MINISTRY OF ENERGY AND MINERAL RESOURCES
REPUBLIC OF INDONESIA

No.

THE STUDY
ON
ENERGY CONSERVATION
AND EFFICIENCY IMPROVEMENT
IN
THE REPUBLIC OF INDONESIA

FINAL REPORT
MAIN REPORT

AUGUST 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

ELECTRIC POWER DEVELOPMENT CO., LTD.

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LETTER OF TRANSMITTAL

Mr. Seiichi Nagatsuka
Vice President
Japan International Cooperation Agency
Tokyo, Japan

We are pleased to submit to you the report on the “The Study on Energy Conservation and Efficiency Improvement in the Republic of Indonesia”. This study has been conducted by Electric Power Development Co., Ltd. under a contract to JICA in a period from August 2007 to August 2009.

This report focuses on the analysis of present energy consumption structure and proposes effective measures for energy conservation and electricity DSM. In this report we propose action plans and a roadmap to effectively promote energy conservation.

We trust that our study output and proposed programs will contribute to promoting energy conservation and result in improved living and economic standards for the Indonesian people.

We would like to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs and the Ministry of Economy, Trade and Industry of the Government of Japan. We are also most grateful for the cooperation and assistance from the officials and personnel of the related ministries of the Indonesian Government, PLN (State Electric Company) and related enterprises.

Very truly yours,

Kimio Yoshida
Team Leader,
The Study on Energy Conservation and Efficiency Improvement
in the Republic of Indonesia

PREFACE

In response to a request from the Republic of Indonesia, the Government of Japan decided to conduct “The Study on Energy Conservation and Efficiency Improvement” and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Kimio Yoshida of Electric Power Development (J-Power) Co., LTD. between August, 2007 and August, 2009.

The team held discussions with the officials concerned of the Government of the Republic of Indonesia and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the study.

August, 2009

Seiichi Nagatsuka,
Vice-President
Japan International Cooperation Agency

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ABBREVIATIONS

AC	Air Conditioner
ACE	ASEAN Center for Energy
ADB	Asian Development Bank
AFD	French Development Agency
BAU	Business as Usual
BET	Basic Electricity Tariff
BOO	Build Operate-Own
BOT	Build Operate-Transfer
BNSP	National Professional Standard Body
BPPT	Agency for Assessment and Application of Technology
BRESL	Barrier Removal to Cost-Effective Development and Implementation of Energy Efficiency Standards and Labeling Project
BSN	National Standardization Accreditation Body of Indonesia
CDM	Clean Development Mechanism
CER	Certified Emission Reduction (Unit for CDM)
CFC	Chlorofluorocarbon
CFL	Compact Fluorescent Lamp
CLASP	Collaborative Labeling and Appliance Standards Programme
C/P	Counterpart
CPI	Consumer Price Index
CPP	Conventional Power Plant
DANIDA	Danish International Development Assistance
DEDP	Department of Energy Development and Promotion
DGEEU	Directorate General of Electricity and Energy Utilization
DLC	Direct Load Control
DOE	Designated Operational Entity
DSM	Demand Side Management
DSM Peduli	DSM for encouraging awareness of energy saving for household consumers with load less than 900 VA
DSM PJU	DSM for Public Street Lighting
DSM Terang	DSM for household consumers with load up to 450 VA
DSN	National Standardization Council
EASS	Energy Analysis Support System
EC	Energy Conservation
EE&C	Energy Efficiency improvement and Conservation
EMI	PT. Energy Management Indonesia
EPPs	Efficiency Power Plants
ESCO	Energy Service Company
ETAEMR	Education and Training Agency for Energy and Mineral Resources
ETCERE	E＆T Center for Electricity & New Renewable Energy
ECTC	Energy Conservation Technology Center

FTL	Fluorescent Tube Light
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GTZ	Deutsche Gesellschaft Technische Zusammenarbeit
GW	Gigawatt
GWP	Global Warming Potential
HAKE	Energy Conservation Specialist Association
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
HP	High Performance
HSD	High Speed Diesel Oil
IDO	Industrial Diesel Oil
IEA	International Energy Agency
IMF	International Monetary Fund
IPPs	Independent Power Producers
IRP	Integrated Resource Planning
IT	Information Technology
JBIC	Japan Bank for International Cooperation
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JOGMEC	Japan Oil, Gas and Metals National Corporation
KAN	National Accreditation Committee
KONEBA	PT. Konservasi Energi Abadi, Indonesia
LSP	Independent Certification Organizations
MCs	Municipal Corporations
MCS	Municipal Corporation of Semarang (Capital of Central Java)
MEMR	Ministry of Energy and Mineral Resources
METI	Ministry of Economy, Trade and Industry
MFO	Marine Fuel Oil
MLF	Multilateral Fund
MOE	Ministry of Environment
MOF	Ministry of Fund
MOI	Ministry of Industry
MMPT	Ministry of Manpower and Transmigration
MW	Megawatt
NEDO	New Energy and Industrial Technology Development Organization
ODA	Official Development Assistance
OPP	Off Peak Period

PBF	Public Benefit Fund
PDD	Project Design Document
PF	Power Factor / Phase Factor
PLN	Perusahaan Listik Negara (State Electricity Company)
PP	Peak Period
PPP	Public-Private Partnership
RIKEN	Rencana Induk Konservasi Energi Nasional (National Energy Conservation Plan)
RPS	Renewable Portfolio Standard
RUKN	A national general electricity plan (rencana umum ketenagalistrikan nasional)
SAIDI	System Average Interruption Frequency Index
SAIFI	System Average Interruption Frequency Index
SCF	Spanish Carbon Fund
SIDA	Swedish International Development Agency
SMB	Setara Barel Minyak (Barrel Oil Equivalent)
SNI	Indonesian National Standard
TEPCO	Tokyo Electric Power Co., Inc.
TDL	TARIF DASAR LISTRIK (Basic Tariff of Electricity)
TOE	Ton of Oil Equivalent
TOT	Training of Trainers
TOU	Time of Use
UNDP	United Nations Development Program
UNEP	United Nations Environment Programme
UNFCCC	U.N. Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
WB	World Bank

Executive Summary (Proposal to Implement Optimal Program for Promoting EE&C in Indonesia)

Since August 2007, when the Study started, the Study Team has held dozens of discussions and exchanged much information with C/P, Ministry of Energy and Mineral Resources (MEMR) and related organizations. Taking into consideration these processes, a summary of the major results of analysis, confirmed issues, direction to be targeted and proposals for optimal EE&C promotion are described as follows;

1. Outline of Basic Research

Basic research was conducted to focus on 6 issues below;

(1) Data collection and analysis on Indonesian economic situation and energy supply and demand

(2) Indonesian legal framework and inter-organization structure which had been enacted and formulated in the past

(3) Activities of international and domestic organizations in support of EE&C

(4) On-site and questionnaire survey on industries and commercial buildings to understand the current conditions of EE&C implementation

(5) Market research and EE&C potential estimation for major electric appliances

(6) On the basis of the information above, clarification of the current condition and issues to be solved for promoting EE&C, mainly focus on 3 targeted fields: energy manager program, labeling program and electricity DSM program.

The key information collected and issues clarified to be solved through the Study are described below; **(→; issues to be solved**）

(1) GDP and national energy consumption growth are both expected to be 5-8％/ year

(2) The same growth is expected in national electricity consumption, and electricity supply deficit in the evening becomes an urgent and major issue (refer Fig.1)

(3) Electricity tariff has been politically set at a lower level than realistic cost. So people’s incentive to reduce energy expenditure is so small that it is hard to promote EE&C. Besides, governmental subsidy on electricity tariffs is surging year by year, running over 5％of the national budget, thus creating a vicious cycle. (refer Fig.2)

