a technical database, controlling energy data, and training personnel
 Awareness: Obligation of reporting management results, creating regulations, and offering incentives
 External factor: Corporate CSR, consideration of the environment, ESCO markets

Table 2.4.3 shows the barriers against the introduction of energy conservation measures to consumers.

Table 2.4.3 Barriers against Introduction of Energy Conservation Measures

Barrier	Description
Inexpensive energy price	Government subsidies of energy have maintained an inexpensive energy pricing system (electricity rate) leading to ineffective energy conservation investments.
Insufficient energy demand data	Lack of energy control has led to a lack of data necessary for discussing and promoting energy conservation.
Lack of energy conservation technology	Little knowledge of energy conservation and technology leads to ineffective discussions of energy conservation measures.
Investment in facilities and equipment	Energy conservation equipment and high-efficiency equipment are quite expensive, and also require corresponding knowledge and technology to determine their effects.
Regulations and laws	Indonesia lacks an awareness of energy conservation since laws are inadequate to deter the use of energy and there are no regulations concerning energy consumption.
Incentives	Preferential measures and aid systems are not established to promote energy conservation.

(2) Urbanization plan that pays attention to the environment

Promoting energy conservation measures will lead to ensuring a stable supply of energy and preventing global warming as well by reducing environmental burdens. These cannot be achieved by merely implementing energy conservation measures for facilities in major cities. The policy and vision which leads to a structure of resource conservation are required for consideration of the energy demand structure in the residential and transport sector, and restructuring the current large energy wasting structure. However, the present system promoting energy conservation has failed to consolidate different sectors and industries for energy conservation.

The energy conservation policy which considers a lifestyle to prevent wasting energy, such as promotion of utilization of a public transport means, increase in efficiency of a physical distribution, and an improvement in automobile traffic style, from a long-term viewpoint, and aimed an urbanization policy that pays attention to energy conservation and the environment impact is required.

2.5 Current Situation and Issues of Energy Policy and Institution

2.5.1 Energy Policy

(1) Background

As one of the most energy-resourceful nations in Asia, the purpose of the energy diversity policy has been shifted from the reduction of national oil-dependence to avoiding fossil fuel exhaustion.

The finish line of the energy development is described as the construction of high value-added nation with energy security and flexible governance.

Figure 2.5.1 shows the rebuilding of the energy policy in Indonesia.

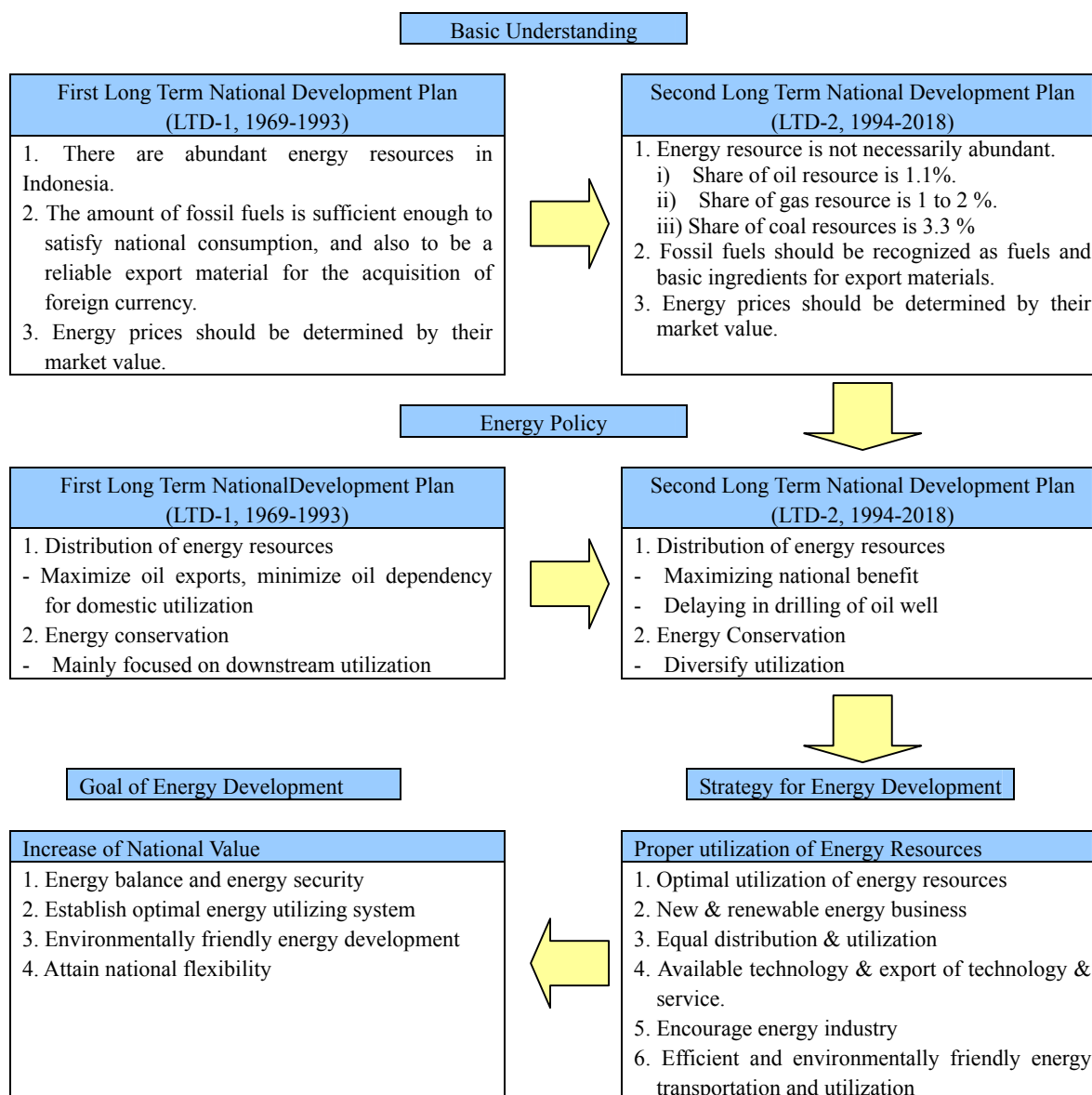


Figure 2.5.1 Rebuilding of Energy Policy in Indonesia

(2) National energy policy

Current Indonesian energy policy is outlined in National Energy Policy 2003-2020, March 2004, based on the second long term national development plan. Main policy is listed as follows:

- The promotion of stable energy supply, to accommodate national development and population increase.
- The diversification of energy sources, aiming at the most appropriate and economic resource composition.
- The promotion of energy conservation

To achieve these policies, the following strategies are presented.

- The development of infrastructure
- The introduction of market economy in energy sector

- The formulation of safeguard for low-income group in urban and peripheral areas
- Environmental protection
- The collaboration among public and private sectors in the energy sector
- Human resource development in the energy sector, particularly in rural areas and isolated islands
- Research and development in the energy sector
- The establishment of an effective management system in the energy sector

In addition, the following numerical targets are proposed.

- To increase electrification ratio to 90 % by 2020
- To increase the percentage of renewable energy, excluding large-scale hydropower, to 5% by 2020
- To decrease energy intensity 1% a year

(3) The National Energy Management Blue Print

The amount of primary energy supply and technological advancement in each energy source was forecasted based on the National Energy Policy. 'Peraturan Presiden Republik Indonesia Nomor 5 Tahun 2006 tentang Kebijakan Energi Nasional' presented the preferable primary energy composition to be achieved by 2025. Specifically, the expected proportion of each energy source in national energy consumption is described as below:

- Oil less than 20%
- Gas ... more than 30%
- Coal...more than 33%
- Biofuel more than 5%
- Geothermal more than 5%
- Other... New & renewable energy (biomass, nuclear, hydro, solar, wind) ... more than 5%
- Liquefied coal... more than 2%

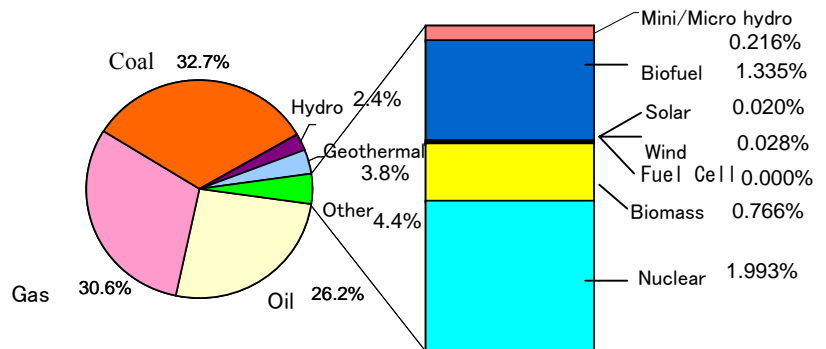


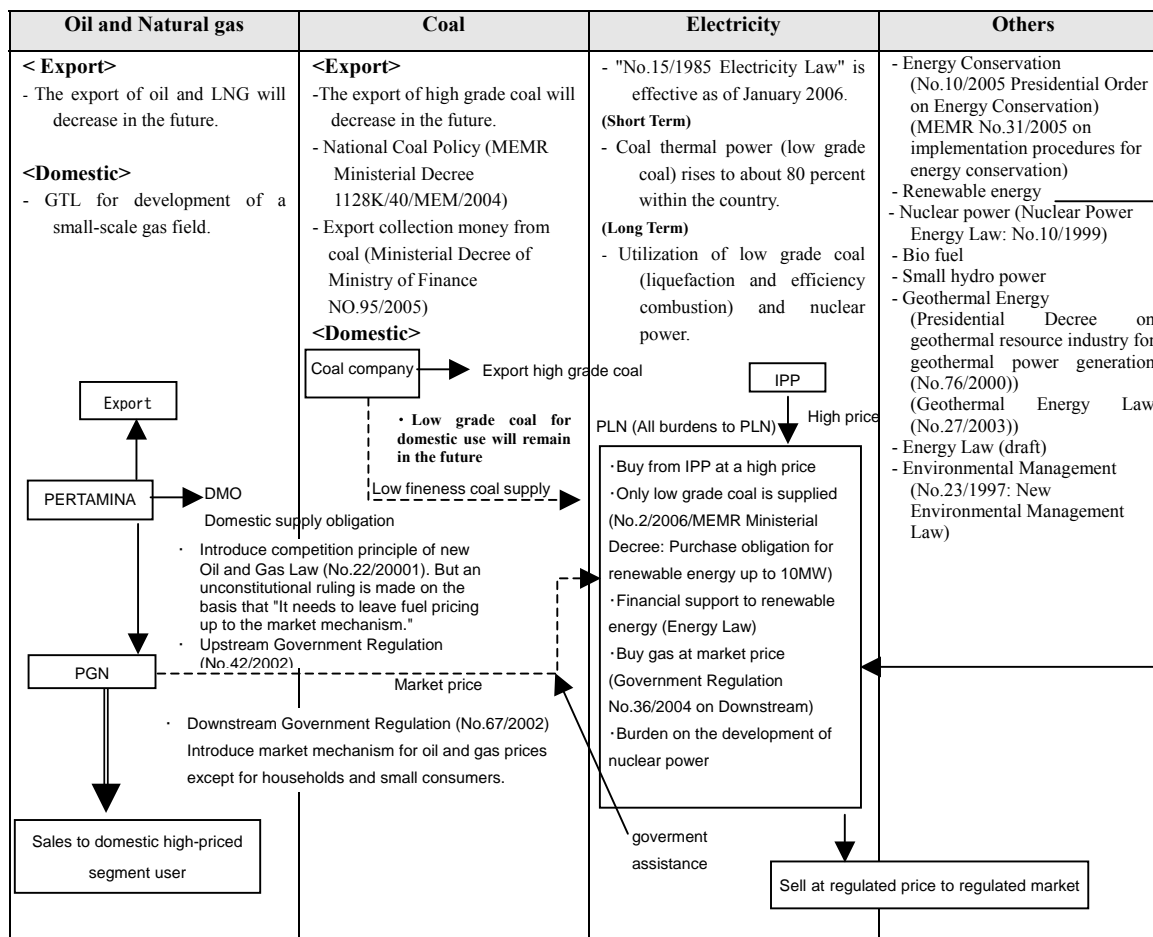
Figure 2. 5.2 Target of Primary Energy Mix

2.5.2 Issues in the Energy Policy

(1) Inconsistencies across the range of energy policies

There is an important issue to be addressed regarding the lack of consistency among energy policies and laws in Indonesia, even though it is partially balanced and consistent in terms of support of renewable energy and the poor, marketing tariffs, and domestic supply obligation. In particular, although PLN has obligations on the input side, such as buying gas at market price, IPP, and buying renewable energy, there are restrictions on the output side, such as revenue from tariffs. Therefore, these inconsistencies, caused by the liberalization of the energy sector are consolidated in the financial structure of PLN. This situation is illustrated in the figure below.

The energy law and policy system in Indonesia is summarized in Figure 2.5.3.



Source: Prepared by JICA investigation team from various materials

Figure 2.5.3 Energy Law and Policy Systems in Indonesia

(2) Stagnation in the development of the related-laws

In the current situation, in which rulings of unconstitutionality were made on the New Electricity Law and on a part of the New Oil and Natural Gas Law, the legal system regulating the energy sector has not been adequately developed yet. An immediate solution for attracting private investment needs to be formulated. In particular, although Government Regulation No. 3/2005 (the revision order of No. 10/1989 on the supply and utilization of electric power) describes the utilization of private investments as the basic policy, the contracts and procedures for the investments as well as the specific system, sharing responsibilities and the decision making need to be clearly defined.

(3) Relationship with the regional administrations

As for regional administration, the authority on investments, industries and energy has been transferred to regional governments under Chapter 7 (2) of No. 22 Regional Administrative Law and Government Regulation No. 25 (dated 6 May 2000). Moreover, the shares of petroleum oil of central and regional governments is regulated under the No. 25/1999 Balanced-budget Law and No. 33/2004, as shown in the table below; and it is thought that effective utilization of these shares will contribute to the energy supply in the regions. Further investigations on the current status need to be made.

Table 2.5.1 Shares of Petroleum Gas of Central and Regional Governments

	Law	Central	Regional
Oil	Law No. 25/1999	85.0%	15.0%
	Law No. 33/2004	84.5%	15.5%
Gas	Law No. 25/1999	70.0%	30.0%
	Law No. 33/2004	69.5%	30.5%

2.6 Analysis of Current Situation and Issues of Regional Development and Rural Electrification

This section analyzes (1) the current situation of regional development and rural electrification in Indonesia and (2) the possibility and issues of how the energy sector in general and rural electrification projects in particular can contribute to regional and rural development in terms of poverty alleviation and human security by referring to the relevant literature and the field survey of Nusa Tenggara Province.

2.6.1 Regional Development

(1) Current situation of regional development

■ Regional development in the national development planning

The Mid-term development plan (2000-2004) of Indonesia refers to the followings as the development issues.

- ◆ Establishment of a democratic political system and maintenance of national unity
- ◆ Establishment of the rule of law and good governance
- ◆ Restructuring of the economy and strengthening of the basis for sustainable and fair development (e.g., poverty alleviation, SME development, stabilization of economy and finance, expansion of investment and export, strengthening of international competitiveness, infrastructure development, and environmental conservation and management.)
- ◆ Improvement in the national welfare and religious life and creation of vigorous culture (e.g., education, science and technology, health and sanitation, protection of workers and the disadvantaged, and improvement in women's status.)
- ◆ Facilitation of regional development (capacity development of the local governments, reduction of disparity between the regions, capacity development and participation of people)

Thus, the Plan regards the promotion of regional development as one of the priority development issues. Under decentralization policy, the role of the central government is limited to the national issues, while the provincial government is responsible for addressing inter-regional issues and those that are delegated by the central government. The relationship between the ministries of the central government and local (regency and city) governments has shifted from "control" to "consultation". Regional development plans formulated by the local government include the long-, mid-, and short-term plans, based on the law of national development plan system, which will be discussed later.

■ Regional development plan

The outline of regional development plans is briefly described in the Law No. 32 (2004). According to this law, the provincial, regency, and city governments are required to formulate regional development plans to manage regional administrative tasks in line with the national development plan.

Table 2.6.1 Types of National Development Plans

Type	Form	Term
1) National long-term development plan (RPJP)	Law to be approved by the Parliament	20 years
2) National mid-term development plan (RPJM)	Presidential decree	5 years
3) Ministerial strategic plans (Renstra-KL)	Presidential decree	5 years
4) Government work plan (RKP)	Presidential decree	1 year
5) Ministerial annual work plan (Renja-KL)		1 year

Source: Satoshi Iijima

Note: RPJP: Rencana Pembangunan Jangka Panjang; RPJM: Rencana Pembangunan Jangka Menengah; Renstra-KL: Rencana Strategis Kemenrian/Lembaga; RKP: Rencana Kerja Pemerintah; Renja-KL: Rencana Kerja Kementrian/Lembaga

The local government is responsible for formulating the long-, middle-, and short-term development plans in a systematic manner like the central government. The development planning department

(BAPPEDA) of each local government coordinates the formulation of plans.⁴ The responsibility for implementing plans lies the departments of the local government.