→ **To formulate a countermeasure for this distortion is the biggest issue**

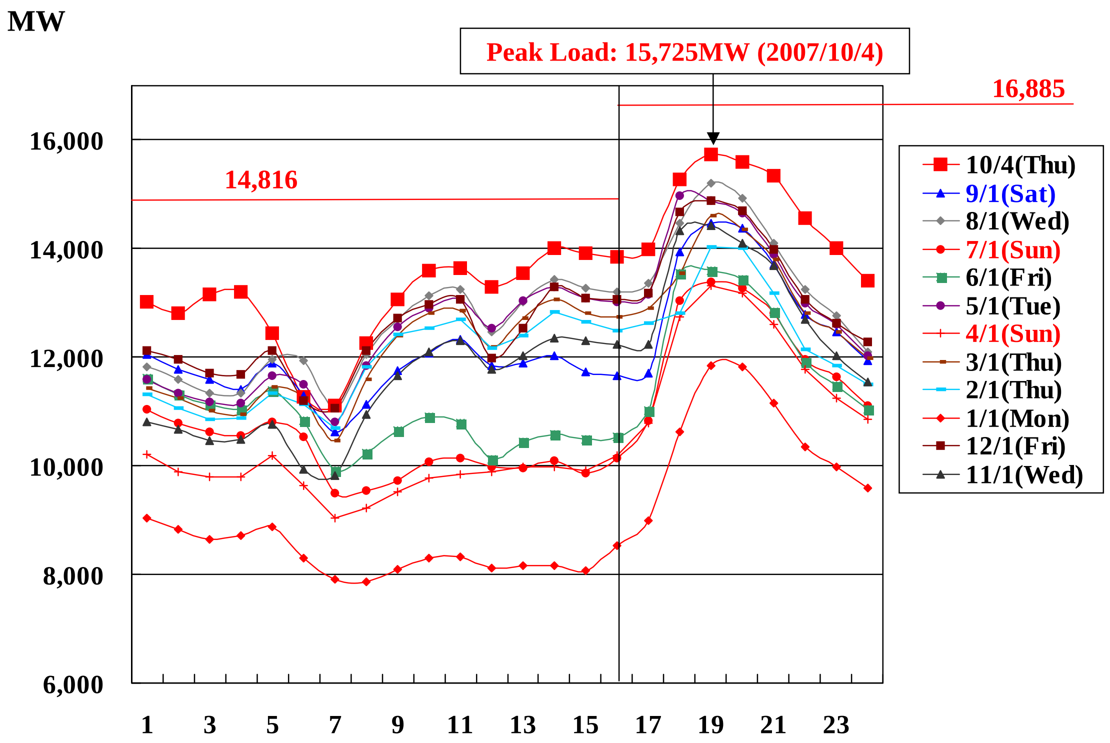


Fig. 1 Daily Electricity Load Curve of PLN

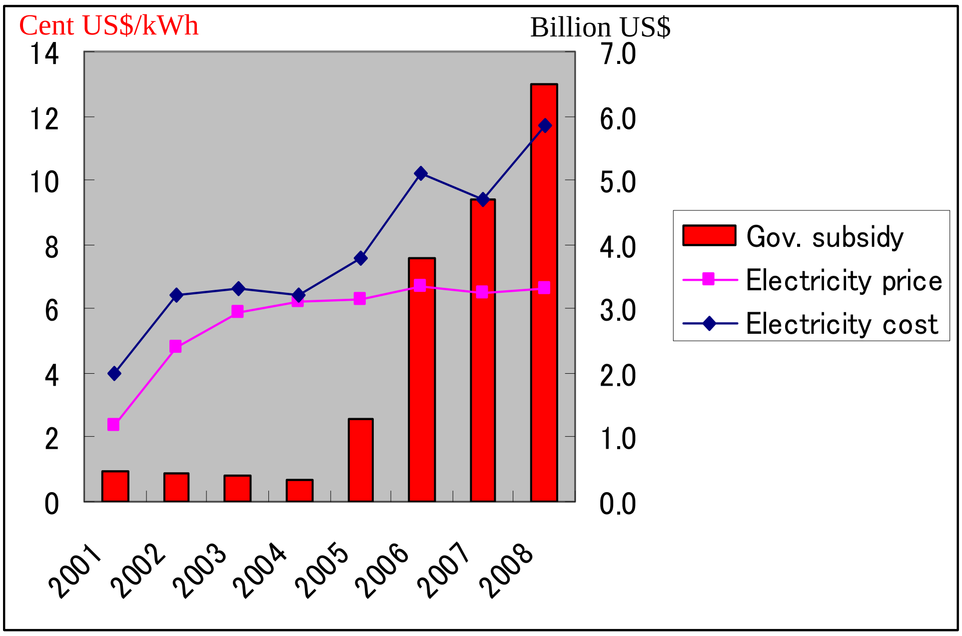


Fig. 2 Trend of Average Electricity Price (Tariff), Cost and Subsidy from Government

(4) Fuel switching from oil to coal is on-going

(5) The Indonesian government is concentrating on formulating legal frameworks to implement energy manager and labeling program for EE&C, which was stipulated in the Energy Law enacted in August 2007.

(6) Regarding the energy manager program, it has been decided that MEMR has a responsibility for enacting and operating this program collaborated with Ministry of Industry (MOI). And the competency standard of certified energy manager for commercial buildings has been decided. The Education and Training Center of MEMR (ETCERE) has been chosen as an executing agency for EE&C training.

(7) Energy Conservation Specialist Association (HAKE) is expected to be accredited as an agency for certificating an energy manager license in the discussion between MEMR and National Professional Standard Body (BNSP).

→ **However the practical tools and materials to operate the program has not been prepared yet. This becomes an urgent issue.**

(8) The labeling program for CFLs has been finalized as the first such program in Indonesia. And from now on MEMR has a plan to formulate labeling programs on refrigerator, air conditioner and TV, whose energy consumption is increasing rapidly.

(9) The major programs drawn up, proposed and supported by international organizations are as follows:

UNIDO; International energy manager program (ISO 50000 basis) 2009-2013

UNDP; International labeling program 2009-2013

DANIDA; Implementation of clearing house for EE&C and related supporting programs 2009-2013

AFD; Co-financing on Cool Earth Program Loan which is proposed by Japanese government 2008-

→ **Functional linkage among these international organizations is an indispensable issue for Indonesian EE&C.**

(10) On the basis of on-site and questionnaire surveys, the state of the implementation of EE&C practices in factories and buildings was analyzed. The results of the analysis are summarized as follows. The interrelations among the constraints analyzed are also shown in Fig. 3.

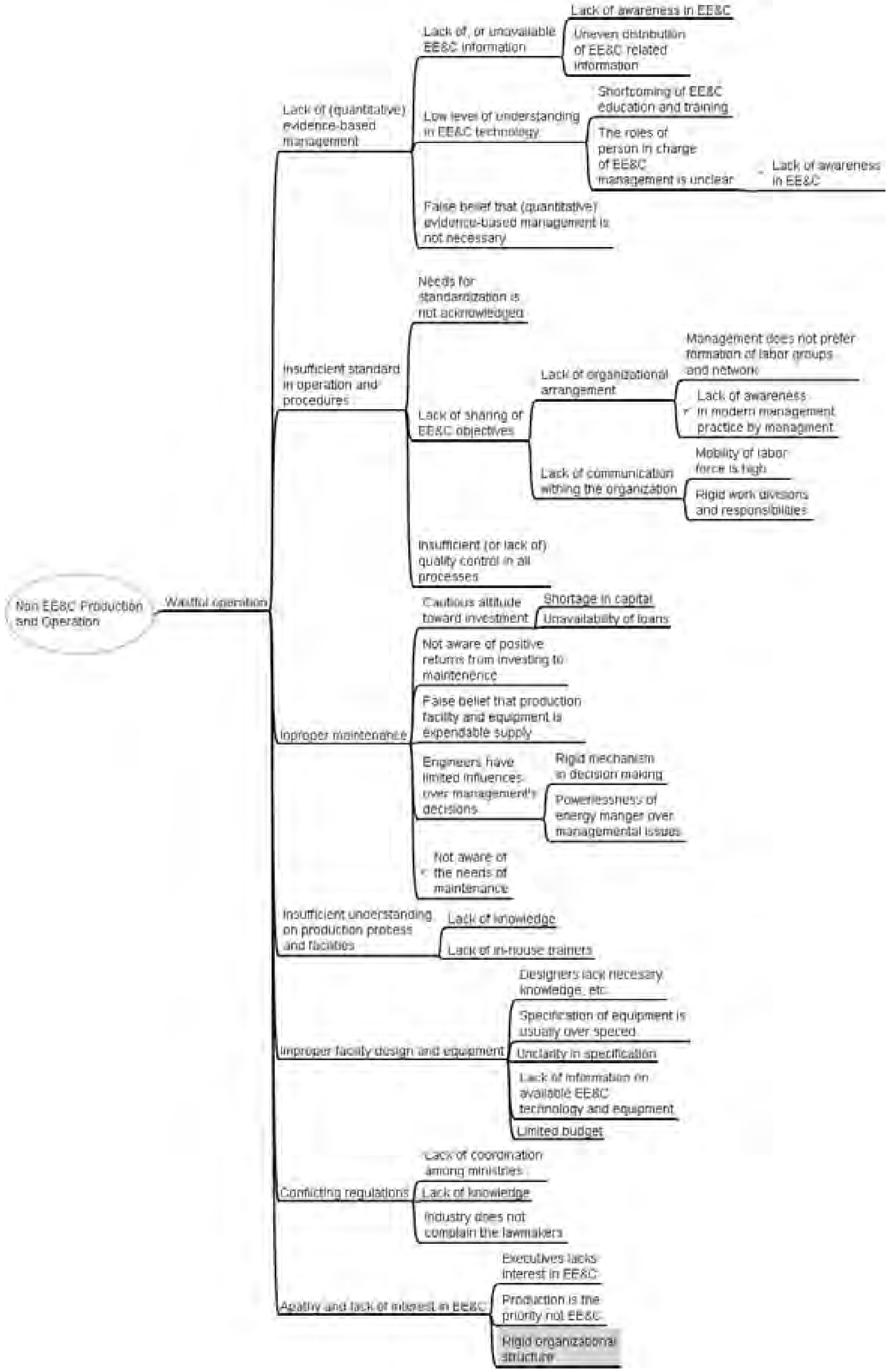


Fig. 3 Problem Tree (Analysis of the Constraints of EE&C Promotion in Indonesia)

1) Lack of (quantitative) evidence-based management
2) Insufficient standards in operations and procedures
3) Improper maintenance
4) Insufficient understanding of production process and facilities
5) Improper facility design and equipment
6) Conflicting rules and regulations (Regulation on Hospital room temperature etc)
7) Apathy and lack of interest in EE&C (especially in top management)

→ **Practical countermeasures to breakthrough these 7 issues should be formulated**

(11) Outline of results of market research and EE&C potential estimation are described as follows;

1) Conversion from incandescent lamps to CFLs has the quite comprehensive effect of achieving not only EE&C but also electricity peak cut, financial benefits for users and reduction of governmental subsidy to PLN (reduction of electricity cost).

   → **Promoting CFL dissemination is a quite promising countermeasures for EE&C**

2) EE&C potential in cooling is the largest in commercial buildings

   → **Promoting high efficiency air conditioners and chillers is also promising. A major issue to be clarified is the dissemination speed (scenario) of the inverter type**

3) Formulating labeling programs for TVs and refrigerators before their full scale spread is an effective countermeasure to mitigate the future growth of electricity consumption.

4) The EE&C potential of introducing high efficiency motors is quite large.

2. Major Contents of Discussion with C/P and Technology Transfer during the Study Term

During the study period, not only 3 targeted fields: energy manager program, labeling program and electricity DSM program, but also the methodology for economic and EE&C potential analysis and indicators was discussed and transferred to C/P and related organizations. As illustrated in Fig. 4, the Study has been conducted through three steps. As the first step, Analysis 1 centering on market survey of electrical products and Analysis 2 centering on energy audit and questionnaire survey were taken with an eye to acquiring basic data and information reflecting the country’s energy conservation potential. The studies in the two Analysis were reinforced by a study on the introduction of DSM system. As the second step, energy conservation potential and CO_2 reduction potential were estimated based on results of the Study in the first step, and were compared with the expected effect of the government’s existing energy conservation master-plans. And finally in the third step, recommendations featured with a roadmap and action plans were presented to the Indonesian government.