The draft development plans are prepared by BAPPEDA and discussed among stakeholders at the development planning meeting. Based on the outcome of discussion, BAPPEDA finalizes the plan.

Table 2.6.2 Types of Regional Development Plans

Type	Form	Term
Long-term regional development plan (RPJPD)	Regional regulations to be approved by the local parliament	20 years
Mid-term regional development plan (RPJMD)	Regulation set by the head of local government	5 year
Regional strategic plan of local government departments (Renstra-SKPD)	Regulation set by the head of local government departments	5 years
Local government work plan (RKPD)	Regulation set by the head of local government	1 year
Annual work plan of local government departments (Renja-SKPD)		1 year

Source: Satoshi Iijima

Note: RPJPD: Rencana Pembangunan Jangka Panjang Daerah; RPJMD: Rencana Pembangunan Jangka Menengah Daerah; Renstra-SKPD: Rencana Strategis Satuan Kerja Perangkat Daerah; RKPD: Rencana Kerja Pemereintah Daerah; Renja-SKPD: Renja Satuan Kerja Perangkat Daerah

The long-term plan of the local government reflects the content of the long-term national development plan. The middle-term plan refers to the long-term plan, while the short-term plan refers to the middle-term plan and the annual work plan of the central government. Each local government department formulates the strategic plan and annual work plan, including mission, objectives, strategies, policies, plans, and action plans, based on the long- and middle-term regional development plans. The departments of the local government not only formulate the plans but also regularly monitor and evaluate the implementation, while BAPPEDA is responsible for overall monitoring.

BAPPENAS is currently formulating the activity plan including (1) the production of information system and database system, (2) the formulation of regional development models (target setting and formulation of priority development issues and programs), (3) the establishment of development planning forums, and (4) the promotion of inter-regional cooperation in order to construct and manage the development planning system.

(2) Issues of regional development

As described above, the legal framework of regional development plans is already in place. Local governments have started producing the plans. However, several issues need to be resolved.

■ Production of regional development system

The regulations should be formulated and enacted as concrete documents in order to enforce the laws and should be harmonized between them without contradiction. The information system and regional development model should be established in order to run the system.

BAPPENAS provides a training program for development planning to the local government staff with a limited budget only. The Regional Development Department (BANGDA) of the Ministry of Home Affairs, which is in charge of regional development as well, issues the guidelines for development planning process, but does not have the training budget.

In fact, the development plans are descriptive and are not clear about the priority issues and

⁴ Decentralization law (1999) gives a very limited role to the provinces and places them at the same level of regency and city governments. However, the revised decentralization law (No. 32/2004) reviews the role of the province as the intermediate government and removes and gives the role supervision and coordination for regency and city governments.

implementation process due to a lack of budget and schedule. In addition, the local governments seem to lack the evaluation ability. For example, a development plan document of a province declares that almost all the expected inputs, outputs, outcomes, and impacts are achieved without indicating any evidence. Thus the local governments are unlikely to be able to effectively monitor a series of processes, including planning, implementation, monitoring, evaluation, and feedback. The local governments have much room for improvement in this regard.

■ **Development budget of the local government**

Even if the development plans are formulated, the budget is not sufficient for implementation. For example, the Central Lombok regency government submitted the budget proposal of Rp. 1.6 trillion but secured Rp. 479 billion only. Of the entire budget, the development budget is only Rp. 184 billion, while the rest is allocated to the administrative cost such as salary.

■ **Increase in the number of the local governments**

As of February 2006, 99 local governments including 21 provinces submitted a request for separating from other local governments and are waiting for the screening of the Ministry of Home Affairs.⁵ The majority of the requests are from governments that are endowed with abundant natural resources. Since the enforcement of the decentralization law, five provinces, 81 regencies, and 18 cities have been created.

However, many of the newly established local governments suffer from (1) insufficient subsidy due to the serious financial difficulty of the central government, (2) a lack of human resources, and (3) delay in infrastructure development. All of the above hinder efficient realization of regional development.

2.6.2 Rural electrification

Rural electrification had been promoted mainly by grid extension of PLN as a national priority policy to narrow the gap among the regions. The rural electrification ratio for households increased up to over 50% in 1997 from 30% in 1993. However, there had not been much progress since the economic crisis of 1997 and the electrification ratio stayed at 54.8% in 2003. Although the MEMR, the organization in charge of rural electrification, aims to increase this ratio to 75.2% by 2013 and 90% by 2020, its achievement is regarded as extremely difficult under the current environment.

(1) Current situation of rural electrification

■ **Rural electrification policy**

Rural electrification policy is significantly influenced by the decision of the court on the unconstitutionality of the law (No. 20/2002). At present, the revision of the law is still under discussion and the policy direction is not yet clear. The law (No. 20/2002) assumed that the central and local governments should provide the fund for rural electrification, while the central government and PLN in fact took a substantial responsibility before the enforcement of this law. However, even with this law, the division of responsibility between the central government and the local governments and the source of the fund were not clear. Furthermore, PLN dissolved the department in charge of rural electrification and withdrew from this business in line with the move toward PLN's breakup and privatization. The court judged that the power sector should not be exposed to competition in the market because of the nature of this industry as a key industry and the central government should maintain the responsibility for the sector.

■ **Organization in charge of promoting rural electrification**

The division of roles and responsibilities among the organizations is not clear although many are involved in rural electrification. MEMR is the one responsible for supervising rural electrification policy and has the budget for this purpose.

⁵ Jakarta Newspaper, February 8, 2006

The measures for rural electrification are mainly divided into (1) on grid (grid extension by PLN) and (2) off grid in the area where grid is difficult to extend. The majority of the electrification is on grid, which is the responsibility of PLN. If grid is extended to the area with an off grid system, the generators (mainly diesel generators) are transferred to the unelectrified areas. MEMR supports both types of electrification by providing the grant to PLN for the construction of distribution facilities.

On the other hand, off grid electrification projects refer to projects to construct the decentralized generation system and electrify the area where PLN's grid is unlikely to be extended. Though many ministries are involved in off grid electrification projects, the institutional structure of the government for rural electrification is not clear. There is one type of the project in which PLN constructs and operates the system, while there is another type in which MEMR, MOC, or the local governments construct the system. In the latter, the responsibility for operation and maintenance tends to fall on community organizations or cooperatives. Furthermore, in addition to MOC and the local governments, BPPT promotes the electrification projects by using the decentralized solar power generating systems.

Table 2.6.3 Role of the Organization in charge of Electrification

	On grid		Off grid	
	Construction	O&M	Construction	O&M
MEMR	Construction of distribution systems (grant to PLN)	PLN	Construction of diesel and micro hydro power projects (grant)	PLN (Diesel), Cooperatives & community organization (micro hydro)
MOC	—	Cooperative (meter reading, fee collection), delegated by PLN	Construction of micro hydro power projects	Cooperatives
Local gov't	—	—	Construction of micro hydro and decentralized solar power projects	Cooperatives, community organizations
BPPT	—	—	Decentralized solar power projects	Cooperatives, community organizations

■ Fund for rural electrification

Rural electrification as social infrastructure requires public funding. Although MEMR is an organization responsible for rural electrification policy and has the budget for this purpose, the budget is not still sufficient for achieving the target of electrification ratio. Indeed, the share of the budget for rural electrification is less than 1% of the total development expenditure of the local governments.

Table 2.6.4 Rural Electrification Budget of MEMR

(Unit: billion rupiah)

Year	2003	2004	2005	2006
Budget	390	423	476	648

Source: MEMR

Table 2.6.5 Rural Electrification Projects of MEMR (2006)

Grid extension		SHS	Micro hydro		Wind power	
Length (km)	Budget (billion rupiah)	No.	Site	Generating capacity (kW)	Site	Generating capacity (kW)
3,155	241.6	22,160	59	6,573	7	560

Source: MEMR

Table 2.6.6 Micro Hydropower Projects of MOC (unit: billion rupiah)

	2004	2005
Budget	6	1
No. of projects	7	1

Source: MOC

Rapid grid extension is difficult because of PLN's financial difficulty. According to the ex post evaluation of JBIC's rural electrification project, the income statement of rural electrification of 2002 reports that the revenue is approximately Rp. 6.50 trillion and the expenditure is Rp. 6.58 trillion, which resulted in the loss of Rp. 83.2 billion (loss ratio of -12.8%). The evaluation report analyzes that the cause of this loss is the low profitability of the business in outer islands. If looking at the benefit structure of the outer islands alone, the revenue is Rp. 2.29 trillion and the expenditure is Rp. 3.27 trillion, which results in Rp. 971.6 billion (-42.4%).

On the other hand, MOC gives technical and managerial guidance to those cooperatives that engage in operating and maintaining the electrification system. In addition, the Ministry has the budget for the construction of micro hydro power generating facilities, though it is extremely small compared with that of MEMR. However, the budget of the Ministry significantly decreased from Rp. 6 billion (7 projects) in 2004 to Rp. 1 billion (1 project).

Thus, rural electrification, regardless of on grid or off grid, has the limited budget, which makes it difficult to implement the projects.

(2) Issues in rural electrification

This section summarizes the issues to be taken into consideration in the analysis of technical assistance project, based on the current condition of rural electrification and regional development.

■ Oversight capacity of the central government

The facilities of the rural electrification projects funded by MEMR are normally transferred to community organizations or cooperatives. Therefore, MEMR does not monitor or evaluate the projects. Those cooperatives that engage in operation and maintenance do not submit the report of a micro hydropower project to MOC due to decentralization policy. Combined with the low managerial capacity of the local government and community organizations, this factor is a serious constraint for achieving sustainable operation of the electrification projects.

However, counter measures started tackling such issues. For example, MOC imposed the condition that the cooperatives must save 40% of the revenue from the project to the bank account and can not withdraw money without a prior approval of MOC. In addition, MOC gives the guidance on the appropriate level of tariff (e.g. Rp. 50,000 per month), which is much higher than the average tariff of the visited sites (Rp. 10,000).

■ Organization, human resource and financial capacity of the local government

The level of organizational capacity and human resources of the local government regarding the electric utility is low. There is a case that PLN staff go on loan to the local government as the local government does not have know-how in this area. In the case of Central Lombok regency, there is no staff in charge of electric utility on a full-time basis at the department of energy and mining, which makes it difficult for the local government to take an initiative for rural electrification.

Even if the authority and responsibility are decentralized to the local government, it lacks the capacity to finance the projects and faces difficulties in securing the budget for electrification. As mentioned earlier, the local government has a relatively small development budget compared with the administrative budget.

For example, Central Lombok regency has the electrification budget of Rp. 120 million only, which is just enough to install 20-25 sets of solar home systems. Though the project of 100kW micro hydro power project is being planned, the regency government only provides land, while the provincial government designs the facility and the central government gives the budget and equipment. Therefore, the immediate transfer to the local government (regency and city) of the responsibility for the electrification projects seems difficult to achieve the smooth monitoring and management.

■ **Managerial capacity of community organizations**

Decentralized rural electrification schemes, especially solar power and micro hydropower generation, are often operated and managed by cooperatives or community organizations. Communities would ideally be equipped with the necessary capacity for operation and maintenance and the system should generate sufficient profit to achieve sustainable operation. However, the communities face a variety of difficulties in reality. This section analyzes the issues of management by the community organizations in terms of (1) a sense of responsibility for operation and maintenance, (2) operation and maintenance system, and (3) finance.

○ **Sense of responsibility for operation and maintenance**

The communities tend not to take seriously their responsibilities for operation and maintenance of the community-managed rural electrification projects. It would be ideal if they paid careful attention to the management of the project as a public asset.

For example, in the SHS project of Mareje village, solar home systems are granted to a village cooperative (KUD) and are further leased to those households who are selected based on predetermined criteria. Both the cooperative and beneficiary households signed the lease agreement clarifying the responsibility for operation and maintenance of the cooperative, the responsibility for monthly lease payment of the beneficiaries, and the future transfer of the ownership after the payment of a certain period. However, the beneficiaries ceased to pay the leasing fee after six months. This may be because (1) solar home systems were given to the neighboring village as a gift by a politician and (2) the beneficiaries assumed their leased system as a gift as well.

As a result, the cooperative is unable to save the money necessary for maintenance such as replacement of batteries. Users are continuing to use old batteries or purchase the batteries with their own money. There are many cases that users have sold the systems to others or the systems are not functioning properly.

○ **Operation and maintenance system**

The operation and maintenance system of the community organizations is not enough in terms of technical capability, (2) type of technology utilized, and (3) the distance from the organization in charge to the project site.

Though community organizations normally attend the training for the basic operation, they need to depend on technicians or the governmental organizations in case of breakdown. However, due to the low financial capacity, community organizations are often unable to receive the repair service by technicians. The governmental organizations do not have sufficient budget for repair.

Spare parts are sometimes unavailable in the local market as they are too sophisticated. For example, in the case of solar power/micro hydropower hybrid system, the community was unable to find the spare parts for the system and, as a result, requested the government office for the supply. In this hybrid system, the revenue is too low to earn the necessary money for replacing many batteries, which is too high compared with the monthly revenue. This is an example that the expensive equipment makes it difficult to continue the operation.

○ Finance

The issue of operation and maintenance is deeply rooted in the low earning capacity of the organization in charge of operation. Batteries, the controller and the generator need to be replaced periodically for solar home systems and micro hydropower generation respectively. The money for such replacement should be generated by accumulating a part of the revenue.

However, the organizations in charge of operation tend to fail to recognize the need for saving and keep the connection fee and electrification tariff at low level. For example, the Sedau micro hydropower project started its operation in 1999. In the beginning, the organization did not charge any fee for the connection. It started to charge Rp. 500,000 in 2005 and Rp. 1 million in 2006 for this purpose, the fee level is not sufficient to cover the connection cost. The electricity tariff was Rp. 7,500 in 2005 and Rp. 10,500 in 2006, both of which are lower than the expenditure for kerosene, dry batteries, and battery charging before the electrification.⁶ As a result, the organization saved Rp. 2.4 million only as accumulated profit. Although the generator is not functioning properly, the organization can only submit a request for repair to the department of energy and mining of the local government.

The supervision on the organization in charge of operation by the local government is lacking as well. The organization in charge of the Sedau project is required to submit quarterly financial reports to the local government. Though the government office should check the financial condition and give proper guidance such as the increase of tariff, such supervision is not practiced yet.

■ Cost effectiveness of rural electrification

If the local government is to play the role of implementing rural electrification projects, it may have a negative impact on their development and efficiency. As decentralization is assumed to devolve power to local governments, it also decentralizes resources to them, which may harm the economy of scale. A system to alleviate this negative impact becomes necessary.

The following issues can be pointed out as the constraints on rural electrification.⁷

1. Local areas and rural villages in particular have low population density, which makes the centralized supply system difficult and costly.
2. Decentralized electrification system can provide only the limited power and the component such as solar panel becomes costly.
3. Low population density increases the cost for tariff collection, which results in higher electricity tariff.
4. The region, which depends on agriculture, forestry, and fisheries, has a large population of the poor and a stagnant economy, both of which lower the demand for electricity.

Thus, due to the low population density and low demand for electricity, the cost of electrification becomes extremely high in rural areas, which necessitates the provision of a grant to grid extension or the off grid electrification for the promotion of electrification.

In fact, JBIC's ex post evaluation concludes that electrification in rural areas of outer islands is not profitable due to the low demand density and the fact that the majority of electricity is generated by diesel generators with the higher generating costs. Many users have the low voltage contract for household, which has a low electricity tariff structure. These issues should be carefully taken into consideration at the time of establishing the institutional and organizational structure for the development of rural electrification initiatives. In particular, regency and city governments lack the capacity to promote rural electrification.

⁶ According to Chapter 9 of the JICA-funded study on the utilization of renewable energy, the average monthly expenditure on alternative lighting such as kerosene lamps of the households in the unelectrified village is Rp. 20,670 (minimum Rp. 5,925, maximum Rp. 64,400).

⁷ Lalith Gunaratne, "Rural Energy Services Best Practices", May 2002

2.6.3 Role of Energy Supply for Regional Development

While energy supply is essential as the base for industrial development, it plays another important role in facilitating livelihood improvement and poverty alleviation. As the urban/rural gap is serious in the electricity utility infrastructure and living standards, the linkage between energy supply and regional development is important as well.

For example, the World Bank states in its report that the supply of efficient and clean energy is a key for economic growth and can alleviate poverty through various linkages.⁸ Use of modern energy and economic development/human development (health, education, life expectancy) is correlated and this linkage takes many forms.

No country has succeeded in alleviating poverty without increasing energy utilization. Unless a majority of the people benefit from the minimum energy service, the country can not go beyond a subsistence economy. However, the introduction of cheap and easy-to-use energy alone does not necessarily lead to socio economic development. Energy is consumed in the process of producing assets and services and is a derived demand of other assets and services.⁹

The impact on regional and rural development of energy supply (electrification in particular) may be well recognized. A brief summary of the detail of the impact and process¹⁰ are shown as follows;

- (1) Improvement in welfare and economy of households
 - Impact of lighting and electric appliances
 - Improved environment for education
 - Improved health and sanitary conditions
 - Stimulation of economic activities
 - Improvement in livelihood through various steps

- (2) Improvement in public services
 - Health services
 - Educational services
 - Religious facilities

⁸ Energy and Mining Sector Board, World Bank, "The World Bank's Energy Program: Poverty Reduction, Sustainability and Selectivity", December 2001, p.1-2

⁹ Energy Working Notes, p.5

¹⁰ This description of this section depends mainly on Michel Matly Marge (2003), "Rural Electrification in Indonesia and Sri Lanka: From Social Analysis to Reform of the Power Sector", JBIC (2003), "Ex post evaluation of rural electrification project (2)", Abul Barkat et al. (2002), "Economic and social Impact Evaluation Study of the Rural Electrification Program in Bangladesh".

Chapter 3 Assessment and Strategy for Solution of Issues

3.1 Strategy for Addressing Current Issues

In Chapter 3, we discuss and devise a technical cooperation strategy to address the current issues in the energy sector. This will be performed through analysis of current issues, including findings of the field survey, and consideration of possible future issues, including development of a solution for cooperation that accounts for issues specific to the energy requirements of the different socioeconomic areas in Indonesia. These areas are categorized into firstly, the economic infrastructure area and secondly, the rural and community area. Strategies and solutions for addressing the issues in the cooperation program are examined through the following approaches.

■ **Program approach for the economic infrastructure area (primary energy (fossil fuel, renewable energy) electric power, energy demand, etc.)**

As relationships and partnerships already exist between members of the economic infrastructure sector, it is essential that this is given due consideration in terms of the schedule, collaboration and scale of the support project (support program resources).

■ **Collaborative approach for social infrastructure (Regional development / community development including rural electrification)**

Since it is estimated that issues in the project area are not limited to the energy sector but include other sectors, a comprehensive approach covering all sectors on condition of governmental support etc. is taken (support for regionalization).

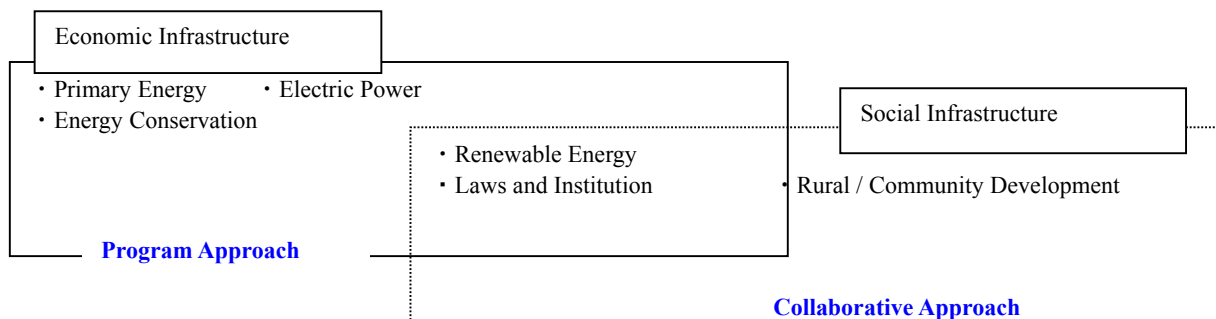


Figure 3.1.1 Technical Cooperation Approach for Energy Sector

3.2 Assessment and Strategy for solution of issues in economic infrastructure sector

3.2.1 Ideal Economic Infrastructure Sector

(1) Review of current situation and issues

As explained in the previous chapter, the current situation and issues are mutually related. Figure 3.2.1 shows the relationship between current energy issues and government policy on the natural gas sector, a sector with important correlations with other sectors.

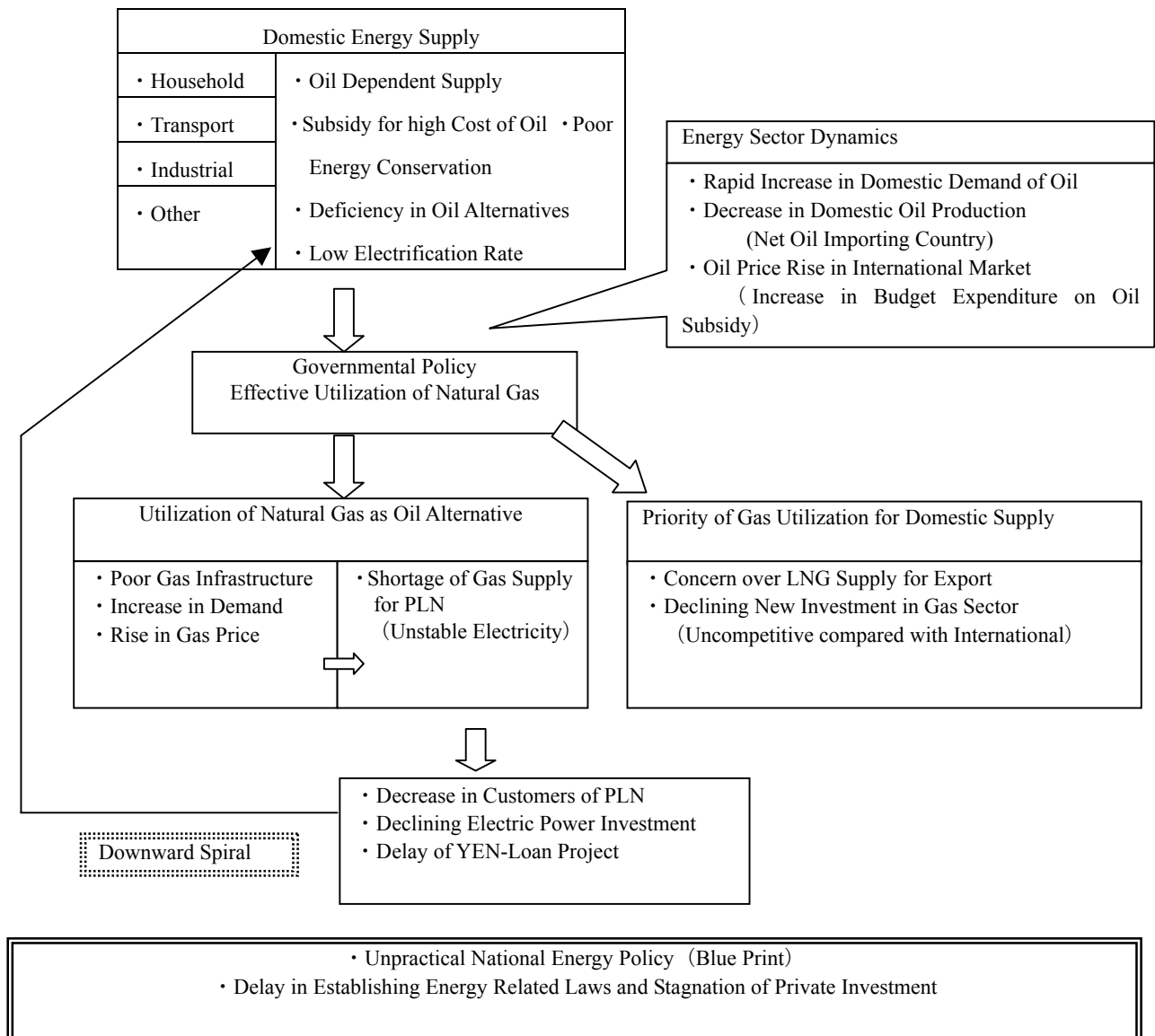


Figure 3.2.1 Review of Current Energy Sector Conditions and Issues (Natural Gas Supply Viewpoint)

(2) Ideal Energy Sector Structure

The essential issue of the energy sector in Indonesia is how to reverse the downward spiral outlined in Figure 3.2.1 above and transform it into an upward spiral, as shown in Figure 3.2.2. In order to achieve this, short-term target and medium-long-term targets are outlined as follows:

- Short-Term Target: Rapid establishment of stable energy supply based on effective utilization of natural gas as oil alternative
- Medium and Long-Term Target:
 - ① Minimize domestic utilization and maximize export of natural gas due to increase earnings of foreign currency
 - ② Utilization of coal and renewable energy as natural gas alternatives and improve of rate of electrification.

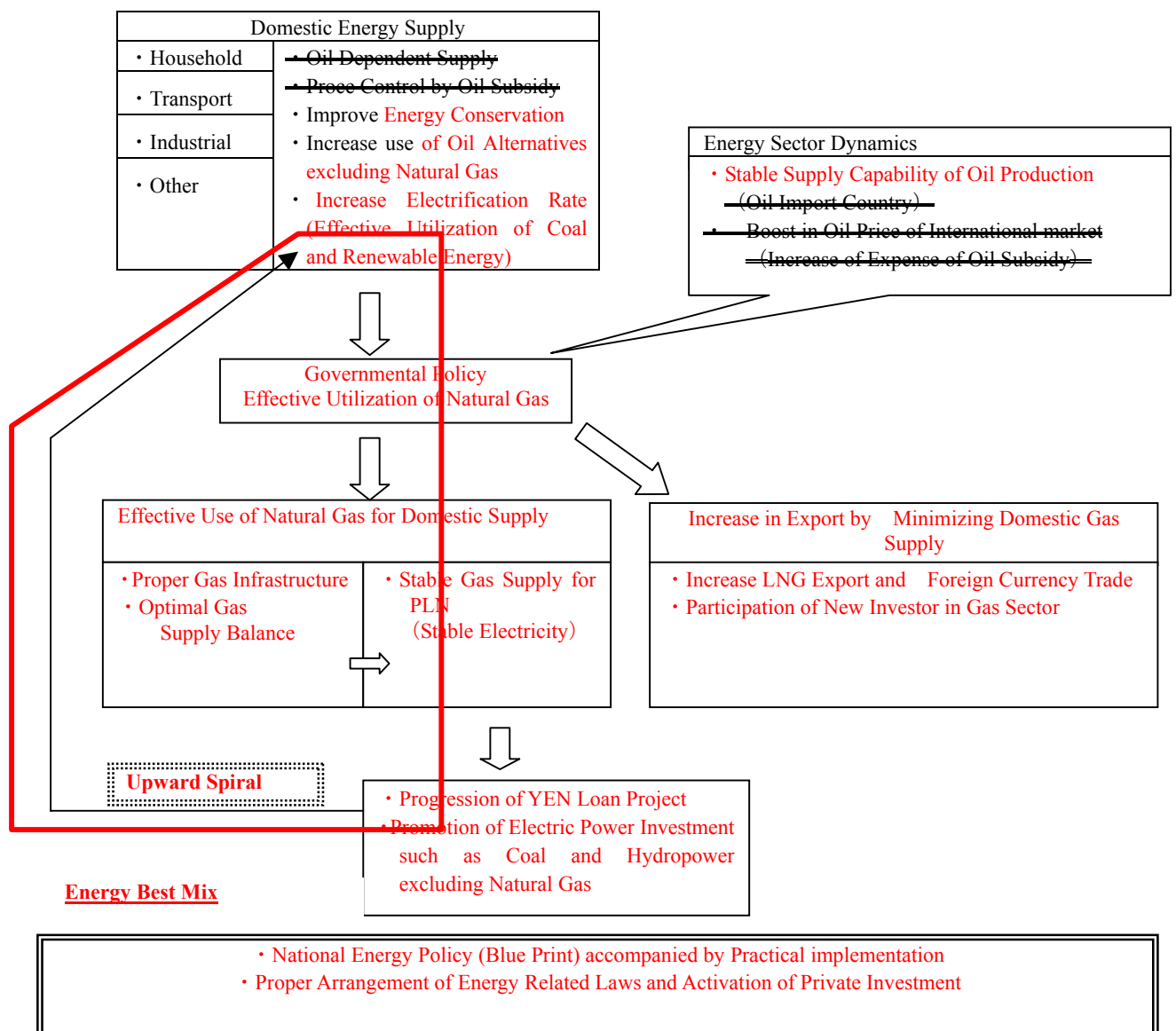


Figure 3.2.2 Ideal Energy Sector Structure

3.2.2. Methodologies on Issues and Solution of Economic Infrastructure

(1) Methodologies on issues and solution of primary energy balance

■ Issues on oil and petroleum products

Regarding new oil fields, the development is expected in Eastern oil fields and Offshore. In particular, exploration and exploitation by foreign companies are anticipated, because huge amounts of capital funds are required for the development of Eastern oil fields and Offshore.

New oil and gas regulations that unconstitutional judgment are sentenced to the parts of them need to be urgently enacted for the purpose of promoting investment activities, and it is important that an oil and gas development system including a preferential tax system, improvement of the investment environment and application of PSC should be implemented as soon as possible.

When considering Indonesian energy importation, most of the importations consist of petroleum products, so it can be said that oil refinery plant capacity is insufficient in present-day Indonesia. For this reason, there is a requirement for new oil refinery plants in consideration of the energy balance, including oil exporting countries from which Indonesia imports petroleum products.

By increasing international petroleum product prices, as the government budget has deficit by the expenditure of oil subsidy, the government makes an efforts to decrease the oil subsidy. By the policy, recent domestic oil prices increase in Indonesia markets. The policy results in an economically difficult environment for low-income persons. Therefore, it is reasonable that the government makes the supporting schemes for such low income persons. And it is considered that the government should be clear the time schedules for avoiding the oil subsidy system. .

■ Issues on natural gas

Effectiveness of natural gas utilization is expected as oil substitution energy. However, as pipelines are not prepared so much as the demand, the construction of the gas pipelines are required urgently. South Sumatra pipeline (SSWJ: Phase 1 = Japan loan/ Phase 2 =PGN funds) are under construction, however the estimated natural gas reaches in high prices effected by international market price.

Gas transmission and distribution including SSWJ are managed like monopoly by PGN. As the 40 %stocks of PGN are privatized on stock market, PGN is managed in view point of high return mind. As the results, PGN has strong market control power. In future some regulations such as profitability constraints to gas pipeline business of PGN will be required. The system design for gas business might be required by the year of 2008 when gas market will be opened.

Meanwhile, LNG export is important method for retaining foreign income. The policy that natural gas should be supplied to domestic market preferentially is issued in order to occur natural gas shortage for domestic consumers. Concretely the government has an intention to negotiate new LNG contracts with considering the domestic market demand against the existing contractors that are expired from 2010 to 2015. It is important that LNG supply and demand optimize under the conditions that government minimizes domestic supply of natural gas and maximizes export of it.

In upsteam of natural gas industry, rehabilitation of production equipment as well as crude oil are expected.

■ Issues on coal

High quality coal has been used as export, electric power generation fuel and industry use. Hereafter, it should be main theme that low quality coal is used effectively in future. In the upstream of coal industry, as environmental issue that powdered coal accumulates in the bottom of the Mahakam river is happened, it is valuable to transfer the technologies such as suitable coal mining technologies and establishing the regulations and to make efforts to protect the environment.

In down stream of coal industry, it is necessary to transfer Clean Coal Technologies (CCT) such as CFBC and desulfurization technologies for protecting the environment, and the technical transfer should be implemented with the limitation that the technical transfer should be applied to only power generation sector such as PLN and IPP rather than auto generation sector. And also some incentives and vital policies for constructing mine mouth power generation should be considered.

CWM(Coal Water Mixture) and coal liquefaction technologies are discussed for enhancing coal utilization. Regarding bio coal contained limestone, it is expected to improve combustion characteristics and direct desulfurization effects. However, as the cost of bio coal is higher than direct coal combustion, there is concerns about not to come into wide use. In future, by improving sea transportation regulation and enacting new regulations in Japan, if RPS is applied to bio coal, the spread of bio coal utilization is expected in Japan.

■ Comprehensive energy plan

National Energy policy (Blue print) is designed in New and Renewable Energy & Conservation in MEMR. As the policy is not discussed enough among other governmental organizations, it does not have the reality to be implemented. Otherwise, The oil and gas policy in Indonesia is been in change of Directorate General of Oil & Gas (MIGAS) in MEMR. As imbalance of oil and gas export and domestic demand is happened in recent Indonesia, MEMR-MIGAS requires comprehensive econometric energy balance model for making good energy balance between energy export and domestic demand including activities of industry, residential, transportation and power sectors. And it is required that MEMR makes total energy policy in Indonesia. For supporting it, it is required to transfer suitable technologies and capacity development for the staffs.

(2) Methodologies on issues and solution of renewable energy utilization

Indonesia possesses considerably large geothermal energy resources and the government aims to supply five percent of the national energy demand through geothermal energy. Japan has a high level of experience and technology in the field of geothermal energy utilization and technological assistance to enable formulation of the Master Plan.

Concerning other renewable energy sources, the mandatory purchase requirements for renewable energy in relation to CDM was increased in January so that PLN now has a responsibility to purchase medium-scale renewable energy, that is less than 10 MW. Therefore, the structural plan for the energy sector, including application of CDM scheme, is also required. The plan should include the promotion of the IPP business sector involving small-scale hydropower energy or biomass. In addition, nuclear power should be carefully discussed with the aim of forming a long-term strategy. All renewable energy is expected to be supplied in the form of electric power.

At the same time, the Indonesian government seems interested in developing the utilization of jetropa as a bio-fuel. Efforts should be made to support the promotion of the bio-fuel, for example, to make it compulsory for official vehicles to use the bio-fuel.