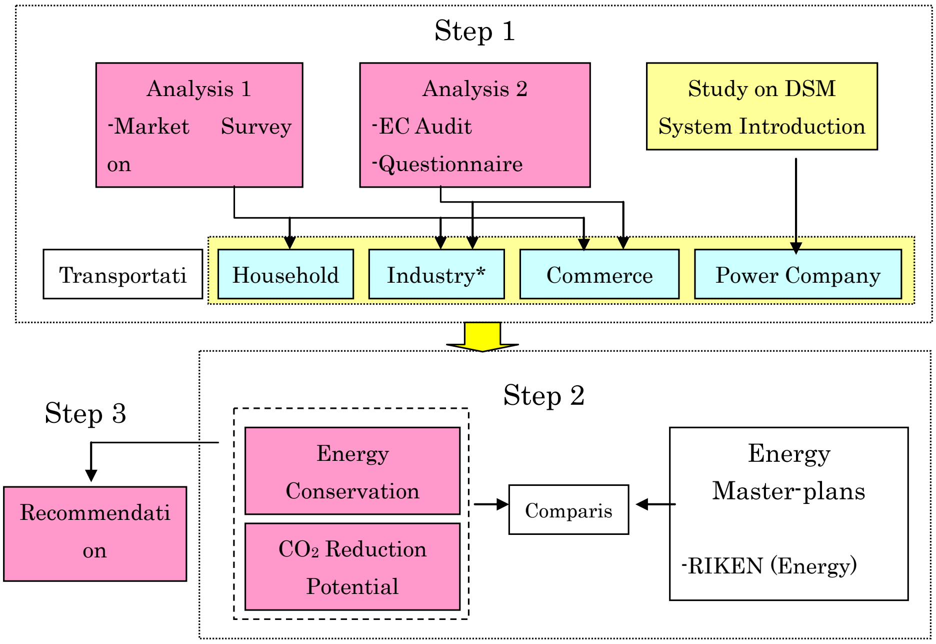


Fig. 4 Steps of the Study

Fig. 5 visualizes the scope of the Study whereby to clarify the interrelationship between the Study and existing energy conservation master-plans made by the Indonesian government, as well as the relationship between Analysis 1 and Analysis 2 within the Study. Additional reference needs to be made to the scope of Blueprint for Electricity Conservation (Draft). Although it is defined as part of the larger area covered by Analysis 2 of the Study, strictly speaking, it should extend beyond the boundary of Analysis 2's area, as sectors like transportation and construction also consume a certain portion of electricity. However, since this portion is relatively insignificant, it is consciously neglected here to make the picture visually easy to understand.

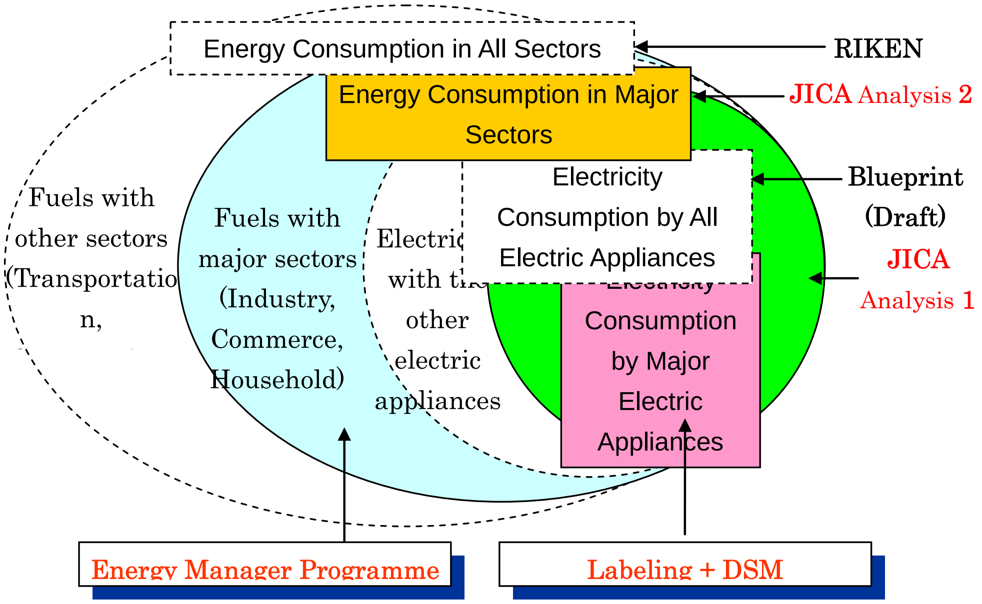


Fig. 5 Scope of the Study

Major contents of discussion with C/P and technology transfer list is attached in Table1.

Table 1 Major Contents of Discussion with C/P and Technology Transfer

Theme	Transfer to	Timing	C/P apply
Common			
Economic Analysis			
Intensity/elasticity	MEMR	3rd mission	Shared
Procedure of economic analysis	MEMR/EMI	1st, 2nd	PPT
EE&C,CO2 potential	MEMR/EMI	3rd, 4th ,5th,7th,8th	EXCEL table
Economic analysis	MEMR/EMI	4th ,5th	EXCEL table
Future Direction	MEMR	5th	
Training in Japan	MEMR/ETC/BPPT/EM	2008.Novem.	
Energy Management			
Legal Framework	MEMR/ETCERE		
Japanese Periodecal report		3rd, 4th	WORD
Middle & long term plan		3rd, 4th	WORD
EM training curriculum		2nd, 3rd	WORD
Outline of EM training		2nd, 3rd	WORD
Example of test paper		between 2nd and 3rd	WORD
Punisshument		2nd, 3rd	WORD
EM program	MEMR/ETCERE		
Outline of surrounding countries		2nd, 3rd	WORD
Number of candidate factories		2nd, 3rd	Applied
Competency for Industrial		4th	
EA program	MEMR/ETCERE		
Competency fot EA		4th	WORD
Guideline	MEMR/ETCERE/EMI/ BPPT	4th, 5th	To be discussed
Energy Management			WORD
Audit, measurement			WORD
Guideline			
Auditing（8 spots）	MEMR/BPPT	2nd, 3rd	Introduction of EMS
Potential Next project	MEMR/ETCERE	4th,5th,6th,7th,8th	To be discussed
Labeling program	MEMR		
Japanese labeling system		1st, 2nd, 3rd	WORD
Comparison & proposal		3rd, 4th	PPT
（Lamp、Ref.、AC、TV）			
Japanese testing Meth.		3rd, 4th	WORD
Outline of surrounding countries		3rd, 4th	WORD
EE&C potential estimation		3rd	EXEL
DSM program			
Japanese DSM、electricity tariff	PLN/MEMR	3rd, 4th	PPT
EPP/CDM	MEMR/PLN	2nd, 3rd	PPT
Proposal of CFL programatic CDM	PLN	between 2nd and 3rd	Applied
Potential estimation	PLN	3rd, 4th	EXEL
Energy auditing support system	PLN/MEMR	3rd, 4th	PPT
Proposal of EPP	PLN/MEMR	4th, 5th	PPT
Potential Next project	MEMR/PLN	4th,5th,6th,7th,8th	To be discussed
Roadmap & Actionplan	MEMR/ETCERE/PLN	4th, 5th,6th,7th	

3. Proposal of Roadmap and Action Plan for Indonesian EE&C

On the basis of the results of the Study, the "Basic Strategy for Promoting EE&C" was figured out in Fig.6, focusing on 3 strategic fields, namely "Enhancement of Awareness and Consciousness of EE&C", "Strengthening Support from the Government", and "Enforcing Rules and Regulations". And under these 3 strategies, the measures to be taken for introducing functional EE&C were illustrated. They are listed in 14 programs. The summary of these programs and projects is contained in Table 3. The contents of the programs are attached in Appendix at the last of report.

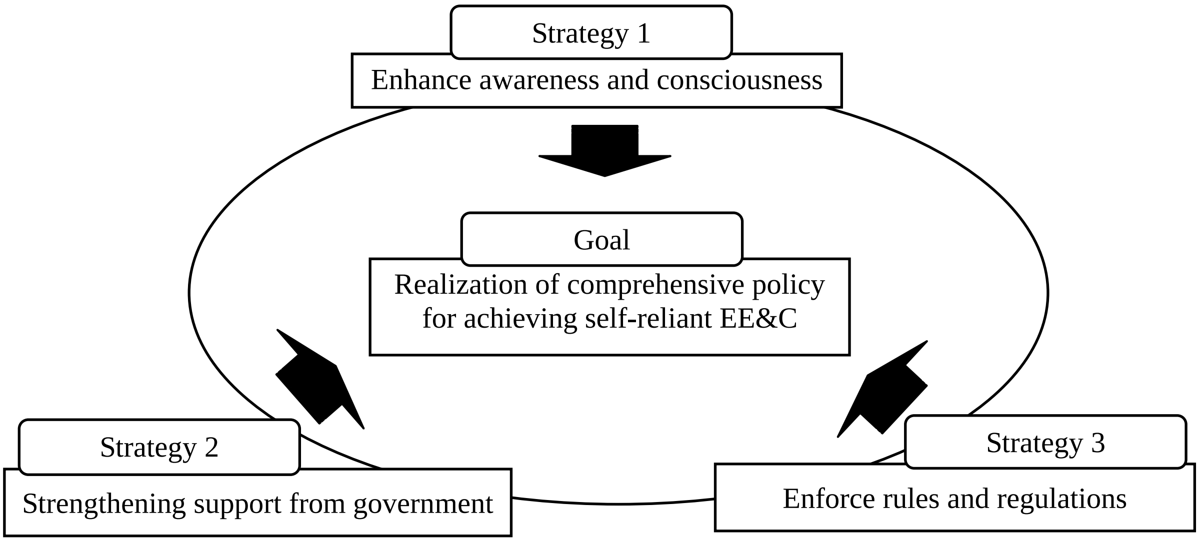


Fig. 6 Basic Strategy for Promoting EE&C

Basic grounds for proposed programs and projects are as follows;

Compared with Japan and surrounding countries, national budget & resources for EE&C activity per capita and GDP in Indonesia is quite small. In order to achieve national target of EE&C level, it is necessary to invest at least several times larger financial resources. And to achieve the target, firstly road map (total figure) for EE&C promotion should be prepared. Then to secure the budget needed, functional linkage among eligible international supporting programs (organizations) should be formulated.