(3) Stable Power Supply and Energy Best Mix

It all comes down to the fact that the urgent issue in the power sector is securing natural gas for fuel. Government intervention regarding fuel negotiation between unregulated gas suppliers and regulated PLN in electricity tariff may be necessary, even though it involves a private contract. In addition, as defined in the literature related to the Yen loan agreement, the fuel procurement contract is the fundamental requirement for implementing the gas combined cycle generation projects in west Java, such as Muara Karang repowering, Muara Tawar expansion, Tanjung Priok repowering and so on. Unless the fuel procurement problem is resolved, construction of these projects will not be proceed. Meanwhile, SSWJ (Phase 1) financed by JBIC as a Yen loan project is considered only to supply gas for the public/industrial/residential sectors. However, it seems worthful for Indonesian gorverment to examine the open use of SSWJ (Phase 1), as it would allow PLN to procure natural gas a little bit

cheaper, considering the issues mentioned above.

As for existing power plants, there are several problems regarding output and heat efficiency due to inadequate maintenance and operation. Therefore, technology transfer is required in this area. The conclusion and recommendations of the ongoing “The study of improved operation and maintenance plan for power plants in Java Bali system” will be a good reference for solving these problems.

Regarding the new power plants, IPPs may tender for a coal power unit with the condition of ① no government guarantee, ② land acquisition by bidder, ③ burden of transmission line expenses. However, these conditions are very severe for IPP investors. Reconsideration of government guarantee application is one way to overcome the obstacle, and establishment of guidelines for PPP (Public-Private-Partnership) project should be studied as another option in order to develop related infrastructure. The situation regarding Yen loan projects were mentioned earlier.

As for the transmission system, reinforcement of facilities is urgently required. In addition, capacity development of transmission planning for PLN staff members is necessary to improve their capability in power flow and stability analysis. For the distribution system, technology transfer relevant to the distribution planning is necessary for the consolidation of three technical standards, considering the demand increase.

From a long-term viewpoint, there is an important step to be realized with regard to electricity and switching energy supply from oil and natural gas sources to coal and renewable resources. By supplying electricity in a stably manner and at a reasonable price, the increase of electricity share out of the total amount of energy consumed can be achieved. Through the above, a synergistic effect is expected for the effective use of renewable energy.

As for development of large scale reservoir type hydropower projects, solving residential and environmental problems through the dialogue with the relevant individuals is essential. As for use of nuclear power, firstly, national and international consensus on development of nuclear power plants is needed, followed by the step-by-step studies on related laws and technology transfer. These projects should be studied in terms of replacing the energy sources of oil and gas as a part of national energy policy.

The future picture of power sector should be outlined in RUKN prepared by MEMR, however, the previous RUKN was prepared by modifying RUPTL prepared by the PLN. Therefore capacity development in power development plan for MEMR is necessary in order to provide capability for establishing power sector policy independently based on the national energy policy. In addition, new frame work covering all energy related sectors would should be studied considering the be national energy flow in order to encourage investors. For example, providing an option of natural gas equivalent in alternative energy may be attractive to IPP investors in large-scale coal fired power plants, because these plants would contribute the reduction of natural gas for domestic use.

Finally, early enactment of new electricity law is desirable for encouraging investment in the electric power sector.

(4) Encouraging energy conservation

(Please also refer to 2.4.3 Issues Related to Promoting Energy Conservation)

The Indonesian government has maintained low prices of domestic energy with subsidies for a long time. As a result, there is lacking in energy conservation technology, expertise, and personnel. However, large demand for energy conservation measures are foreseen for plants and office buildings because of continuing oil price hikes in the future. For this reason, the Indonesian government needs a large degree of technical assistance from Japan, including the institutional arrangement of energy conservation agencies and promotion circumstances. To this end, it is necessary to establish a core center that will urge cross-sectional and cross-industrial cooperation in order to promote energy

conservation. Moreover, the government will need to implement an ESCO project and a CDM project to promote energy conservation.

Furthermore, the government is urged to adopt a policy for restructuring energy supply and demand structure in the consumer and transport sectors from a long-term viewpoint. Although clearly distinct from promoting the energy conservation technologies mentioned above, the optimization of transporting means (for example, introduction of monorails and subways) and energy conservation that requires the construction of infrastructure (for example, construction of gas-supply infrastructure and the introduction of natural gas co-generation systems in commercial buildings and plants in cities) are essential issues. These infrastructures will also require technical assistance for urbanization plans that presume the implementation of energy conservation measures.

(5) Issues in Energy Policy and others

Measures to promote investments and to review liberalization frameworks for the whole energy sector

In the current situation, where rulings of unconstitutionality were made on the New Electricity Law and to a part of the New Oil and Natural Gas Law, the legal system regulating the energy sector needs to be developed. Although a tentative energy sector law was enacted, there is a lot of uncertainty regarding the parts related to investor involvement. As a first step, an immediate solution for attracting private investment needs to be formulated. Although PLN has obligations on the INPUT side, such as buying gas at the market price, IPP, and buying renewable energy, there are restrictions on the OUTPUT side, such as revenue from tariffs. Therefore, the contradictions caused by the liberalization of the energy sector are consolidated in the financial structure of PLN.

Therefore, it is first necessary to review the liberalization framework of the whole energy sector. If the contradictions in the liberalization framework and design of the energy sector are not removed, the financial structure of PLN will not improve. From this point of view, it is worth considering the establishment of a financial simulation model which takes liberalization into account, so that the whole energy sector may run smoothly. It may allow for political consideration of the optimization of oil, gas, coal, renewable energy, and electricity prices. In addition, setting the benchmark for the management of PGN and measures to promote new entry in the gas transmission and distribution sector should be considered so as to prevent PGN from exercising dominant market power.

Investment promotion-related legal systems will become important, as well as the New Investment Law which is being discussed in the Diet at this moment. In particular, when private investment is utilized for exploration and development in oil and natural gas upstream activities, a broad range of discussions will be required, which include preferential treatment on contracts for the production sharing system, the pricing mechanism (cost recovery + return) in case domestic supply is imposed, and the role of government guarantee and preferential tax treatment.

3.3 Issues on Social Infrastructure and Measures for Solution

3.3.1 Direction of Analysis for the Issues on Social Infrastructure

(1) Summary of the current situation and issues

The current situation and issues on regional development and rural electrification systems were analyzed in 2.6.1 and 2.6.2. Each system is vulnerable and not functioning as expected. Furthermore, neither system is well coordinated though it is possible to coordinate them and produce synergy impacts. The limited generating capacity of the electrification projects tends to contribute to regional development on a limited scale. The current situation and issues are summarized in Figure 3.3.1.

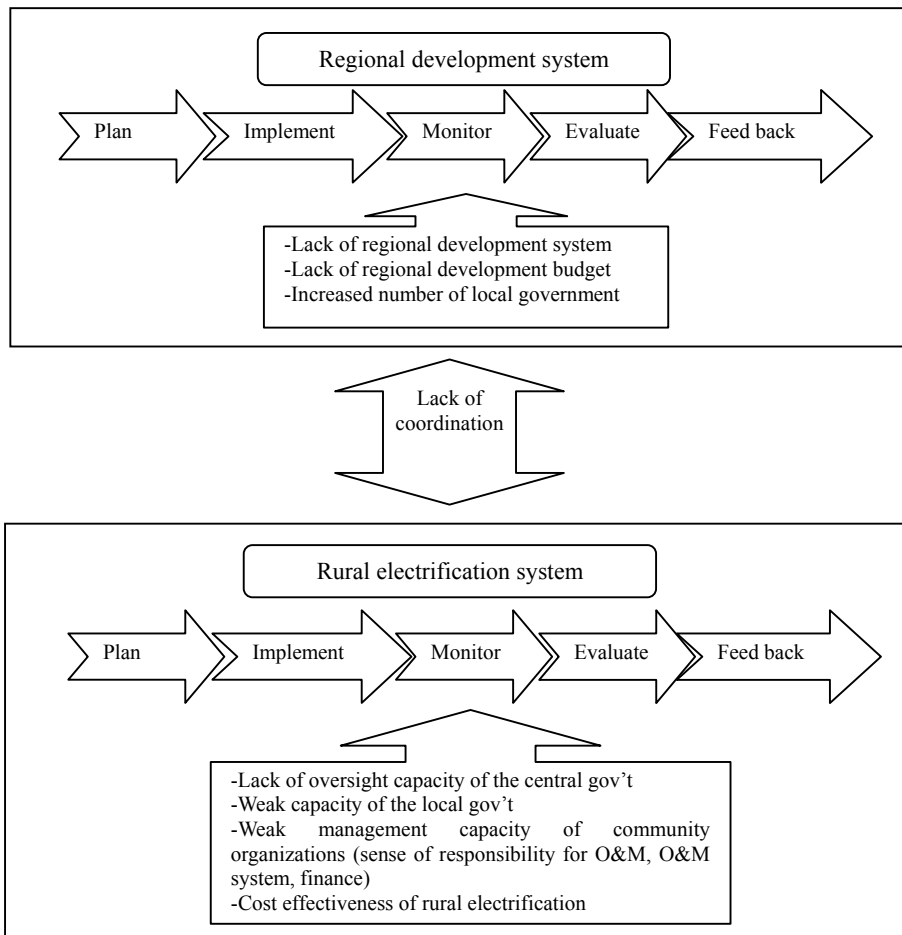


Figure 3.3.1 Current Situation and Issues on Regional Development and Rural Electrification in Indonesia

(2) Direction of analysis

In order to promote rural electrification and effectively contribute to regional development, both systems should be structured, function, and coordinate with each other.

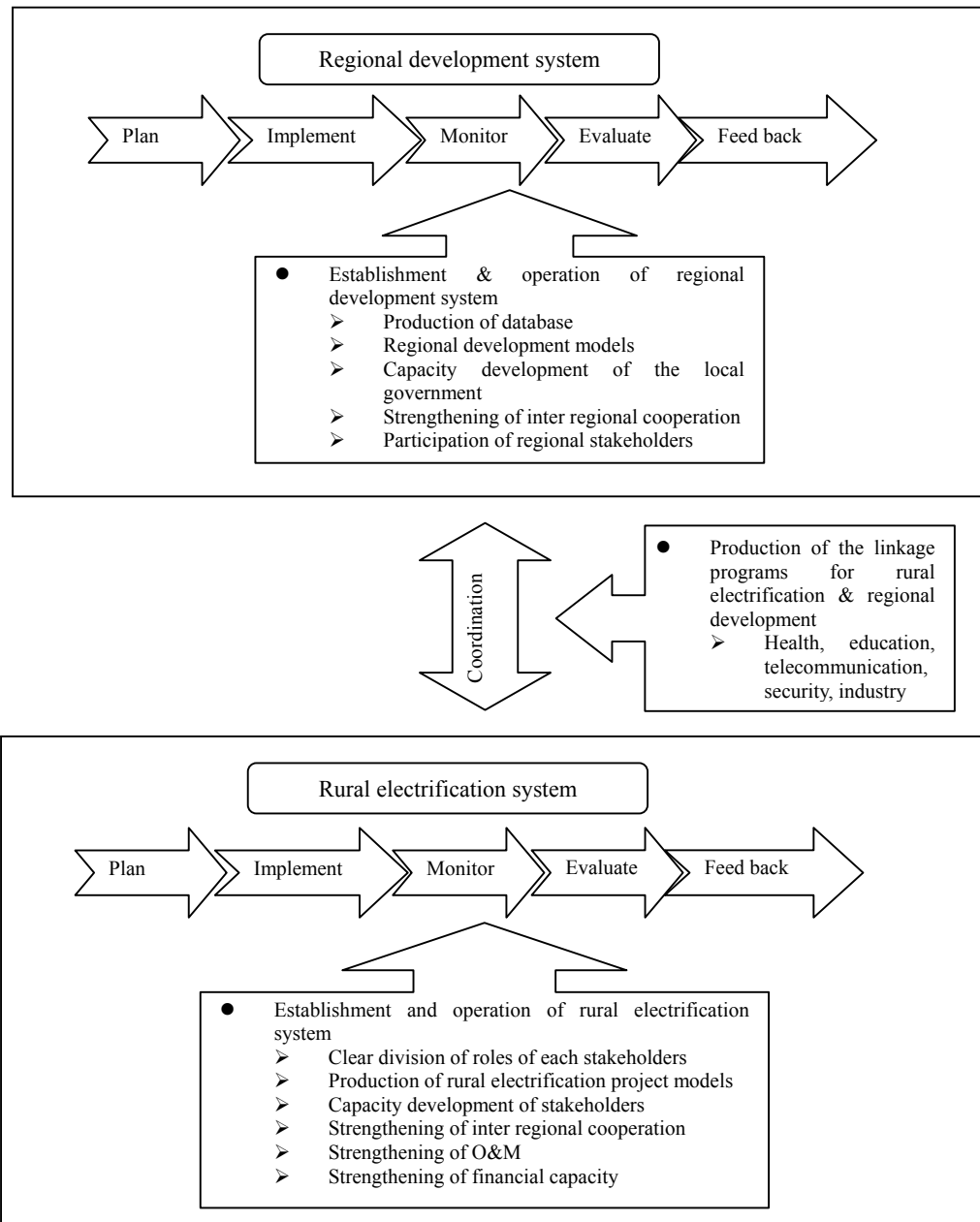


Figure 3.3.2 Direction of Solution for the Issues on Rural Electrification and Regional Development in Indonesia

3.3.2 Measures to Solve the Issues on Social Infrastructure

(1) Establishment and operation of the regional development system

The need for structuring the system, the difficulty in securing the budget and the vulnerability due to the increased number of the local governments are referred to as the issues related to regional development to be resolved in 2.6.1 (2). The initiative to establish the regional development system has just started. BAPPENAS, which is playing a major role for this purpose, is planning the measures and activities such as the establishment of the information system and database, the production of regional development models, the establishment of regional development forums, though the staff in charge admits the need for donors' assistance. As the first step, the comprehensive regional development system should be established to cover a series of processes of planning, implementation, monitoring, evaluation, and feedback. It should also be disseminated to each of the local governments

with the assistance of capacity building.

In fact, JICA has been supporting the projects regarding regional development, such as the projects on Sulawesi rural community development, human resource development for local governance, and regional development policies for local governments in the past.. However, as the assistance of JICA has so far not covered the whole process from planning to feedback, a possibility of the assistance to this area is worth considering.¹¹

(2) Establishment and operation of the rural electrification system

Oversight capacity and authority of the central government ministries, the human resource and financial capacity of the local governments, project management capacity of community organizations, and the cost effectiveness of the rural electrification projects were analyzed as the crucial issues in 2.6.2 (2). Though it depends on the revised content of the electricity law, it is essential to address the issues such as the clearer division of roles among the central and local governments and community organizations, the establishment of the whole process including planning, implementation, monitoring, and evaluation, capacity development of each stakeholder, and the securing of the budget.

The ministries of the central government should establish the efficient and consistent system to implement the rural electrification projects, structure and disseminate the sustainable operation and maintenance system, training for the local governments and community organizations, and the budgeting. The local governments should implement the projects in cooperation with PLN, the private sector, NGOs, and community organizations, supervise the implementation and operation of each project, and the budgeting. If economy of scale is taken into account, the cooperation between the local governments and more active role of the provincial governments may need to be strengthened.

Community organizations are assumed to be organizations that directly manage the rural electrification projects. However, there were several cases observed such as inappropriate tariff setting, lack of operation and maintenance, and the closedown of the system. The measures to address these issues are necessary, including the increased sense of ownership and responsibility for operation and maintenance, the capacity development of operation and maintenance, the preparation of the guideline to improve the financial condition, and awareness raising before the project implementation.

As the electrification cooperatives went bankrupt in the case of Indonesia and careful consideration should be given to the electrification through this system, the applicability of the good practice, which is observed in the electrification of Bangladesh and Chile, is worth analyzing. The case of Bangladesh has several practices that can be replicated such as the enhanced training system, good communication with customers, the performance-based incentive mechanism, the securing of transparency, and the establishment of technical levels. The case of Chile proves the effectiveness of the incentive mechanism to the local governments.

(3) Production and application of the packages linking rural electrification and regional development

If the regional development system and the rural electrification systems work properly, the regional development through electrification is likely to occur. The development of the packages for the effective linkage is beneficial to those regions that have constraints in infrastructure and funding. In West Nusa Tenggara province, a wireless telephone system combined with a solar home system is a case in point. The system requires a small battery, which lowers the maintenance cost and profitable as a business model. By assisting the initial investment, those areas where no fixed line exist and mobile phones are not available can continue to provide telecommunication services without additional assistance. The introduction of the low cost and sustainable package is unlikely to face difficulties in operation and maintenance, which often occurs in the regional electrification project. It is also easy to earn revenue, realize positive impacts, and guarantee the operation and

¹¹ For example, The final evaluation report of the Project on Regional Development Policies for Local Governments concludes in :”Efficiency” that the Project had a difficulty in covering a long cycle of survey (baseline survey, understanding of the status quo, issue analysis), planning, implementation, monitoring, and evaluation, even in individual program and project.

maintenance.