Until 2015 utilizing international organizations support, the government should concentrate on 1) formulating national energy manager certification program and introducing the concept of energy management in factories and buildings, 2) disseminate labeling program of selected electric appliances and 3) accelerating DSM measures in electricity field. These programs are not so costly, and with these prioritized measures, 10％EE&C will be achievable.

From Japanese experiences by introducing energy management system and steadily operating it (PDCA cycle), at least 5 % EE&C can be got. Indonesian government should continue and accelerate the preparation and enactment for legal frame work of national energy management program. And also Government should strongly focus on awareness program for governmental organizations and private companies about the merit of introducing energy management system.

Following up the labeling program on CFL, it is quite effective to formulate next labeling program on

AC, TV and refrigerator etc. and go into steady operation, which will be sure to be spread in the near future in Indonesia, before their popularization. There are several failures in other countries without controlling the energy efficiency criteria on these electricity appliances.

DSM in electricity becomes quite effective and speedy measure when applied with functional electricity tariff mechanism. The expected benefit is not only achieving EE&C, mitigating peak demand but also works to reduce increasing governmental subsidy to PLN.

Priority main programs and the Study approach to reach them are shown in Fig. 7.

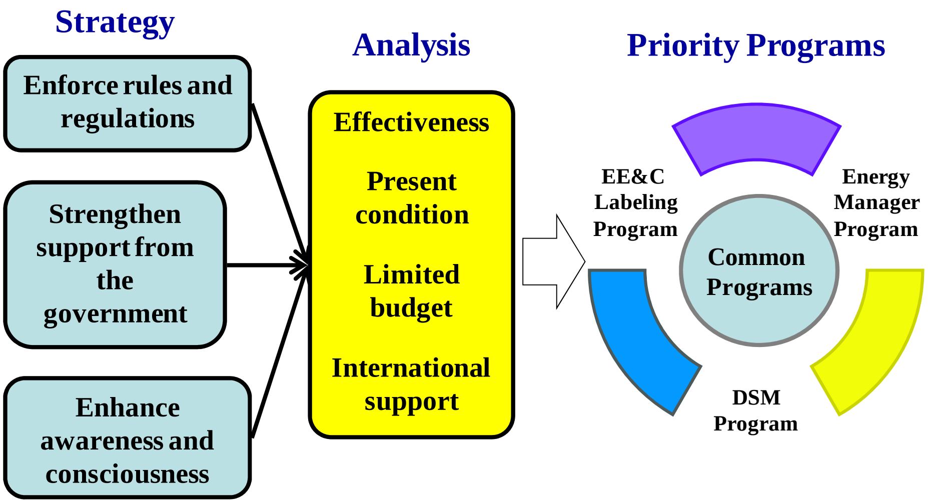


Fig. 7 Approach to the Priority Programs

There is a trend for decentralization in Indonesia, but up to 2015 central government should play a leadership to show the national direction for EE&C, prepare guideline and formulate national framework.

In this context more resources should be allocated in central government than provincial. And reflecting national direction, related ministry, provinces and private sectors will be able to formulate their original plan. And following it, they can prepare their own budget for EE&C and go into implementation stage.

Up to 2015, it is also effective to clarify eligible EE&C technologies, which is effective but costly, and conduct demonstrative projects of these specified technologies and formulate supporting programs to incite private company’s investment in these technologies.

After 2015 the dissemination of these specified technologies should be accelerated mainly by private sectors. The governmental role should be limited in awareness and support.

The tentative incremental realization scenario of EE&C & CO_2 reduction potential for all the major sectors is reflected in Table 2. (Notice needs to be taken that while the energy types of industry sector include fuels and electricity, commerce and household sector only focus on electricity.)

Table 2 EE&C & CO$_2$ reduction Potential Incremental Realization Scenario for All the Major Sectors

Item / Sector	Focused Energy Source	EE&C/ CO2 reduction Potential (%)			
		Approach1	Approach2	Approach3	Total
		Mainly 2005~15	Mainly 2016~20	Mainly 2021~25	2005~25
Food	Multi	5 5	5 5	5 5	15 15
Iron & Steel	Multi	10 10	7 7	13 13	30 30
Textile	Multi	10 10	5 5	15 15	30 30
Cement	Multi	4 2	2 2	4 2	10 6
Other Indus.	Multi	8	4	11	23
Commerce	Electricity	10	5	10	25
Household	Electricity	10	10	10	30

Source:: Based on field study, NEDO report and MEMR report. Data of food and

Note:: Regarding the proportion of electricity consumption among total energy consumption in the commercial sector, it is expected to be 62% in Year 2025 with the BAU Case, and 55% with the EC Case. As for the proportion of electricity consumption in the household sector, it is expected to be 28% in the same year with the BAU Case, and 22% with the EC Case. The parts colored red represent sectors within the scope of the Study.

The main points of the above-mentioned tentative EE&C potential incremental realization scenario are summed up as follows:

a) Approach-1 and Approach-2

- With reinforcement of energy management（Zero cost for users and low cost for the government) , modification and addition of parts (cost of minor investment）, it is assumed to be possible to achieve EE&C by 10-20% within a period of 5 to 10 years.
- At present, problems of incomplete energy management system on the factory floor and mid-level managers’ lack of expertise and experience remain obstacles to the promotion of EE&C.

b) Approach-3

As far as the analysed sectors of this study, more significant EE&C could possibly be achieved by investment of larger scale to replace existent equipment with energy-efficient one. EE&C of respective sectors could be achieved in the following ways:

- Iron & steel : 10% plus EE&C by introducing high-efficiency reheating furnace would be possible.

- Textile : 20% EE&C mainly through heat recovery in dyeing process would be possible.
- Food, cement and others : It looks promising to utilize the results of NEDO pilot projects in the fields of heat recovery, cooling and biomass technology, etc.
- Building : 10% plus EE&C by BEMS could also be possible.
- Household : 30% EE&C could be possible mainly in AC and refrigerator with inverter, TV and lighting; though introduction of Labeling system is urgently needed.
- Two-step loan or project financing loan using ODA soft loan from international financial institutions like JICA, ADB and the World Bank would be effective options for the introduction of promising though costly EE&C technologies such as the technologies which have been implemented as NEDO's pilot projects or study etc.

Table 3 Summary of the Road Map for EE&C C Dissemination and Promotion

No	Main Program	Program	Description/Issues	Measures	Priority	C/P (Implementing Agencies)	Schedule
1	Energy Manager Program	Education and Training (on EE&C for senior executives, etc)	Relevance and feasibility of EE&C investment are not fully understood by the management. (Difference of effect and controllability between sales increase caused by interaction with consumers and cost down that can be achieved by in house EE&C activity) Adopting proposed ISO 50001 (Energy Management System) through participating EE&C promotion programs proposed by UNIDO	Various seminars and training events for senior managers made available to teach the feasibility of EE&C investment. EE&C should become a major indicator for good management. Creating a positive corporate image of an eco-friendly company.	A	MEMR （ETCERE）	Highest priority among all programs/projects. Complete in Stage 1
2		Development of the Network of Designated Factories and Energy Mangers	Absence of forum aiming at technology exchange and transfer across industry. Technical information on EE&C and its advancement is not easily distributed in Indonesia. No connection with other energy managers. Lack of information on a good practice and effective measures, etc.	Seminars for Energy Managers Preparation for examination for certification Technology transfer.	A	MEMR, ECTC	Implement ASAP HAKE has been established as a professional association for Energy Managers

No	Main Program	Program	Description/Issues	Measures	Priority	C/P (Implementing Agencies)	Schedule
3		Energy Audit Partnership Program (Continuation and Expansion of the Existing Program)	Weak capacity in auditing There is no professional certification for energy managers Less implementation after auditing	Training for Auditors, program on strengthen auditing skill Compilation and publication of the analysis and audit results	A	MEMR	Stage 1 Enhancement of PROMEEC and existing programs
4		Implementation of Seminars, Education and Training on EE&C	Access to the technical information is very limited. The knowledge of the regulation is limited.	A variety of technical seminars and training programs targeting various levels.	A	ETCERE、local government, conglomerate	Introductory levels in Stage 1 (2009-15) Technologically advanced contents may be introduced in the succeeding stages
5		Target-Setting Agreement with Designated Factory	There is no regulatory framework for overseeing energy use of industry and building, etc. There is no functional incentive for adopting EE&C because of low energy prices driven by politics. Adopting proposed ISO 50001 (Energy Management System) through participating EE&C promotion programs proposed by UNIDO	Introduction of target-setting agreement program Mandatory reporting on energy use Nomination of an energy manager	A	MEMR	Stage 1. (Implementation of Energy Manager Program, which has been prepared to enact, is one of the highest priorities)

No	Main Program	Program	Description/Issues	Measures	Priority	C/P (Implementing Agencies)	Schedule
6	Labeling Program	Promotion of Energy Labeling Program	Functional Labeling Program has not been implemented, Lack of information on useful EE&C technology. Lack of awareness program	Establishment of testing methodology and testing organizations, Specified technologies Establishment of sustainable developing program	A	MEMR, Accredited testing laboratory, Label Certification Body, ECTC, Clearinghouse	Stage 1 (Mainly focus on CFL,AC, refrigerator and TV etc. which are effective in the short term) Utilizing BRESL and CLASP program which are supported by international cooperation organizations
7	DSM Program	Promotion of Electricity Demand Side Management (DSM) Program	Absence of incentives and disincentives based on electricity usage	Introduction of sustainable and functional electricity tariff schedule Provision of incentives to adopt measures for DSM	A	PLN, (MEMR)	Should be implemented in Stage 1 utilizing the proposed JICA supporting program
8	Common Program	Establishment and expansion of award program for achievement of EE&C activities (targeting industries, commercial buildings, machinery and equipment, school and children)	Lack of incentives for adapting EE&C. Weak attitude to carry out EE&C	Stronger publicity for EE&C. Incentives through getting a good name.	A	MEMR（ACE, MOI and MOE）, ECTC	The current award program may be carried out soon. Develop a new award program in the separate areas in the mid and long term activities.
9		Promoting EE&C design and use of EE&C goods and materials	There is no one stop access to technical information, etc on EE&C Hard to access useful EE&C information	Provision of so-called “one-stop service” (establishment of the clearing house) Establishment of EE&C information collection and dissemination mechanism (future linkage to program 10)	A	MEMR	Stage 1 Utilizing DANIDA program

No	Main Program	Program	Description/Issues	Measures	Priority	C/P (Implementing Agencies)	Schedule
10		Energy Conservation Technology Center (ECTC)	There is no functioning central agency to promote EE&C	Present and promote EE&C technology	B	MEMR	Stage 2 (after 2015) and the following (after the institutional arrangement is completed) Support from industry is indispensable
11		Establishment of financial mechanisms to support EE&C promotion and dissemination.	Financial support for implementing EE&C is lacking. Weak incentive for promoting EE&C measures	Study on establishment of Energy Conservation Fund whose source is derived from tax on electricity and fossil energy consumption. Provision of subsidies (e.g. low-interest loan, etc.). Tax relief for EE&C investment Lower import tax.	A	MEMR（MOF）	For the near term utilizing international cooperative program as much as possible. Launch supporting measures that can start earliest. Implementing tax reform in the early stage is the highest priority.
12		Promotion and Acceleration of Research and Development	Dependence on foreign EE&C technology. No room for fostering technology originating in Indonesia	Presenting EE&C policy directions suitable for the socio-economic system of Indonesia. Collaboration among universities and industries. Development of technology unique to tropical climate.	B	MEMR, Ministry of Education	Initial emphasis will be on behavioral sciences (laws, organizational development, policy areas) in Stage 1. Engineering development may come in Stages 2 and 3.

No	Main Program	Program	Description/Issues	Measures	Priority	C/P (Implementing Agencies)	Schedule
13		Preparation of Laws, Regulations and Standards for Promotion and Dissemination of EE&C	Various ministries prepare laws and regulations without close coordination and consultation	Coherent implementation of EE&C laws and regulations	A	MEMR、MOI	Should be implemented in Stage 1.
14		Establishment of common database of EE&C.	Common database of EE&C has not been established.	Establishment of national basic data base. Formulation of functional data collection and analyzing mechanism. Implementation of master plan based on the above database.	A	MEMR、MOI, ECTC	Should be implemented in Stage 1. Cool Earth Partnership Program, which is supported by JICA and AFD, should be utilized to establish CO_2 road map on industries.

CHAPTER 1

INTRODUCTION

Chapter 1 Introduction

1.1 Background of the Study

The Government of the Republic of Indonesian (hereinafter referred to as GOI) has made the following efforts to improve the country's EE&C (Energy Efficiency & Conservation) since the early 1980s:

- Enacting "National Policy Aiming at EE&C" to promote awareness of EE&C in the early 1980s.
- Setting up a state-owned institution, KONEBA, with assistance from the World Bank in 1987, for the purpose of promoting EE&C through various activities such as database and human resources development, public information and energy auditing for industrial establishments.
- Issuing the Executive Order Regarding EE&C, requiring energy consumers to improve energy efficiency in 1991; enacting a guideline for EE&C, "National EE&C Basic Plan: RIKEN", in 1995 (by MEMR).
- Enacting the "Demand Side Management (DSM) Action Program" with the help of USAID in 1992, on the basis of which the State-owned Power Generation Corporation (PLN) continued its efforts in the field of EE&C including the pilot project of compact fluorescent lamp (CFL) introduction.

GOI has historically controlled the domestic energy market and has kept the tariff low, largely because it has been an energy producing country rich in oil, natural gas and coal. This policy has not helped in raising Indonesian people's consciousness toward EE&C. The drastic increase of energy prices caused by decrease of domestic oil supply has forced GOI to take urgent actions to cut domestic oil consumption. The government, therefore, issued the Executive Order on EE&C and the MEMR Minister's Decree on Order on the Implementation Procedure of EE&C (Guideline of EE&C)" in July 2005. Later, in August 2007, the Energy Law was enacted,. This law strongly focused on EE&C, and the need for strengthening EE&C, especially reducing oil consumption, is among the highest priorities of the energy-related policies of Indonesia.

While the impending crisis associated with global warming is growing intense, EE&C promotion is becoming more and more popular in the world. Given increasing energy consumption in the world economy, governments of the world acknowledge the urgency of ensuring constant supply of energy under such market conditions. It is very important for both developed and developing nations to work together in response to the abovementioned global challenges.

In February 2005, JICA published a guideline entitled "JICA Thematic Guidelines on Energy Conservation". The guideline specifies the significance of EE&C as follows:

- Reduction of energy consumption
- Reduction of greenhouse gas (CO_2） emission
- Curtailment of energy expenditure

In addition, the overall goals to be achieved via the realization of EE&C are listed in the guideline as shown below:

- Energy security
- Countermeasures against global warming
- Income growth (reinforcement of competitiveness of domestic industry)

These overall goals listed above are in line with the ultimate purpose of the Study, therefore the relevance of conducting the Study is high.

1.2 Purpose of the Study

The purpose of the Study can be summarized as follows:

- To formulate a road map and an action plan for EE&C promotion, including a proposal for effective legal and administrative systems for EE&C promotion based on the analysis of the EE&C implementation in the frontline practices of industries and commercial buildings in Indonesia.
- To transfer technologies concerning EE&C promotion to C/P institutions, including MEMR, and other relevant organizations.
- To assist by showing the direction for enhancement of legal and administrative frameworks on EE&C, development of human resources and organizations that support EE&C policies.
- To support policymakers of Indonesia in formulation and implementation of comprehensive EE&C policies matching with the current status of Indonesia.

The road map and action plan for EE&C promotion are among the outputs of the study. They include a proposal for prioritized programs and projects for promoting EE&C. The Study is “action-oriented”, enabling the realization of the road map and the facilitation of EE&C related private sector activities conducted by Indonesia in the next stage.

1.3 Study Content

The Study flow of this project is shown in Fig 1.3.1-1. The Study is based on basic policy of study described in JICA TOR.

1.3.1 Core Programs and Supporting Programs

- Core programs of this study are "Energy Manager Program", "Labeling Program" and "DSM Program", described in the left side of the figure.
- As supporting programs, "EC awareness program", "Energy Audit Program" and "Local Consulting Program" were conducted simultaneously.
- These programs are scrutinized, improved and strengthened by the "capacity building program".

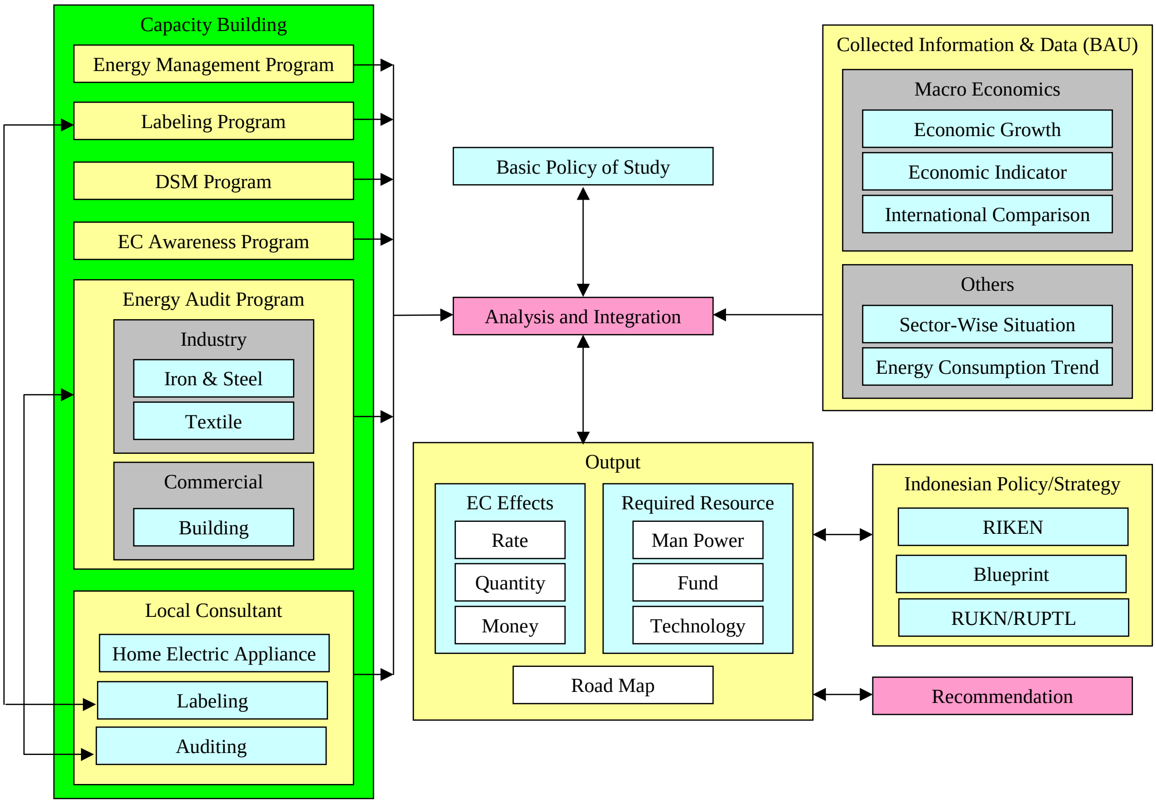


Fig. 1.3.1-1 Work Flow of the Study

1.3.2 Basic Data and Information about Indonesia Required for EC Study of Indonesia

The following data and information were collected and analyzed from the viewpoints of future prospects and strategy establishment.

- Macro economics of Indonesia (trend of economic growth and indicator)

- Energy and consumption trend by sectors
- On going legislation and organization of Indonesia on EE&C
- Activity of international cooperative organizations
- Activity on EE&C in industrial sector and business sector
- Market research on household appliance and industrial equipment which consume huge energy, and potential estimation for amount of EE&C
- Present situation of EE&C implementation on main programs consisting of energy manager, labeling and DSM programs.

1.3.3 Analysis and Integration of Main Programs and Indonesian Data/Information

On the basis of the basic study policy, an analysis of main programs and Indonesian data/information was conducted and integrated. The following output was drawn up and discussed with counterparts.