Furthermore, this type of package can be integrated into the government- or donor-funded program targeting the regional infrastructure development as one of the components. In this sense, the Kecamatan Development Program of the World Bank can be referred to as the good practice in terms of the competition in the process of project selection, the counterpart funding of the local government, and the funding for various types of infrastructure.

3.4 Strategy for Ideal Structure

To devise a strategy for achieving the ideal energy sector structure we must examine the means of resolving the issues reviewed in sections 3.2 and 3.3, taking into consideration the role of both related agencies in Indonesia and in Japan. Accordingly, expanded operation of existing supporting tools or a new framework for more effective utilization of supporting tools is introduced.

■ Proposal for Cooperation Program

In the execution of issue analysis and preparation for the cooperation program, available tools based on the expanded operation of existing assistance from JICA or new developing schemes are proposed as follows:

• **Tool 1 : Effective Utilization of Small-Scale Follow-Up Study**

After completing large-scale development study like master plan study, continual follow-up studies should be conducted to maintain the established recommendations from the large-scale study.

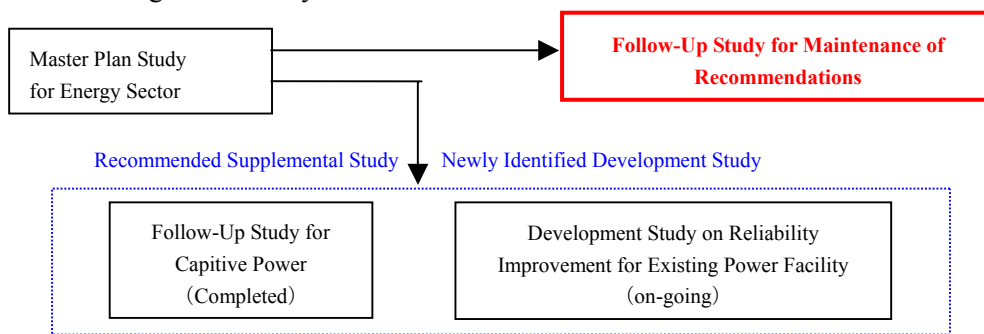


Figure 3. 4. 1 Effective Utilization of Small-Scale Follow-Up Study

• **Tool 2 : Project Preliminary Study ahead of Master Plan Study**

If a Master Plan is sure to have close relationship with other sectors, a small-scale study like a Preliminary Study should be conducted in advance to confirm relating sector issues and upgrading of efficiency.

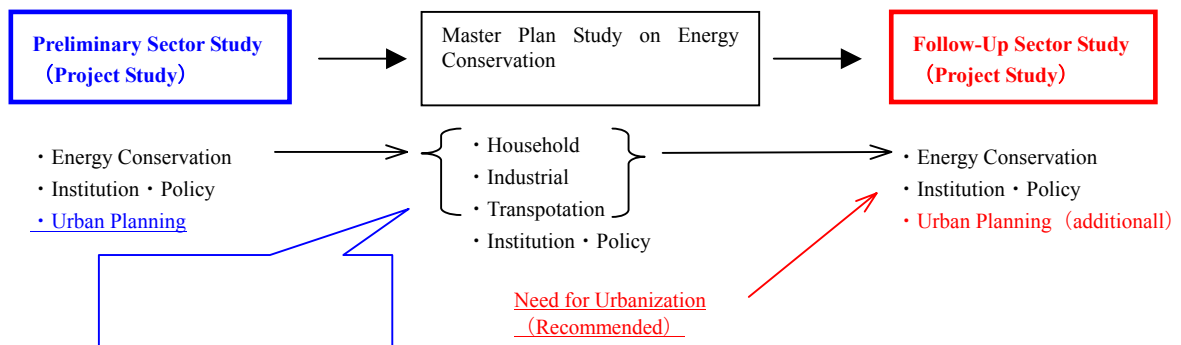


Figure 3. 4. 2 Project Preliminary Study for Master Plan Study

• **Tool 3 : Collaboration Program with JBIC**

Since the Government of Indonesia is inclined to request a large scale project for JBIC loan due to request-based assistance in Japan’s ODA policy, excessive small and medium-scale grant project requests are excluded. The Government of Indonesia reasons that small and medium-scale projects are financed domestically. However, such projects usually seem to be postponed or neglected. Therefore, the outline of a framework for Japanese projects through JICA’s initiative should be arranged in the JBIC Loan negotiation in order to implement the recommendations of Development Study of JICA.

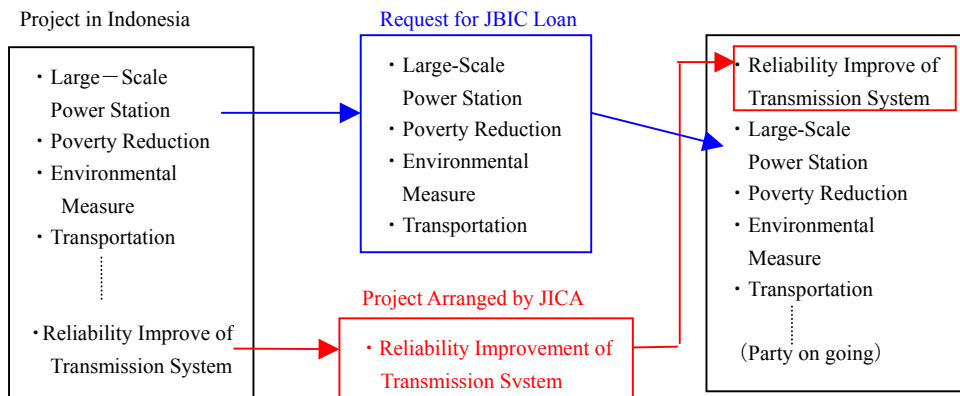


Figure 3. 4. 3 Collaboration Program with JBIC

• **Tool 4 : Project Review by Follow Up Study (Master Plan for Renewable Energy Utilization)**

The development studies which feature changes in evaluation due to the alteration of the policy and international relations in the field of renewable energy, CDM and so on, should be combined as a group of studies which consist of large-scale studies such as master plans and periodical small-scale studies such as follow-up in order to adapt the changes of environment and importance of the project.

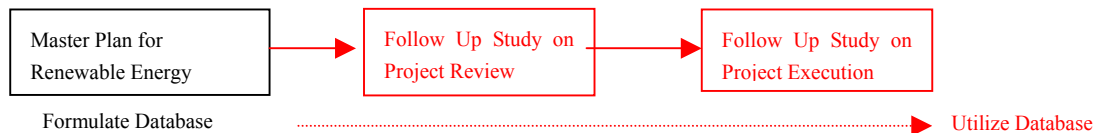


Figure 3. 4. 4 Project Review by Follow Up Study

Chapter 4 Cooperation Program

4.1 Cooperation Program Proposal for Economic Infrastructure

4.1.1 Road Map for Economic Infrastructure

As described in 3.2.1, a short-term approach for energy issues involves the utilization of gas as an alternative for oil and medium-long term approaches are to minimize gas supply for domestic use and maximize export of gas as a measure to increase earnings of foreign currency. Utilization of coal and renewable energy as natural gas alternatives and improving the rate of electrification are also important measures. Figure 4.1.1 shows the road map of the energy sector in the field of economic infrastructure.

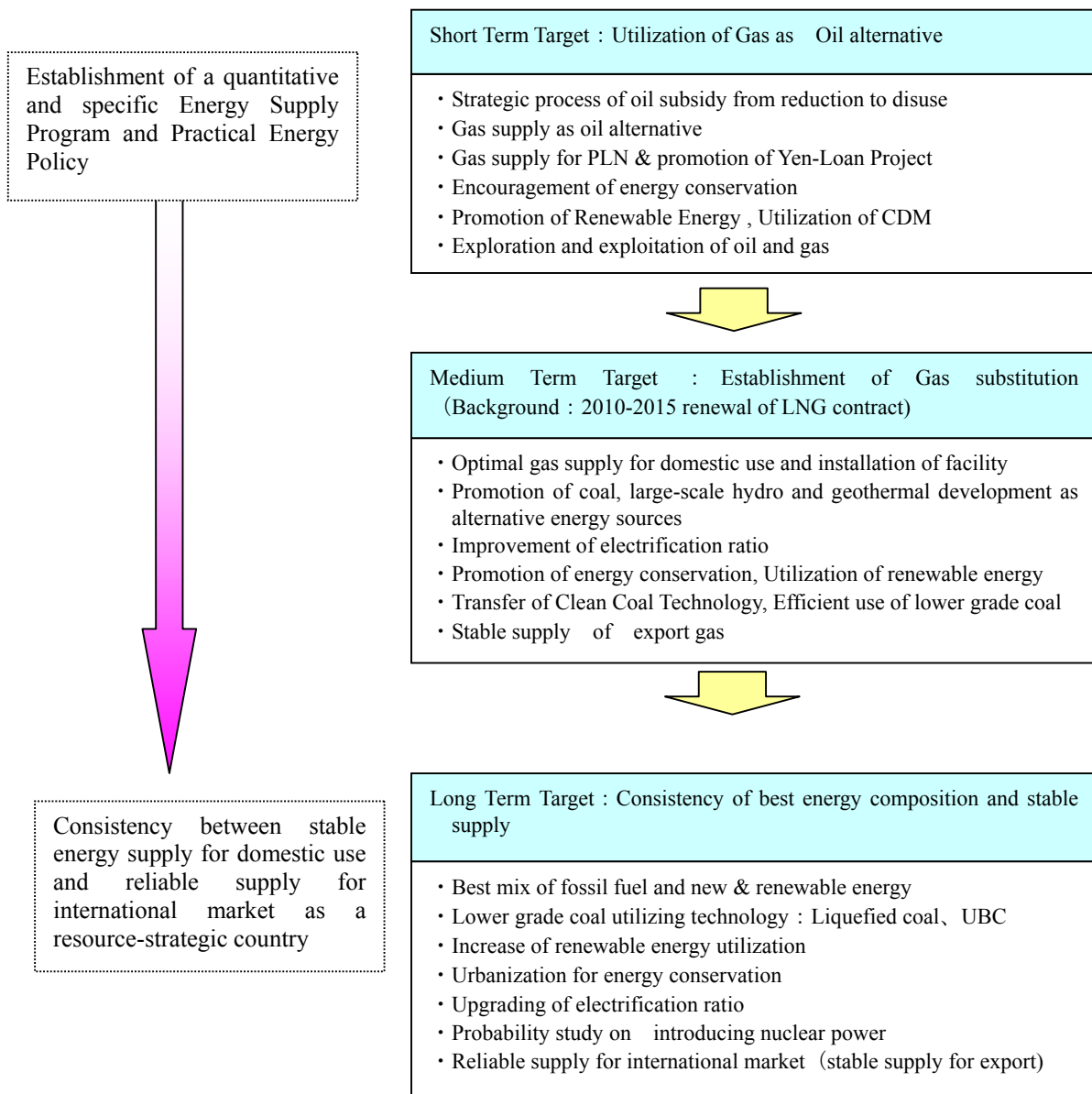
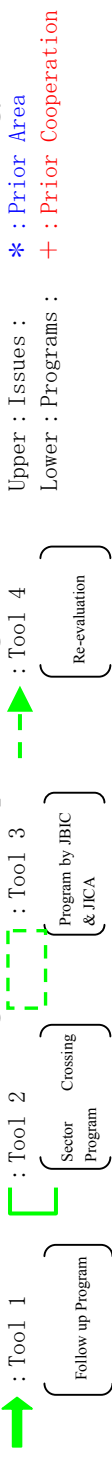


Figure 4. 1. 1 Road Map for Stable Energy Supply

Term	Short Term (2006-2010)	Middle Term (2010-2015)	Long Term (2015-)
Target	Urgent Stabilization of Energy Supply and Demand Utilization of Gas/Diminution of Oil Consumption	Diminution of Gas Consumption Acquisition of Foreign Currency by LNG Export	Best Mix of Energy Composition Stable Energy Supply Inside and Outside
Primary Energy	Stabilization of Domestic Energy Supply <ul style="list-style-type: none"> Development Manufacturing Capacity for Petroleum Revision of Subsidy System Utilization of Gas, Infrastructure Development Assistance for the Formulation of Basic Plan Master Plan on the Primary Energy + (Incl. Database, Expert Dispatch)	Supply by Alternative Energy <ul style="list-style-type: none"> Optimization of Gas Utilization* Low-grad Coal and Clean Energy* Assistance for Hydropower Development Master Plan for LNG Supply + Master Plan for Coal Utilization + (Incl. Expert Dispatch for Coal Technology)	Long-Term Best Mix of Energy Composition <ul style="list-style-type: none"> Formulation of Policy as Supplier Formulation of Plan for Best Mix* Evaluation for introduction of Nuclear* Assistance for Comprehensive Plan + Technical Transfer on Clean Coal+
Renewable Energy	Introduction of Renewable Energy <ul style="list-style-type: none"> Analysis of Long Term Development Potential* Formulation of the Promotion Plan* Assistance for Geothermal Development + Assistance for Analysis of Biomass promotion + 	Promotion of Renewable Energy <ul style="list-style-type: none"> Assistance for Development* Enhancement of Promotion Plan* Strategy for Development Rural Development by Renewable Energy 	Promotion of Renewable Energy <ul style="list-style-type: none"> Best Mix of Renewable Energy* Optimization of Renewable Energy Comprehensive Strategy for Utilization
Electricity Supply	Action towards Short Term Energy Crisis <ul style="list-style-type: none"> Fuel Reservation (Natural Gas Securement) Commencement of Power Plants by Yen Loan Reinforcement of Transmission System Assistance for the Formulation of MP + Capacity Development for Generation + 	Middle Term Development <ul style="list-style-type: none"> Assistance for Coal PP Development* Assistance for Geothermal Development* Assistance for Hydropower Development Follow up for Master plan on Transmission+ Effective Utilization of PPP 	Long Term Best Mix <ul style="list-style-type: none"> Promotion of Renewable Energy Introduction of Nuclear Power Improvement of Ratio of Electric Power Master Plan on Optimization Master Plan on Improvement of Ratio +
Energy Demand	Reinforcement of Promotion of Energy Conservation <ul style="list-style-type: none"> Formulation of Strategy for Energy Conservation + Technical Transfer on Energy Conservation Formulation of Master Plan + Capacity Development for CDM + Technical Transfer on Energy conservation + 	Promotion of Energy Conservation <ul style="list-style-type: none"> Technical Transfer Follow up for Master plan + Development of Promotion Structure + (Incl. Technical Transfer) 	Development of Energy-Saving City <ul style="list-style-type: none"> Technical Transfer for Urban Planning (Improvement of Transport an Pipeline) Master Plan on Urban Planning (Based on Yen Loan)
Policy and Institution	Development of Energy Related Laws <ul style="list-style-type: none"> Energy Related Laws Laws on Promotion of Private Investment Improvement of Policy Making Capability* Promotion of Private Investment (PPP etc) + Development of Bio-fuel+ 	Development of Promotion Structure for Private Investment <ul style="list-style-type: none"> Monitoring of Primary Energy Policy Development of Promotion Structure* Assistance on Hydro and Coal PP Construction (PPP, Export Credit) 	Presence of Indonesian Government <ul style="list-style-type: none"> Confirmation of Responsibility as Supplier Evaluation for Introduction of Renewable Energy Development of Laws for Renewable (e.g. Technical Standard on Nuclear)

Figure 4.1.2 Cooperation Program on Economic Infrastructure in Energy Sector



4.1.2 Concrete Cooperation Program

In the section, cooperation programs are shown and made each relation among them, finally the concrete cooperation programs are described.

(1) Primary energy

The cooperation program is shown in Figure 4.1.1. For making cooperation programs in primary energy, at first, necessary capacity development will be implemented for making energy polices by MEMR, after that, it is supported to make natural supply master plan and coal utilization master plan in line with the said energy policy. And if necessary, some follow up study should be implemented.