- Energy conservation effect (target rate, quantity and money)
- Comparison between the EE&C effect and current Indonesian policies and strategies such as RIKEN, Blue Print and RUKN/RUPTL
- Required resources for implementation (manpower, funds and technology)
- Road map and action plan for restructuring Indonesia into an energy conscious country
- Summary of recommendations for promoting energy conservation

CHAPTER 2

BASIC STUDY

Chapter 2 Basic Study

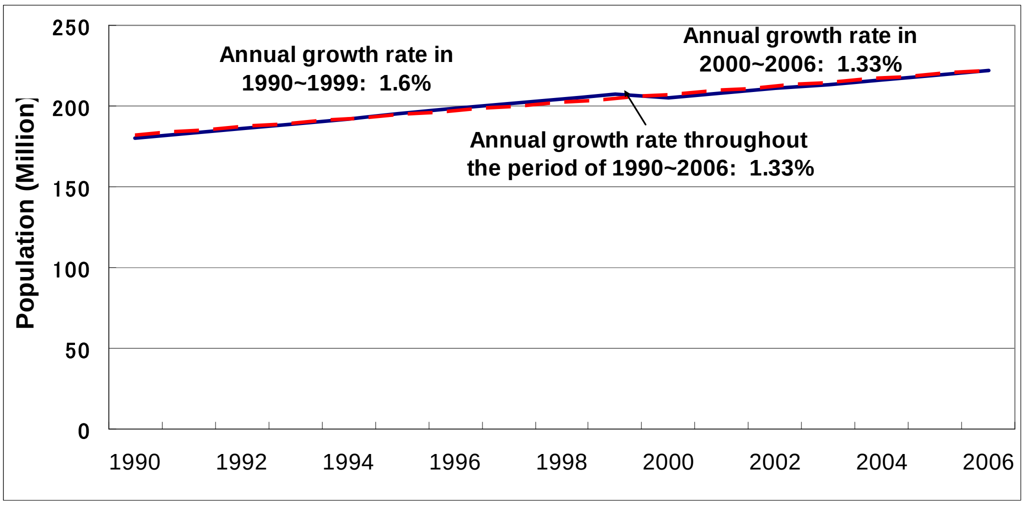
2.1 Social and Economic Conditions

Indonesia is still in the process of recovery from social and economic chaos even after all these years since the end of the Asian financial crisis which broke out in 1997. Generally speaking, major obstacles continuing to retard the country's social and economic development lie in the problems of high unemployment rate, vulnerable infrastructure and financial sectors, unfavorable investment climate, inequitable distribution of resources among districts, and corruption widely accepted as an obstinate social disease, and removing these obstacles requires long lasting efforts by the government.

Nevertheless, signs of positive development in the economy have also appeared since the beginning of 2007. In the political field, the cabinet reshuffle initiated by President Yudhoyono with his core economic team left unchanged inspired public confidence in the government's political and economic policies and to a certain extent contributed to strengthening social stability. In the economic field, the recovery of investment and export is expected to further speed up the annual growth rate of GDP, raising it to above 6% from 5.2% in 2006. Moreover, it is noticeable that the GDP growth contribution ratio of the commercial sector since the Asian financial crisis has been the highest among all sectors, but that of the transportation sector is expected to go up further. Major social and economic indicators will be reviewed below.

2.1.1 Social Situation

(1) Trend of Population Growth

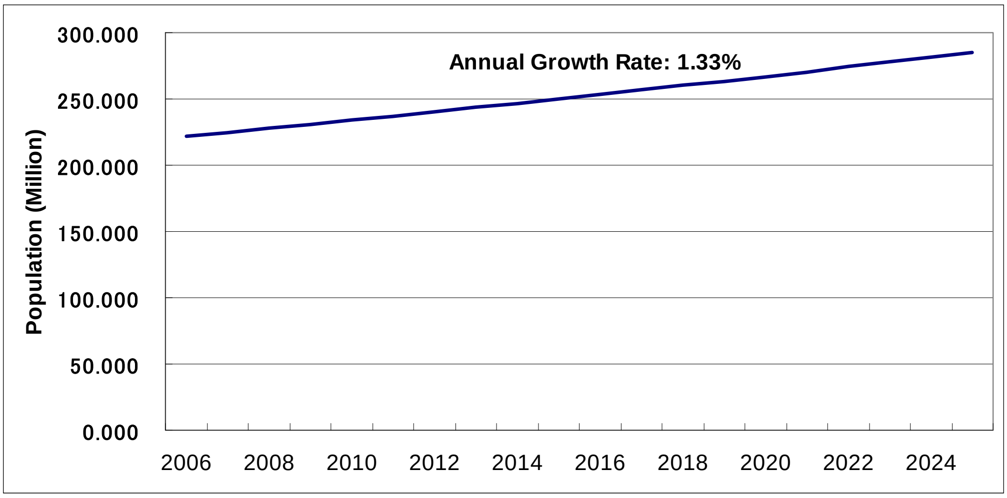


Source: IMF Database

Fig. 2.1.1-1 Trend of Indonesian Population Growth over the Period 1990-2006

The population of Indonesia increased at an average rate of 1.6% from 1990 to 1999, followed by a fall to 1.33% over the period 2000-2006. Throughout the whole period 1990-2006, the population grew from 180 million to 220 million at an average rate of 1.33%. Assuming that the population will keep growing at the same rate in the future, it is expected to reach 290 million in

2025, a 28.5% increase as compared to 2006. Therefore, the demand for energy is expected to increase sharply in the future. (Fig 2.1.1-1, Fig 2.1.1-2)

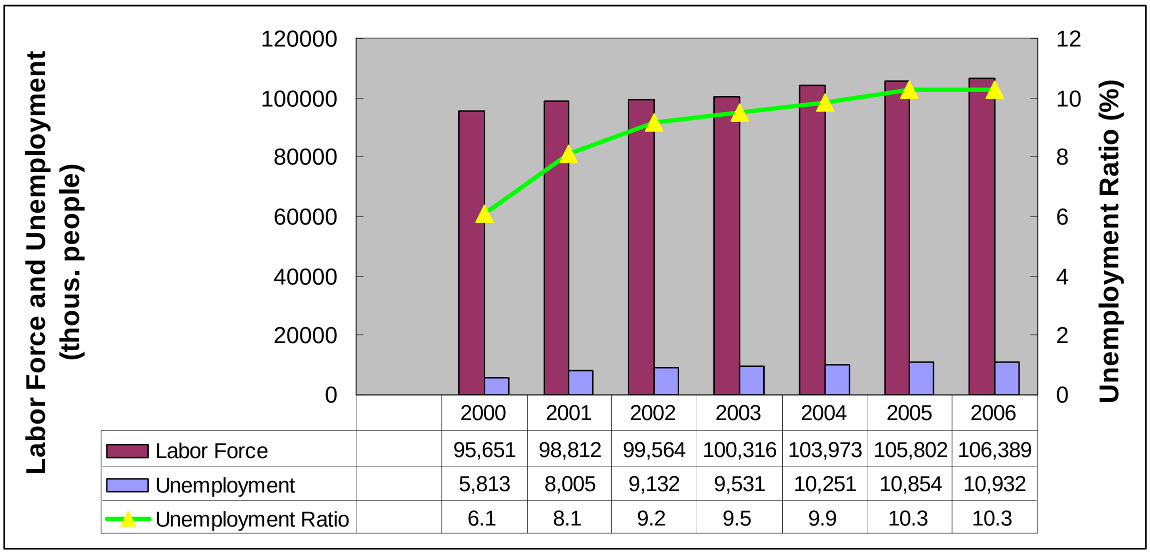


Source: Prediction based on IMF Database

Fig. 2.1.1-2 Prediction of Indonesian Population Growth over the Period 2006-2025

(2) Labor Supply and Unemployment Ratio

Domestic labor supply increased from 95.65 million in 2000 to 106.39 million in 2006. However, owing to the failure of job creation to catch up with the incremental labor supply, unemployment rose from 5.81 million in 2000 to 10.93 million people in 2006, resulting in the unemployment ratio rising from 6.1% to 10.3%.



	2000	2001	2002	2003	2004	2005	2006
Labor Force	95,651	98,812	99,564	100,316	103,973	105,802	106,389
Unemployment	5,813	8,005	9,132	9,531	10,251	10,854	10,932
Unemployment Ratio	6.1	8.1	9.2	9.5	9.9	10.3	10.3