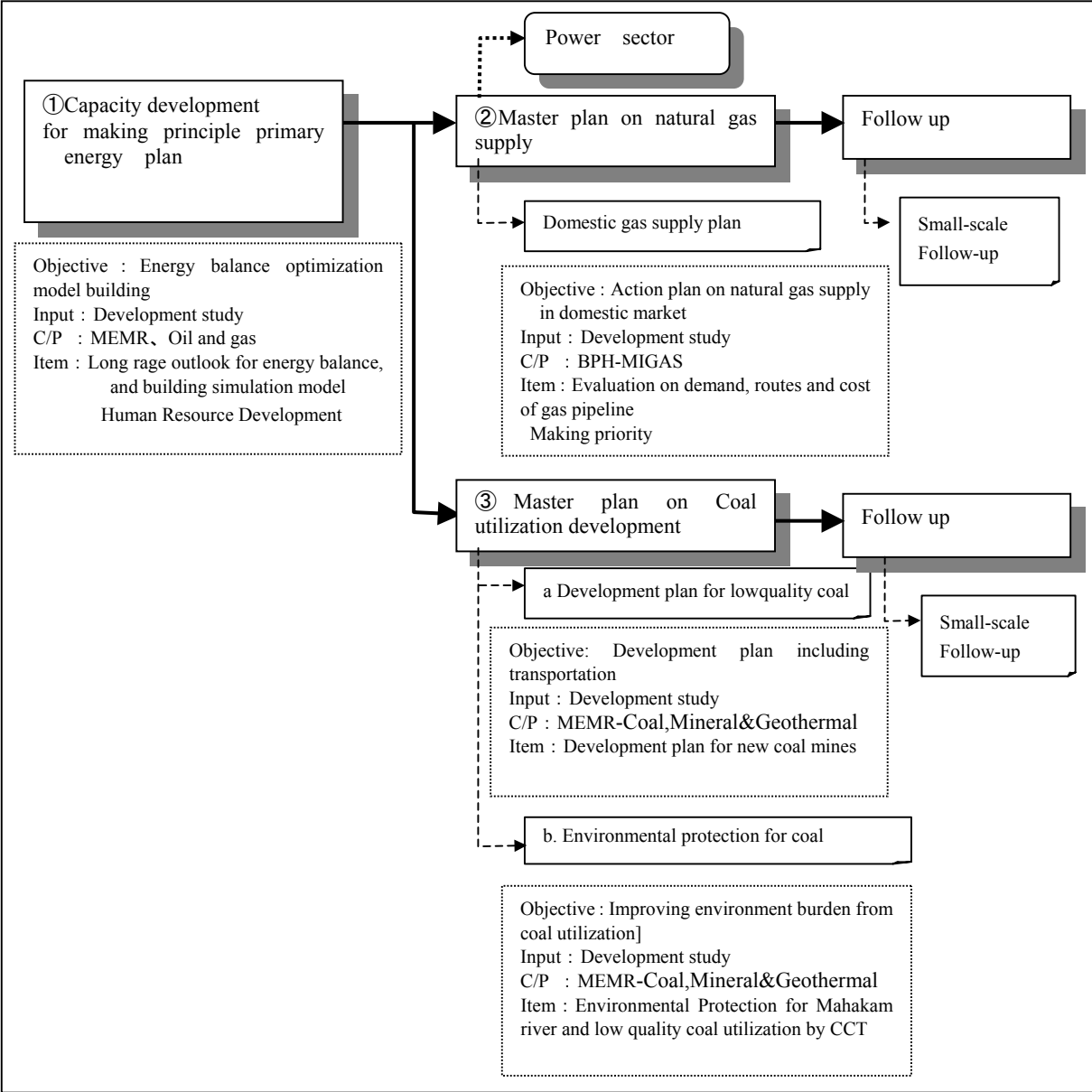


Figure 4.1.3 Cooperation Program in Primary Energy

① Capacity development for making principle primary energy plan

In Indonesia, there are concerns about increasing of importation of crude oil and petroleum products. For deceasing the importation, it is important to promote the development of oil substituting-energies

and energy conservation in the final consumption sectors. Meanwhile, as the petroleum products are derivatives, it is profitable when the production of petroleum products meet the domestic demand, then the government is required to make such kind of energy plan. And the government should consider export after making energy balance in domestic market. The principle energy plan that realize supply of oil substitution energies is required. For the purposes, the support for making simulation model and training the staffs of MEMR-MIGAS as counterparts are required.

② Master plan on natural gas supply

Regarding the effective utilization of natural gas, a gas shortage has occurred around Jakarta due to a shortage of domestic-use gas pipelines. Therefore PGN is implementing five transmission pipeline plans projects and seven distribution pipeline plans projects. There is an urgent requirement that the transmission and distribution pipeline plans should be completed urgently. And it is required to optimize natural gas supply. For the purposes, master plan study on gas pipelines should be implemented with BPH-MIGAS. At the same time, the substitution plan for gas supply should be discussed before completing gas pipelines.

③ Master plan on coal development and utilization

The master plan projects concerning coal are as follows;

a. Development plan for low quality coal

Hereafter, low coal quality coal should be used positively as well as high quality coal in Indonesia. Indonesia government started already to discuss it with Ministry of Economic Trade and Industry in Japan. In future, the master plan that makes clearly the issues and the solving procedure is required. Especially it is required to concrete development plan including transportation system in Sumatra due that foreign investors have plans to develop the coal mines. For examples, new coal mine development in Bunian and Kunkilan, coal high utilization plan such as UBC(Upgraded Brown Coal), hyper coal and bio briquette can be pointed out.

b. Environmental measures for coal and low quality coal utilization

Environmental issue that powdered coal accumulates in the bottom of Mahakam river is happened. JICA already started the study for protecting and improving the environment. For improving the environment, it is necessary to improve the factories around the rive. Today, it is said that clean coal technologies such as CFBC are useful for the improvement. When considering the wide range of CCT, it is useful in environment and cost aspects. For surveying usefulness of CCT, the following items should be examined.

(2) Renewable energy

The cooperation program is shown in Figure 4.1.4.

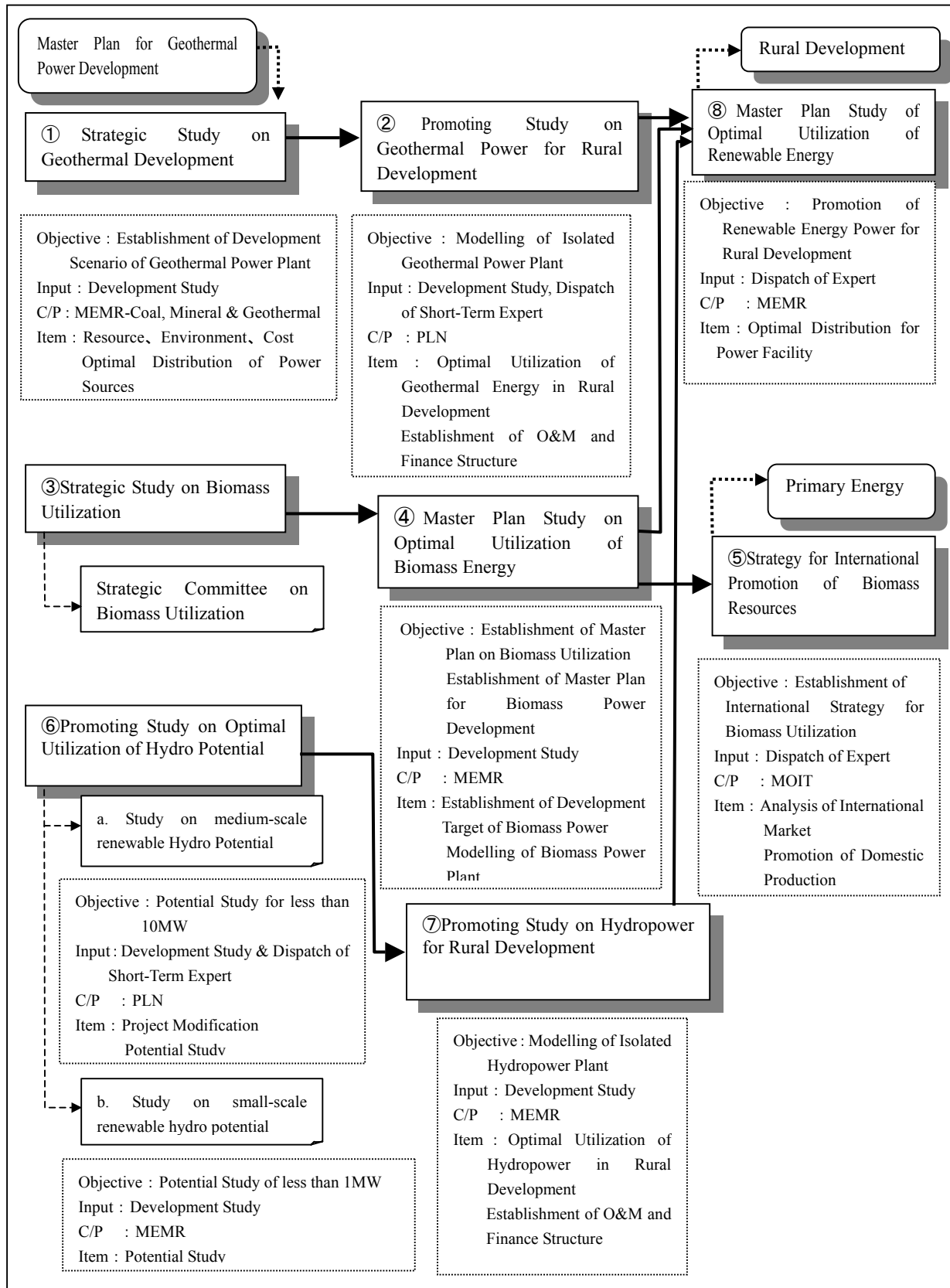


Figure 4.1.4 Cooperation Program in Renewable Energy

After executing the Master Plan Study for Geothermal Power Development, in the field of renewable energy, a Strategic Study on Geothermal Development should be undertaken. Renewable energy development should focus mainly on collaboration with local development to make a clear distinction between economic infrastructure and social infrastructure. Regarding biomass, an international strategic plan is needed and should give due consideration to the current global energy demand.

① Strategic Study on Geothermal Development (Development Study)

The Master Plan study on Geothermal Power Development being planned by JICA should encompass the estimation of resources contained in geothermal project candidates and database installation. Based on this Study, a strategic development plan of geothermal utilization could commence successively. Considering the latest policy for renewable energy development, for example, incentives for medium-scale (less than 10 MW) renewable power purchase, an evaluation of geothermal development, taking into consideration potential, environment, cost efficiency and energy security should be prepared. Moreover, optimal distribution between grid connection and the isolated system should be estimated by examining the share between private investment and the PLN, and establishment of temporary or permanent regulations and incentives.

② Promoting Study on Geothermal Power for Rural Development

The Study establishes a development model for isolated geothermal power plants including technical transfer of maintenance and financial system for rural development. The Study counterparts are considered to be local governments and the PLN.

③ Strategic Study on Biomass Utilization

In the utilizing biomass resources, a cooperative relationship is important with regard to the procurement of crops and utilization of generated energy. A Strategy Study on Biomass Utilization is introduced based on this approach.

A practical plan is devised through comprehensive discussion including security of food, industrial development and trade, and participation of the agricultural, forestry, industrial and energy sector. The structure of the strategic committee on biomass utilization is shown in Figure 4.1.5.

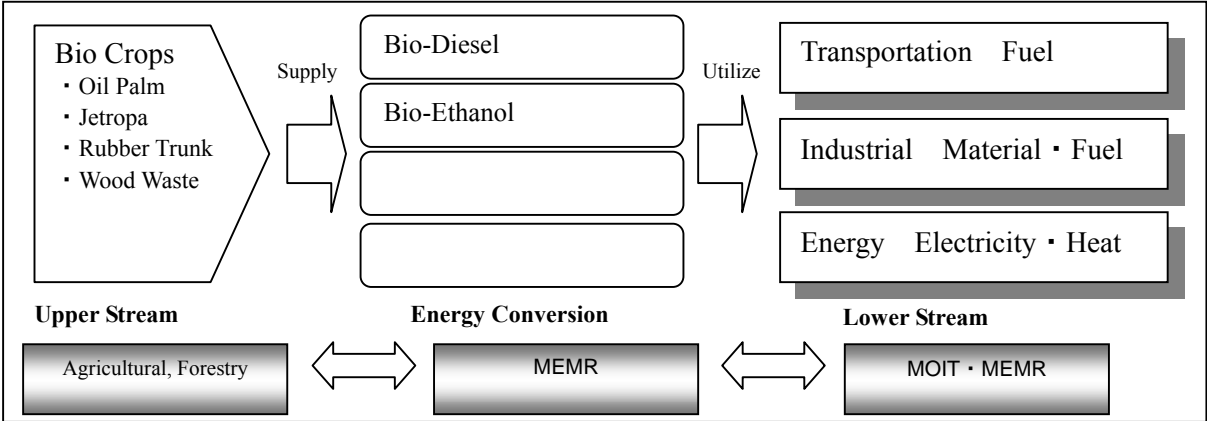


Figure 4.1.5 The Structure of the Strategic Committee on Biomass Utilization

The participation of the private sector is important for the introduction of biomass energy for business use and a comprehensive approach, involving various business resources, is required. The related business sectors include agricultural traders who provide material crops, energy producers who convert the material crops into fuels or electricity, and industrial energy consumers.

A comprehensive approach, including every related sector, should be adopted in forming the

strategy for the introduction of biomass energy for business use. Consensus should be reached among the different sectors in proposing the strategy. The energy converting sectors are expected to play a leading role.

④ Master Plan Study on Optimal Utilization of Biomass Energy

Advancing the development target of bio-fuel, the Master Plan Study on Optimal Utilization of Biomass Energy is focused on the development target of the entire energy converting sector including biomass generation. In order to achieve the target, identification of the project location and development schedule is essential. Therefore, local government participates in the steering committee. The committee is composed of a general meeting group and a sub-task force which deals with individual regional matters and crops in order to clarify roles and responsibilities. One counterpart is MEMR, which is the administrative member of the general meeting group.

⑤ Strategy for International Promotion of Biomass Resources

A strategy for the international promotion of biomass energy could be required following its promotion within Indonesia. The international market for bio-fuel has been developing, therefore, after establishing domestic utilization, the export of bio-fuel could be the next issue to be addressed.

⑥ Promoting Study on Optimal Utilization of Hydro Potential

Being the most mature technology in renewable energy, hydropower is an attractive solution for promoting renewable energy. The Study aims to avoid delaying the utilization of Indonesia large potential in this area.

a. Study on medium-scale (1-10MW) renewable hydropower potential

Following the increase of investment in medium-scale renewable energy, suspended hydropower development projects should be revised and new sites should be appointed. Basic data about the hydropower projects should be disclosed.

b. Study on small-scale (less than 1MW) renewable hydropower potential (concerning rural electrification)

Small scale renewable energy has been removed from the focus of investment in CDM methods, therefore, incentives to develop it are in decline. However, small-scale renewable energy could be effectively developed in some areas according to regional characteristics. The promotion of small-scale renewable energy should be considered as one of the possible alternatives.

⑦ Promoting Study on Hydropower for Rural Development

The Study establishes a development model for isolated hydropower plants including technical transfer of maintenance and financial system for rural development. The Study counterparts are considered to be local governments and the PLN

⑧ Master Plan Study of Optimal utilization of Renewable Energy (Local Energy Best Mix)

Regarding the effective utilization of renewable energy, the role assignment for private-sector participants and the government for each task must lead to the design of effective methods. At the same time, the periodical renewal of the energy development plan and the public information disclosure are essential for involving all participants in a comprehensive development of the energy sector. There is an urgent requirement that the replace of diesel generator and rural electrification by renewable energy should be improved. For the purposes, master plan study on optimal utilization of renewable energy should be implemented in rural area. Proposed projects are showing as follows:

a. Promotion of investment in renewable energy

Coordination with renewable energy based power producers and the PLN, the single buyer for the energy, is crucial with regard to the Ministerial Decree on duty of power purchase. The introduction of standard PPA, which is carried out in Sri Lanka, could be effective to promote the investment in renewable energy.

b. Study on Optimal Distribution for Rural Development

Through a collaborative approach, optimal study for rural energy supply in relation to rural development plan is supported in order to encourage renewable energy development.

c. Analysis of assistance for application of CDM scheme to renewable energy

CDM scheme has been widely introduced to the renewable energy sector, however, ODA funds cannot be diverted to renewable energy projects and JICA's approach tends to be a limited one. Under these circumstances, indirect assistance towards the Indonesian government is more preferable than direct commitment to the projects. Assistance towards capacity development for CDM project countries is also required as follows.

- ① Grid connecting projects (PPP project to extend grid line)
- ② Rural electrification projects (demand evocation)
- ③ CDM capacity development (data base improvement, human resource development)

(3) Power sector

Figure 4.1.6 shows cooperation program relevant to the power sector.