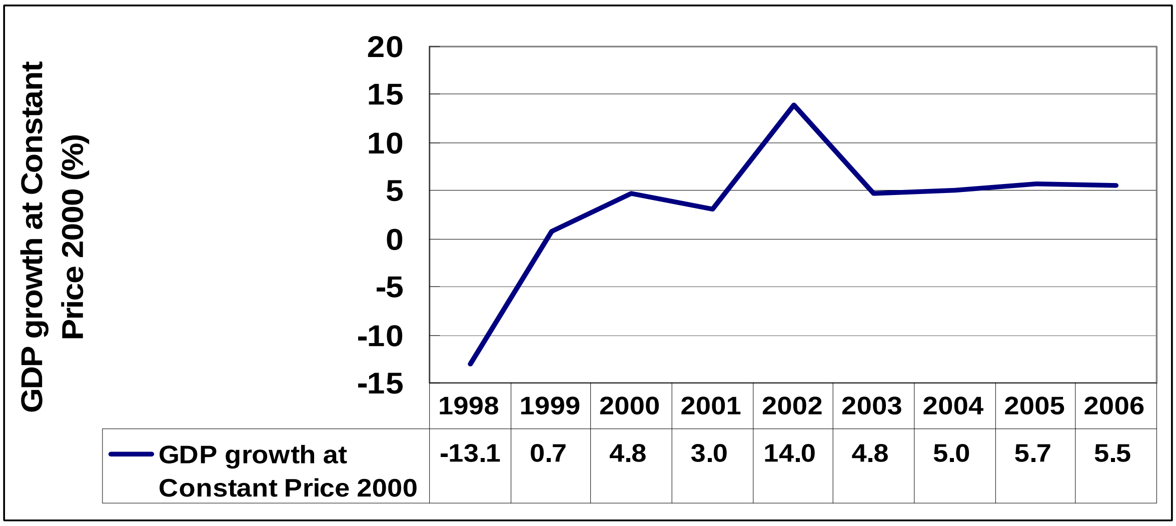
Source：BPS, Statistics Indonesia

Fig. 2.1.1-3 Labor Supply and Unemployment Ratio in 2000-2006

2.1.2 Macroeconomic Situation

(1) Economic Growth

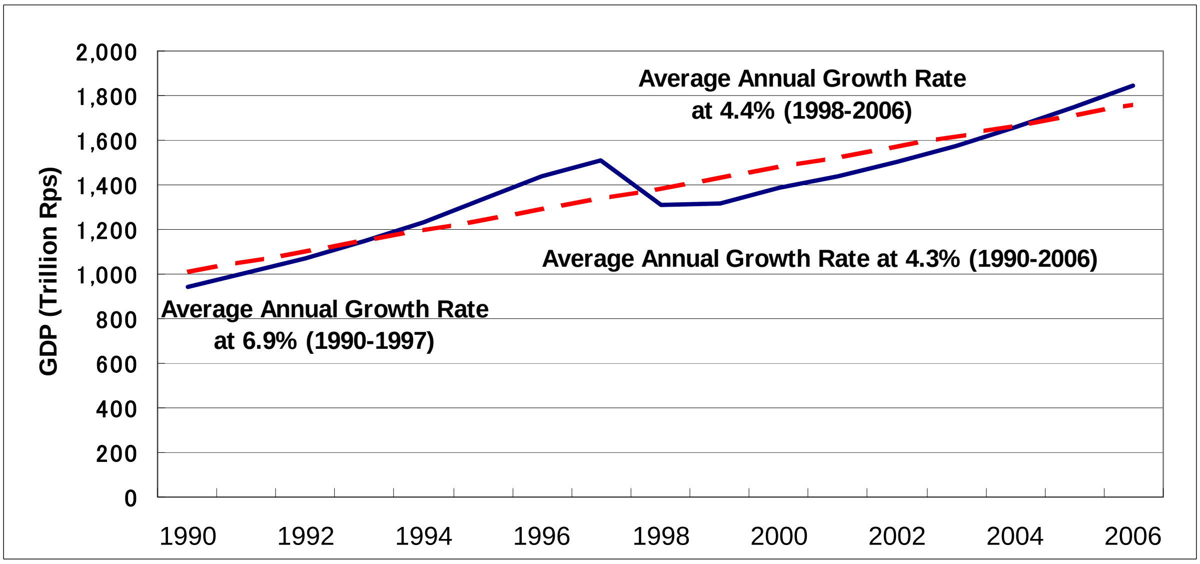
The real growth rate of Indonesian GDP has gradually recovered since the end of the Asian financial crisis, with signs of recovery becoming evident in 2002 and growth having stabilized at the level of 5% and above since 2004. The average growth rate over the period of seven years from 1990 to 1997 was 6.9%, but it fell to 4.4% during the subsequent period from 1998 to 2006, which resulted in the rather low average growth rate of 4.3% throughout the whole period 1990-2006. (Fig 2.1.2-1, 2.1.2-2)



	1998	1999	2000	2001	2002	2003	2004	2005	2006
GDP growth at Constant Price 2000	-13.1	0.7	4.8	3.0	14.0	4.8	5.0	5.7	5.5

Source: Indonesian Statistics Bureau (BPS) and IMF Database

Fig. 2.1.2-1 Real Growth Rate of Indonesian GDP (Base Year: 2000）



Source: Statistical Data of 2007 from Indonesian Statistical Bureau (BPS)

Fig. 2.1.2-2 Trend of Indonesian Real GDP Growth (Base Year: 2000)

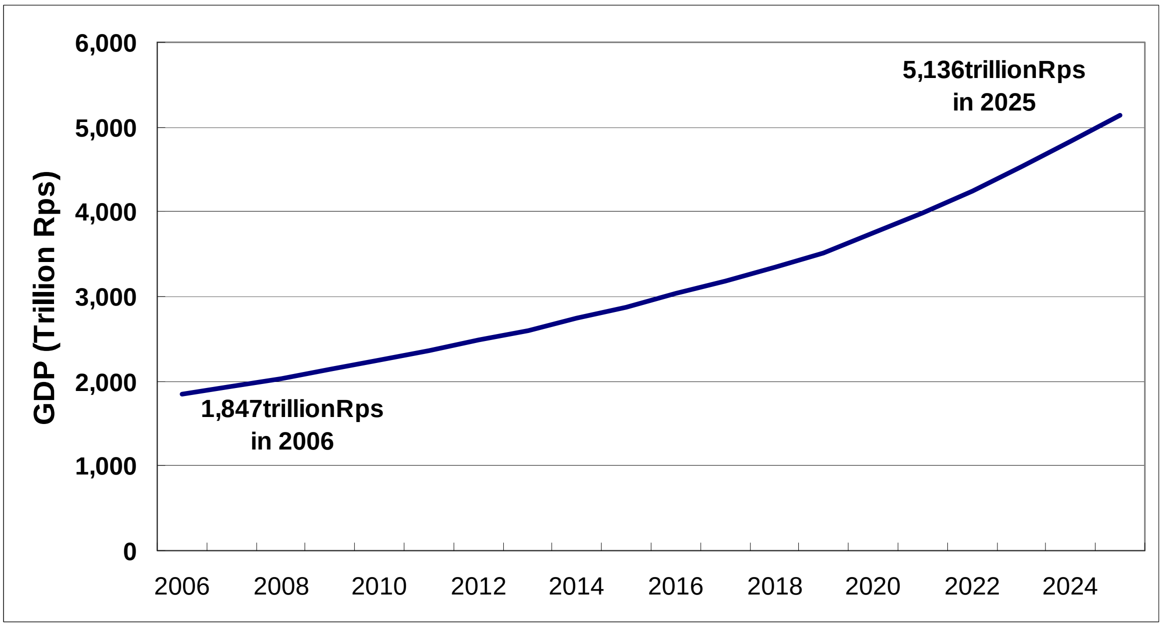
When drawing up RIKEN, the energy master-plan, the policy-makers set the indicators of economic growth rate throughout the period 2005-2025 as shown in Table 2.1.2-1.

Table 2.1.2-1 Indicators of Indonesian Economic Growth Rate with RIKEN (2005-25)

	2005	2010	2015	2020	2025
GDP Growth rate	4.92%	5.13%	5.13%	6.51%	6.51%

Source: MEMR (BPPT 2002) data

On the basis of the abovementioned indicators, Indonesian GDP growth from 2006 through 2025 can be depicted as Fig. 2.1.2-3, which indicates that the size of GDP in 2025 is expected to be 2.8 times that of 2006.

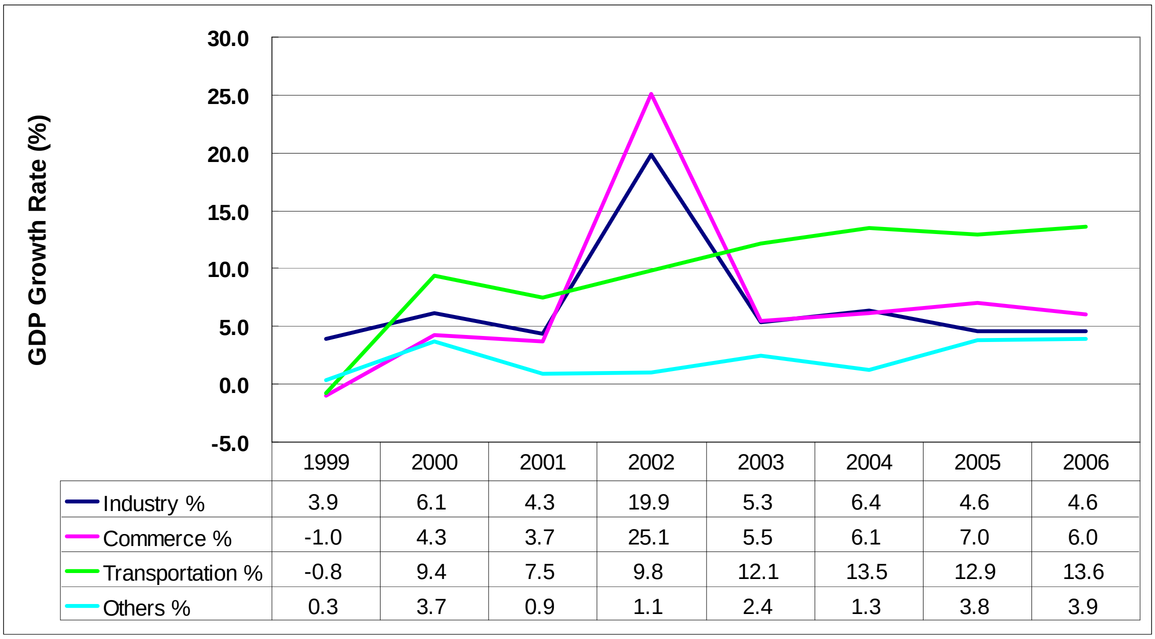


Source: Projection based on the GDP growth rates projected in RIKEN

Fig. 2.1.2-3 Projection of Future Indonesian GDP Growth (2006-2025)

(2) Sectoral GDP Growth and Contribution Ratio

As reflected in Fig.2.1.2-4, annual GDP growth in major sectors has shown robust recovery since 2002, with the growth rates of industry and commerce rising sharply to 19.9% and 25.1% respectively. However, when looking at the average growth rate throughout 1998-2006, the transportation sector registers the highest growth of 9.7%, well above 6.9% of commerce and 6.8% of industry. The growth rate of transportation kept on rising even after 2002, showing a tendency of acceleration of growth.