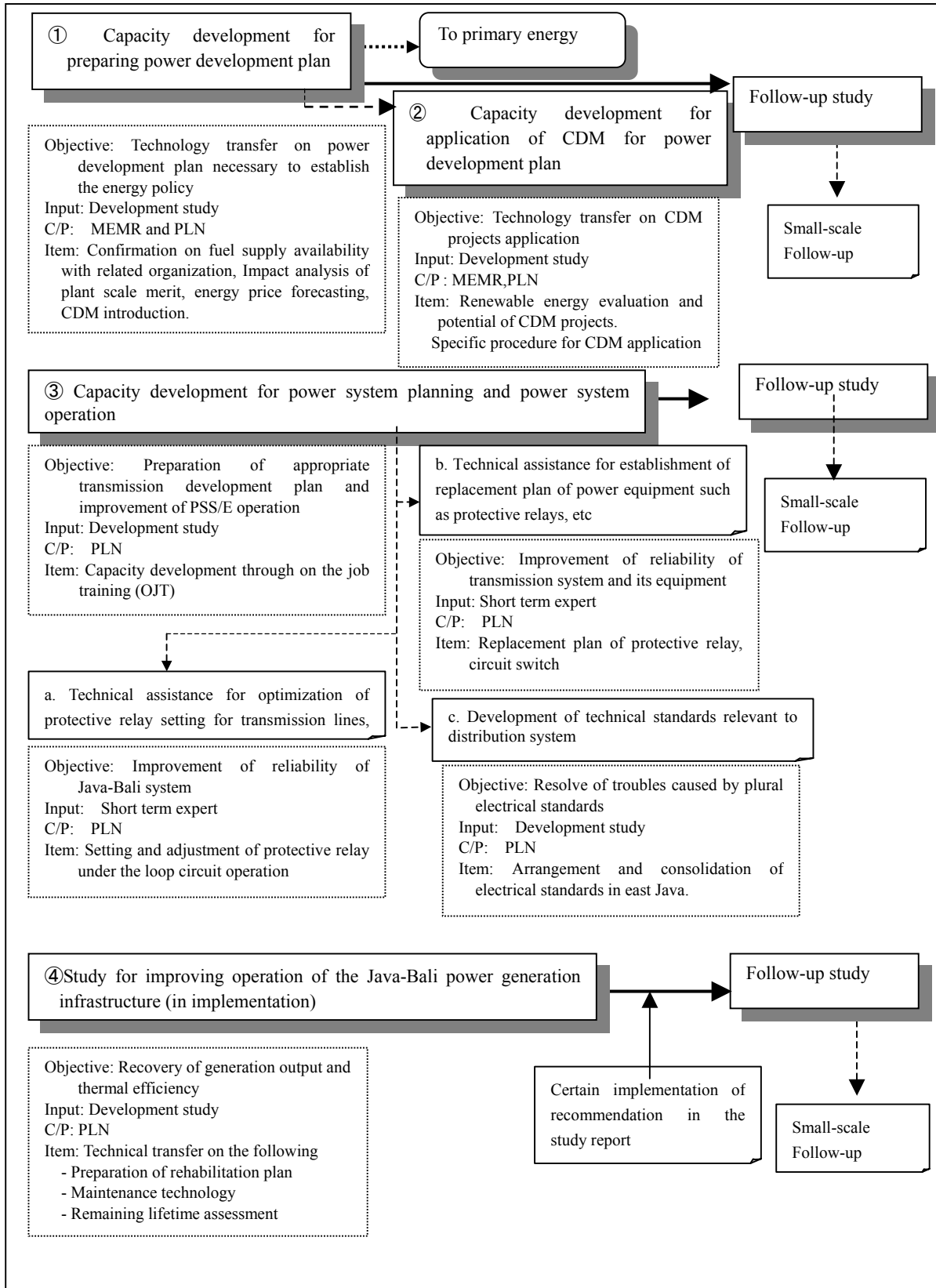


Figure 4.1.6 Cooperation Program in Power Sector

Regarding technical assistance in the field of electric power, first of all, capacity development for preparing the power development plan will be implemented as a priority so that the power source planning may be formulated as a part of the policy making for primary energy. Technical assistance in this area, although it has been conducted repeatedly in Indonesia, will be continuously followed up until it is proven to be effective. In terms of the capacity development above, technical transfer of CDM's basic philosophy will be conducted, with the transfer of procedures and the implementation methods as its sub-programs. The on-going project, 'The Study on the Improvement Measures for Electric Power Generation Facilities in Java-Bali Region in the Republic of Indonesia' will be followed up steadily, the details of which are to be determined based on the results of the study.

① Capacity development for preparing power development plan (development study)

The technology transfer for preparing power development plan can be implemented as a part of JICA's development study related to this technology. For example, adequate level of capacity developments for MEMR and the PLN consistent with their roles can be carried out as a part of power development plan in Sulawesi area, it is planned to be implemented as a new development study. Items of technology transfer to the central government, and also to the rural government, should be clarified considering their roles. The following shows the outlines:

- For MEMR, technical transfer regarding the power development plan planning method reflecting the national energy policy should be conducted. The aim of this assistance is for MEMR, as the policy maker, to acquire the technical skills for preparing the power development plan as a tool for establishing the energy policy. For example, asking for PLN amendment of the power development plan by simulating the amount of energy necessary for the power sector and adjusting issues regarding fuel procurement with related divisions.
- For PLN, as it is capable of conducting basic simulations, technical transfer for an examination method regarding economies of scale as previously stated and forecasting energy-price in the future and so on should be conducted. By conducting technical transfer with MEMR simultaneously, they will confirm the conflict of interests between the policy maker for the power sector and power utilities and this will contribute to formulating a specific and effective energy policy.

In the small follow-up survey (refer to 3.4 tool 1), technical assistance for updating (including development policy) a previous study¹² regarding power development plan and information disclosure for private enterprises should be conducted. An indication of technical transfer achievement and grasp of remaining issues should be conducted for future assistance in this area.

② CDM capacity development for organizations involved in the power development plan (Development study)

Capacity development for the power development plan includes how renewable energies are examined and reflected in the power development plan. In order to utilize CDM as a tool for this, as a sub-program of the capacity development for the power development plan, CDM capacity development will also be conducted, dealing mainly with its procedure.

③ Capacity development for power system planning and power system operation (Development study, short-term expert)

PLN decided to use PSS/E from 2004 though PLN had used various power system programs in the past. However, inadequate utilization of PSS/E was observed in PLN. As power utility, technical transfer relevant to both power system planning and power system operation should be conducted. And in the small follow-up survey (refer to 3.4 tool 1), an indication of the technical transfer achievement and grasp of remaining problems should be conducted for future assistance in this area.

¹² In Indonesia, 「The study on the optimal electric power development and operation in Indonesia」 (2002), 「The study on the optimal electric power development in Sumatra」 (2005)

With respect to the following matters confirmed in this field survey, further investigation regarding the current situation should be verified in this capacity development and development study or short-term expert will be introduced as needed.

a. Technical assistance for optimization of protective relay setting for transmission lines, etc (short-term expert)

For the prevention of a large-scale blackout, appropriate setting of protective relays for transmission lines, those can remove power system faults promptly and accurately is important. With a view to improving power supply reliability in the Java-Bali system, technical transfer to PLN engineers with respect to the optimization of protective relay setting for transmission lines, etc should be conducted.

A more advanced relay setting technique is needed for the loop operation after the completion of 500kV south route, therefore, relevant technical assistance for competence in this areas should be conducted.

b. Technical assistance to establish a replacement plan for power equipment such as protective relays, etc (short-term expert)

In Indonesia, protective relays for transmission lines, etc that triggered blackouts in past years have not been replaced. Therefore, technical assistance to PLN engineers to establish a replacement plan for power equipment such as protective relays, etc should be conducted. In the replacement plan, identifying deterioration of power equipment and the importance of supply area should be considered.

c. Establishment of technical standards relevant to distribution facilities (short-term expert)

There are three technical standards in the distribution system of Java, namely Japanese standards, American standards and European standards, due to the inconsistency of historical technical assistance. Since it is ineffective to have various standards being applied in one island, standardization of technical standards of the power distribution system and should be conducted in parallel with training of personnel.

④ Study for improving operation of the Java-Bali power generation infrastructure (Development study, in implementation)

The on-going project, 'The Study on the Improvement Measures for Electric Power Generation Facilities in Java-Bali Region in the Republic of Indonesia' will be followed up steadily, with details to be determined based on the results of the study.

(4) Energy conservation

The cooperation program for energy conservation is shown in Figure 4.1.7.

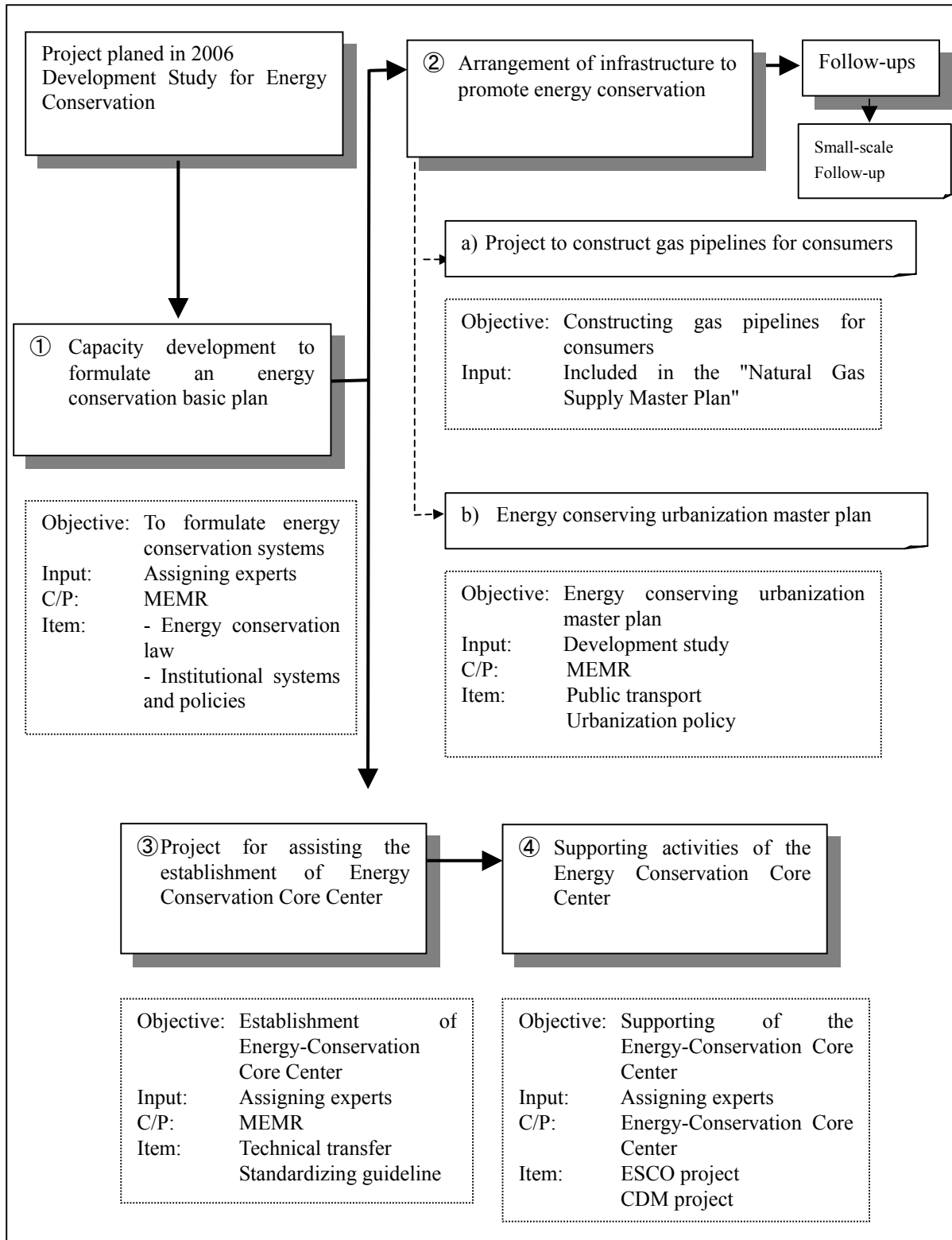


Figure 4.1.7 Cooperation Program for Energy Conservation

In the energy conservation field, it is urged to build the capacity needed for MEMR to formulate energy conservation policy in the future. Based on the energy conservation basic plan to be formulated by MEMR, an energy conservation core center must be founded to execute specific energy conservation measures. Furthermore, establishment of an ESCO market is needed, such as establishment of the ESCO association. The cooperation project needs to be covered these follow-ups. From medium- and long-term viewpoints, the cooperation project also needs to be covered investment promotion for energy conservation and cooperation to formulate a vision for energy-conserving urbanization.

① Capacity development to formulate an energy conservation basic plan

Based on the existing energy conservation policy (Green energy), MEMR (Directorate of New Renewable Energy and Energy Conservation) will need help in formulating energy conservation basic policy. JICA plans a project on develop study for energy conservation, in which technical cooperation on the formulation of an energy conservation basic plan can be conducted. After the project is completed, technical cooperation will be proposed to enact an energy conservation law.

Energy conservation should be separated from the present energy law (proposed) and be enacted as an independent energy conservation law, which covers large consumers' obligation to manage energy and the compulsory introduction of an energy manager system.

As the same time, investment environments must be improved to subsidy the cost for energy conservation facility introduction, to exempt import duties, and to adopt a preferential measure for interest relating to investment.

② Arrangement of infrastructure to promote energy conservation (medium- and long-term)

Energy conservation accompanied by the construction of infrastructure (example: construction of gas infrastructure and the introduction of a natural gas-cogeneration system into commercial buildings in cities) will require a drastic measure. Thus, technical cooperation is proposed on the assumption of an energy-conserving urbanization plan. Technical cooperation will be provided for formulating energy policy from medium- and long-term viewpoints, such as formulating a master plan for energy-conserving urbanization, and assisting the formulation of energy visions. Specific input projects are as follows:

a. Project to construct gas pipelines for private sectors (plants)

Shifting fuel to gas from oil is essential to promote energy conservation at plants. The construction of gas pipelines in cities will be an effective means to transform into a post-oil era. As proposed in the "Natural Gas Supply Master Plan" program for cooperation in the primary energy field, the construction of gas pipelines for the private sectors needs discussions.

b. Energy conserving urbanization master plan

A master plan should be formulated to promote energy conservation in cities. To shift energy supply and demand structure in the consumer and transport sectors and to promote energy-conserving urbanization, Jakarta is set to a model city in which MEMR will formulate energy conserving urbanization policy with technical assistance.

③ Project for assisting the establishment of Energy-Conservation Core Center

To promote energy conservation, a cross-sectional cooperation and promotion system is essential. To this end, it is needed to establish energy conservation core centers under the umbrella of MEMR, MOIT, PLN, and other agencies, and organize a research and development section, a data control section, and an education section to support their efforts.

- **Research and Development Section**

This section will be a comprehensive research and development to promote activities for the foundation of human resource development for energy conservation. More specifically, the section will promote exchanges of information among domestic and foreign institutions, perform research and analysis, and formulate and promote strategies and plans that train personnel for industrial development. Research results will become feedback for the energy conservation data control section and the energy conservation education section operating in alliance.

- **Data Control Section**

This section will accurately grasp the current situation of energy supply and demand, and the related structure; establish a database of energy conservation information; analyze trends in energy consumption in different industries and areas based on the database; examine effective energy conservation measures; prepare guidelines in cooperation with the research and development section and other organizations concerned; and publicize new information to promote energy conservation and PR activities.

- **Education Section**

This section will implement appropriate energy conservation educational programs by sectors and areas, foster energy managers, and conduct technical and on-the-job training for experts in professional fields.

④ Supporting activities of the Energy-Conservation Core Center

Long-term experts will be assigned to the center to transfer technology on energy conservation subjects that are analyzed and studied at the center, and foster experts on energy conservation. In addition, cooperation will be provided to assist the formation of institutional systems to promote energy conservation programs (ESCO project, CDM project.)

(5) Development of legal systems and sectors to promote investments

■ Capacity development of BP-MIGAS and BPH-MIGAS

The following reviews will be made to realize the composition of an efficient gas market, as it is necessary to attempt the optimization of gas supply in Indonesia prior to the liberalization of the gas market in 2008.

- To compare Indonesia's gas regulatory body with the gas regulatory bodies in other countries, then to optimize its function, number of staff and budget.
- To set the benchmark in the gas sector for efficiency.
- To establish a policy for promotion of private investment.

■ Support for energy optimization at minimum cost to the economy and environment

Since the crude oil price has increased, the government encouraged replacement of diesel combustion with stalker boiler combustion, mainly for small and medium-sized companies; however, Sox emission and processing of ash becomes a big environmental issue.

Therefore, policy inducement is necessary to achieve energy optimization at a minimum cost to the economy and environment in Indonesia, considering CDM, etc., therefore policy support needs to be put in place.

■ Support for review of the whole framework of the Indonesian Energy Sector

For years the World Bank, ADB, and JBIC have been requesting the financial recovery of PLN as a condition for financing. The demand by donors for reviewing the nationwide uniform charge and unbundling the rate will continue in the sector reform. However, it is necessary to review the whole framework of the energy sector to improve the financial structure of PLN, since the contradictions in the liberalization of the sector are manifested in PLN. Moreover, supplying and distribution of gas are almost monopolized by PGN, and there is the possibility that the market dominance would be created when there is no new entry in the domestic gas market. Therefore, there is support for a review of the whole Indonesian energy sector framework.

4.2 Cooperation Programs for the Assistance to Social Infrastructure

The systems of both rural electrification targeting social infrastructure and regional development have much room for improvement and lack coordination. This section describes the cooperation programs in both areas based on the issues analyzed in Chapter 2 and the approach identified in Chapter 3. All of the programs are intended to realize the situation that both systems can be closely coordinated.

Period	Short term (2006-2010)	Mid term (2010-2015)
Goal	Establishment and operation of regional development and rural electrification systems	Expansion of regional development and rural electrification systems
Regional development / rural electrification	<ul style="list-style-type: none"> • Establishment and operation of regional development system* • Establishment and operation of rural electrification system* • Coordination of regional development and rural electrification* 	<ul style="list-style-type: none"> • Expansion of regional development system • Expansion of rural electrification system
	<ul style="list-style-type: none"> • Project on the establishment of regional development project+ • Project on the establishment of rural electrification project+ • Project on strengthening of O&M for SHS/micro hydropower systems+ 	<ul style="list-style-type: none"> • Regional development program (to be funded by loans and/or government fund) • Rural electrification program (to be funded by loans and/or rural electrification fund)

Figure 4.2.1 Cooperation Program for Social Infrastructure

4.2.1 Cooperation Program for Regional Development

Cooperation program for regional development is presented in this section. The rural electrification/regional development linkage project can be a part of the project on the establishment of the rural electrification system, which will be described later.

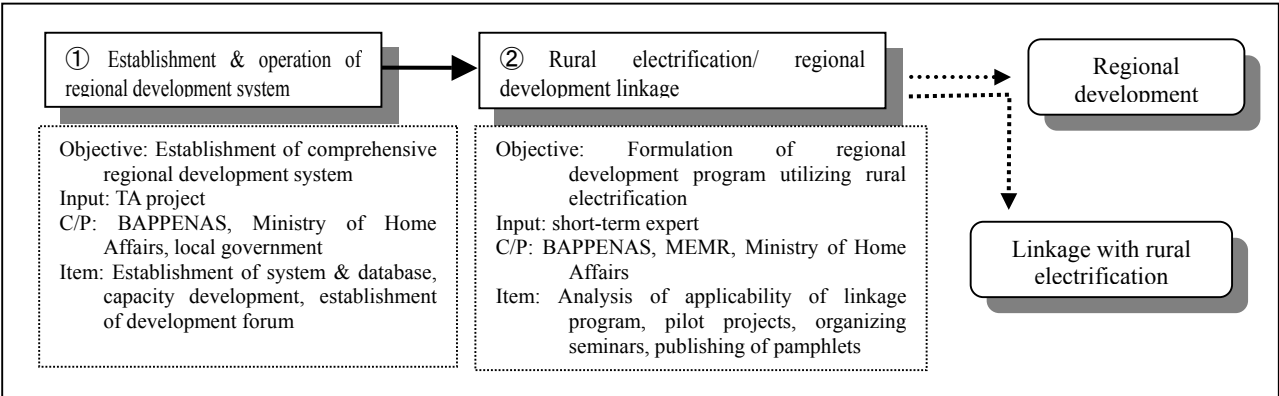


Figure 4.2.2 Cooperation Program for Regional Development

① Establishment and operation of the regional development system

Though there is a legal framework for regional development planning under the law on the national development plan system (2004), the issues such as the establishment of the necessary system and the capacity development of the local governments need to be tackled. In fact, BAPPENAS recognizes the need of donors’ assistance despite the existence of a rough plan for establishing the system. The assistance should be given to the following items.

- Establishment of the system including planning, implementation, monitoring, evaluation, feedback (issues analysis, analysis of improvement plans, preparation of guidelines,

- implementation of pilot projects)
- Production and administration of the database system
- Capacity development of the central and local government
- Establishment of regional development forums with the participation of stakeholders including community people

② Production and application of the packages linking rural electrification and regional development

The assistance to rural electrification does not regard electrification as a final goal, but it is a means to poverty alleviation and regional development. Even if an effort is made to promote the regional development program utilizing the electrification project, there may be an obstacle such as a lack of coordination between the organizations concerned due to bureaucratic sectionalism in public administration. Therefore, the following assistance should be provided for the local government to become able to incorporate the linkage programs into the regional development plan.

- Analysis of the current situation on the utilization of electricity for other sectors programs such as health and education
- Analysis of applicability of the linkage packages
- Implementation of the linkage packages in the pilot project sites
- Organizing of seminars to disseminate the linkage packages
- Publishing of pamphlets to disseminate the linkage packages

4.2.2 Cooperation Program for Rural Electrification

This section describes the cooperation program for strengthening the rural electrification system. The project on the establishment and operation of rural electrification will be a major assistance. However, there are potential factors that may influence the institutional aspects of rural electrification such as the revision of the electricity law. The dispatch of a short-term expert is also necessary to grasp the status quo and prepare the terms of reference for the above project. As there are several good practices in Bangladesh and Chile, careful consideration should be given to the applicability of such practices to Indonesia.

On the other hand, though MEMR and MOC have made efforts to implement the photovoltaic and micro hydropower projects by their own budget, there are serious operation and maintenance issues observed in the field survey in West Nusa Tenggara province. Assistance to the strengthening operation and maintenance of solar home systems and micro hydropower project is urgently needed.

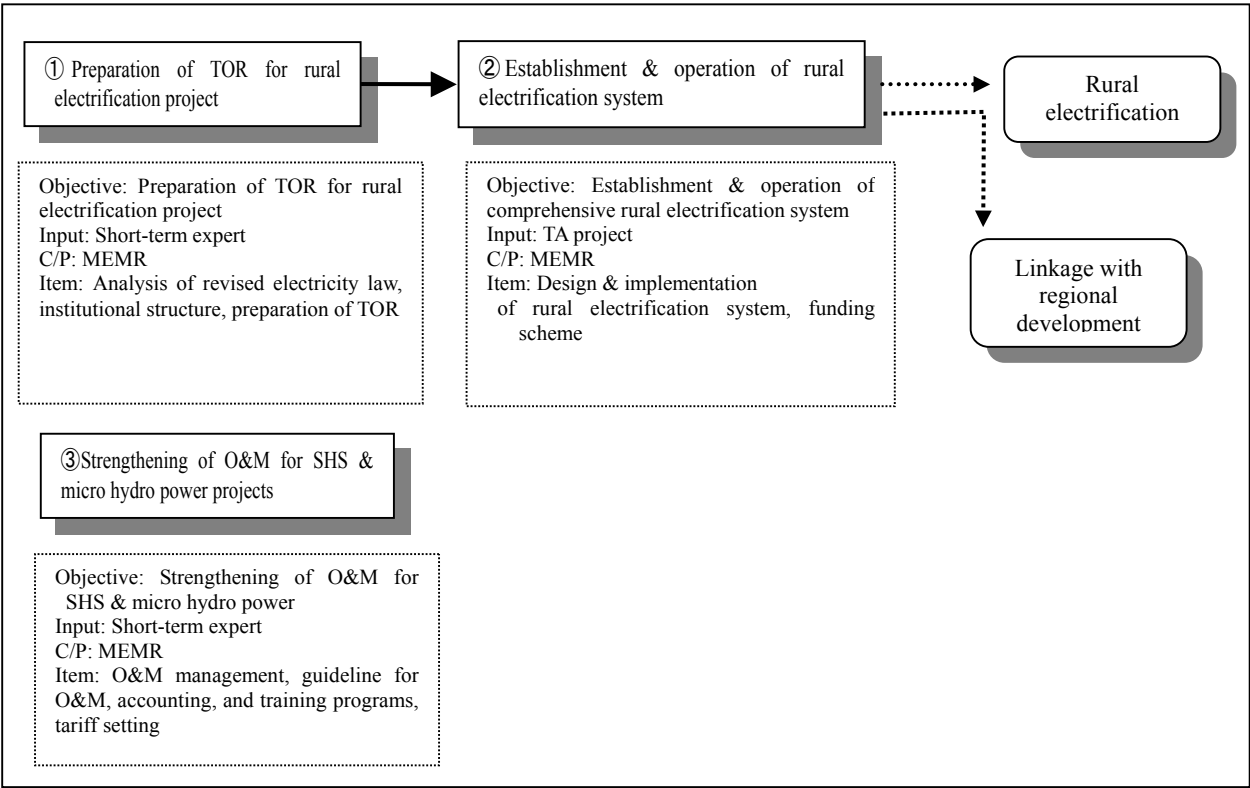


Figure 4.2.3 Cooperation Program for Rural Electrification

① Preparation of the terms of reference for the project on the establishment and operation of the rural electrification system

JICA has dispatched the long-term experts on electricity business management and rural electrification planning for 11 years since 1993 and provided technical assistance, mainly on technology of micro hydropower generation. Although the counterpart staff members have been equipped with the knowledge and skill and the number of micro hydropower projects increased, the development of institutional and funding mechanisms should be developed to expand the projects to other areas, requiring further assistance of donors.

However, the institutions and organizations related to electricity are in a fluid condition due to the future submission of the revised electricity law. It may be necessary for donors to actively engage in creating the favorable environment for the promotion of rural electrification as Indonesian side may

lose interest in this area without further support of donors. This assistance aims to grasp the situation of changes in the legal framework and the institutional and organizational structure through the following means.

- Understanding of the situation of the revised electricity law
- Grasping of the status quo of the institutional structure of rural electrification
- Preparation of the terms of reference for the project on the establishment and operation of the rural electrification system

② Establishment and operation of the rural electrification system

This assistance shifts its focus from the project-based technical assistance in the past to the strategic assistance to rural electrification policy and institutional building. Major areas for assistance can include the institutional development including the coordination mechanism between the ministries concerned, the demarcation of roles of the central and local governments, the funding scheme, and human resource development. Regardless of the result of the revision of the electricity law, each of the central government, PLN, the local governments, and community organizations have serious issues on the promotion and implementation of the rural electrification. It requires the comprehensive restructuring of the system.¹³

- Analysis of the current institutional setting and stakeholders for rural electrification
- Analysis of the content of the revised electricity law
- Design and implementation of the rural electrification system
- Analysis of the funding schemes
- Analysis of the introduction of the incentive mechanism to the local governments

③ Strengthening of the operation and maintenance system for solar home systems and micro hydropower projects

As observed in the cases of West Nusa Tenggara province, it seems difficult to continue the operation of the project with high customer satisfaction due to lack of technical and financial capability, lack of sense of ownership of the beneficiaries, and application of inappropriate technology.

It is urgent to establish a sustainable operation and maintenance system, though it should be dealt with as part of the above project in principle. Therefore, the following assistance should be provided in order to establish financially and technically sustainable operation and maintenance system and to strengthen the organizations in charge of the existing projects by utilizing the guidelines produced in the past.

- Production of the guidelines for operation and maintenance
- Production of the guidelines for accounting
- Analysis of appropriate tariff setting
- Production of the guidelines for training programs
- Implementation of the in country trainings and seminars

¹³ The possibility of the assistance to the structuring of the rural electrification system is analyzed in detail by Preparatory Study on Rural Electrification in Indonesia in January 2005.

Chapter 5 Recommendation

5.1 Recommendation for Reinforcement of Infrastructure for Economic Activities

A stable energy supply in Indonesia is very important, not only for Indonesia but also for Japan. In particular, an increase in domestic use of natural gas is considered a realistic option for reducing domestic oil consumption, while liquefied natural gas (LNG) has been an important export product to acquire earnings from foreign countries. Rapid adoption of natural gas as an oil alternative is an effective measure for supplying a stable primary energy in Indonesia within the short term. However, optimizing and minimizing the domestic use of natural gas by effectively utilizing coal and renewable energy should contribute to securing a sufficient amount of LNG for export as mentioned in chapter 3. Through this, trade profit may continue and status as a net energy export country can be attained.

To achieve this, establishment of a realistic national energy plan is of great importance. Also, problems with energy supply for domestic use or to the international market should be studied diligently, taking into consideration the pricing mechanism, as this has an important impact on the behavior of investors. It is essential to start the process by securing the energy supply for domestic use, then to progress through deregulation in a step-by-step manner, involving establishment of related laws to provide equal opportunity for all energy sector participants.

To implement the energy policy, applications for finance, including Yen loan and Public-Private-Partnership (PPP), should be considered, and technology transfer on effective energy utilization methods, such as clean coal technology and renewable energy technology, should be carried out. As a tool for establishing the national energy policy, preparation of a quantitative and realistic energy supply plan is vital, and technical support for this plan should be transferred through Japanese assistance.

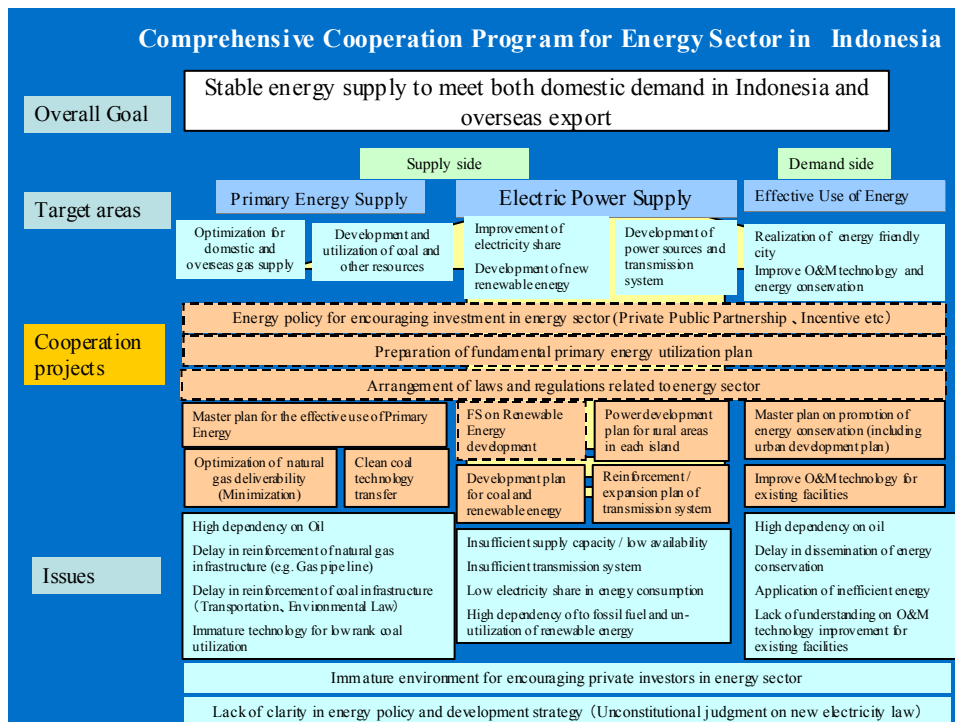


Figure 5.1.1 Comprehensive Cooperation Program for Energy Sector

5.2 Recommendation on the Assistance to Electrification as Social Infrastructure

Rural electrification has various issues to be resolved at each level of the central government, local governments and communities. On the other hand, regional development faces institutional and financial difficulties such as the establishment of regional development system, the development budget of the local government, and the increased number of the local government

Ideally, rural electrification and regional development should be well coordinated to achieve the planned objectives. However in reality these two systems are neither functioning properly nor coordinated effectively. In the short term, it is necessary to dispatch short-term experts regularly to grasp the possible significant changes of the environment due to the revision of the electricity law and to formulate the appropriate assistance plans. Both systems require long-term efforts and assistance. In the future, rural electrification should become an integral part of regional development programs after two systems are strengthened and well coordinated. Furthermore, it should take into consideration how to financially sustain the programs by utilizing the loan or the government budget. In addition, the incentive mechanism should be built to improve the performance of the programs.

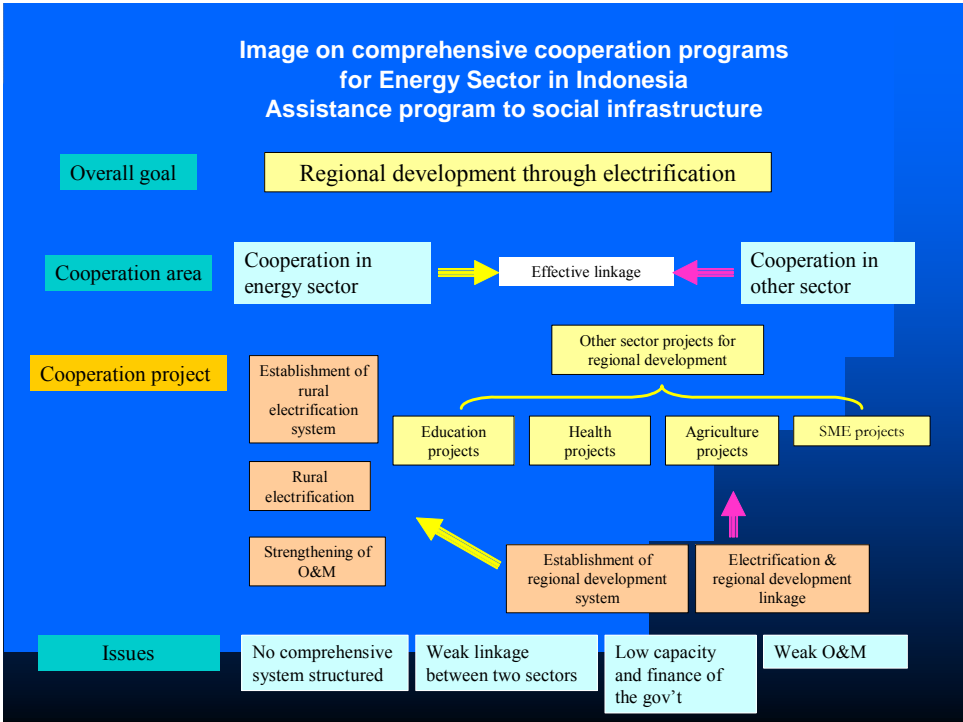


Figure 5.2.1 Assistance Program to Rural Electrification & Regional Development