	1999	2000	2001	2002	2003	2004	2005	2006
Industry %	3.9	6.1	4.3	19.9	5.3	6.4	4.6	4.6
Commerce %	-1.0	4.3	3.7	25.1	5.5	6.1	7.0	6.0
Transportation %	-0.8	9.4	7.5	9.8	12.1	13.5	12.9	13.6
Others %	0.3	3.7	0.9	1.1	2.4	1.3	3.8	3.9

Source: Projection based on the GDP growth rates projected in RIKEN

Fig. 2.1.2-4 Indonesian GDP Growth by Sector (2006-2025)

Contribution to the overall GDP growth by sector expressed in the contribution degree and contribution ratio is presented in Table 2.1.2-2. The overall GDP in 2006 had increased by 52.1% as compared with that in 1998, and the degrees of contribution to the growth by respective sectors are 17.3% for industry, 22.2% for commerce, 5.4% for transportation and 7.2% for the other sectors. By dividing these values by the overall growth rate of 52.1%, the contribution ratios of the respective sectors are 33.2%, 42.6%, 10.3%, and 13.9%. The results are also reflected in Fig. 2.1.2-4, which reveals that the highest contribution ratio to the overall GDP growth since the close of the Asian financial crisis has come from the commercial sector. Nevertheless, as stated previously, owing to the accelerated growth of the transportation sector after 2003, the contribution ratio to the overall GDP growth by this sector is expected to go up further in the future.

Table 2.1.2-2 Contribution Degree and Contribution Ratio by Sector to the Incremental GDP over the Period 1998-2006

Item / Sector	GDP in 1998 (Billion Rp)	GDP in 2006 (Billion Rp)	Incremental GDP in 1998-2006 (Billion Rp)	Contribution Degree (%)	Contribution Ratio (%)
Industry	304,197	514,202	210,005	17.3	33.2
Commerce	383,526	653,068	269,542	22.2	42.6
Transportation	59,464	124,419	64,954	5.4	10.3
Others	467,354	554,971	87,617	7.2	13.9
Total	1,214,541	1,846,659	632,118	52.1	100.0

Source: Based on BPS statistic data of 2007

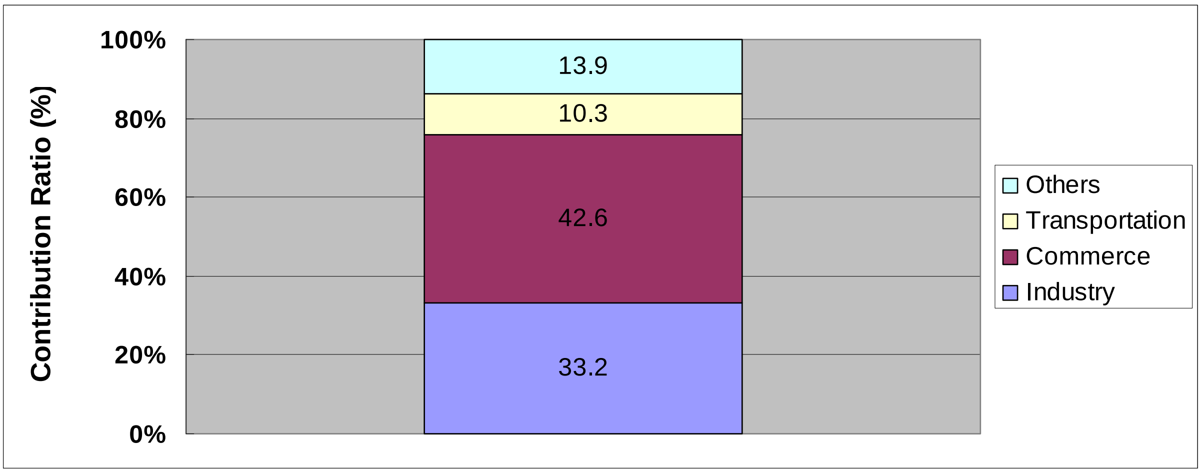
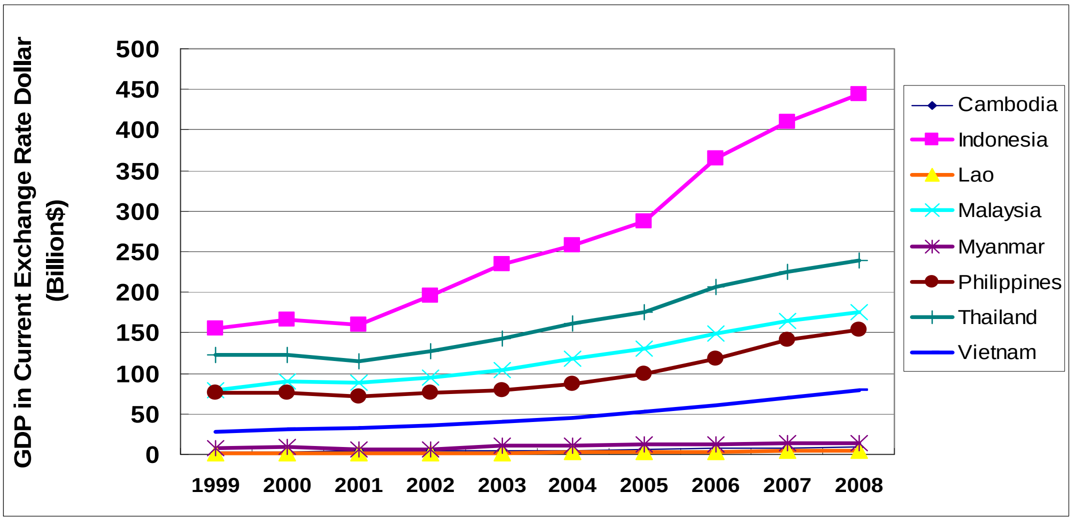


Fig. 2.1.2-5 Contribution Ratio by Sector to the Incremental GDP over the Period 1998-2006

(3) Comparison of Macroeconomic Data with the Surrounding Countries

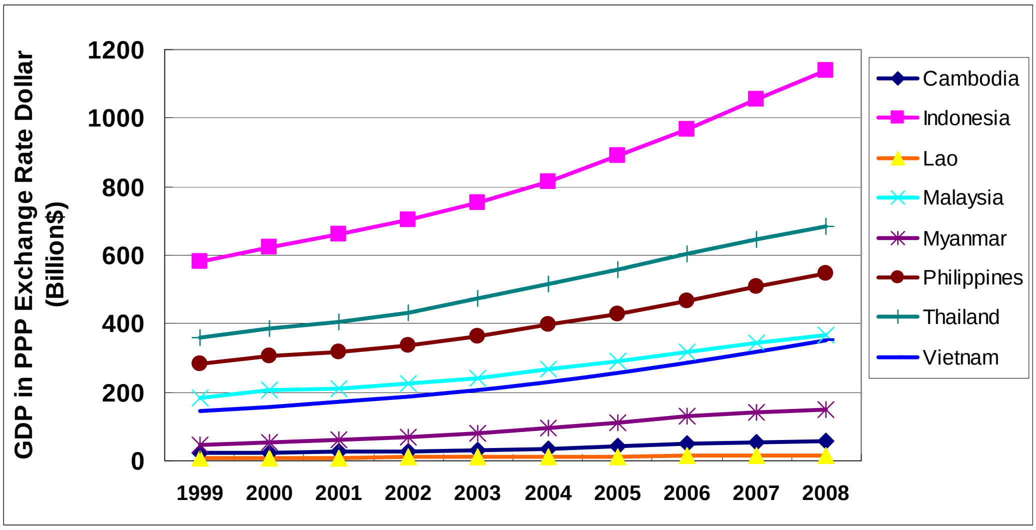
1) Comparison of Total Scale of Economy



Source: International Monetary Fund, World Economic Outlook Database, October 2007
Note: The values of 2007 and 2008 were given by forecast.

Fig. 2.1.2-6 Total GDP Compared with the Neighboring Countries (in Current Exchange Rate Dollars)

As far as total scale of the economy expressed in GDP is concerned, Indonesia occupies the top position among ASEAN whether in terms of current exchange rate dollars or purchasing power parity (PPP) exchange rate dollars. When expressed in current exchange rate dollars, the total Indonesian GDP in 2006 was $364.24 billion, which is 1.8 times that of Thailand and 107 times that of Laos. When expressed in PPP exchange rate dollars, it is $967.32 billion, being 1.6 times that of Thailand and 69 times that of Laos. (Fig. 2.1.2-6, 2.1.2-7)

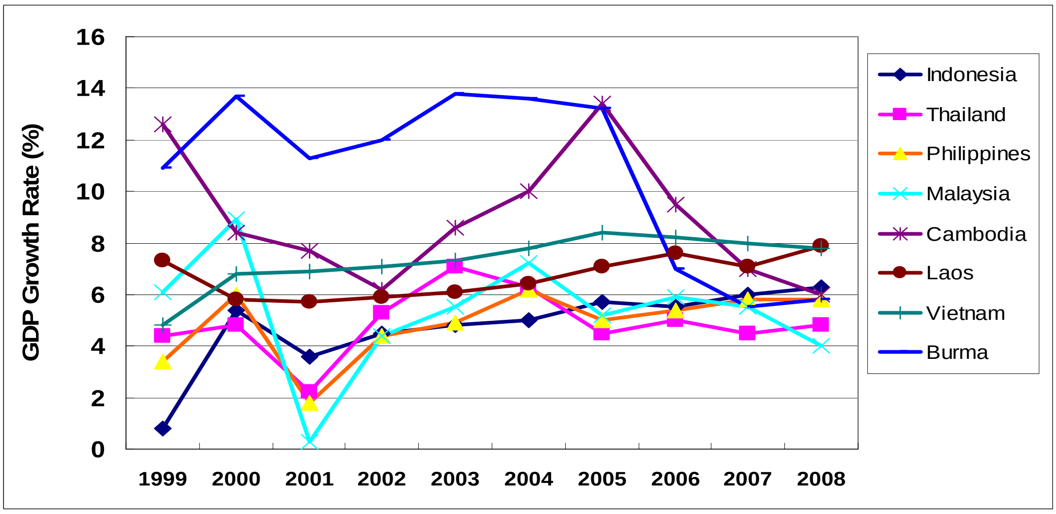


Source: International Monetary Fund, World Economic Outlook Database, October 2007
Note: The values of 2007 and 2008 were given by forecast

Fig. 2.1.2-7 Total GDP Compared with the Neighboring Countries (in PPP Exchange Rate Dollars)

2) Comparison of GDP Growth Rate

Though the Indonesian economy started to recover from 2002, its GDP growth rate in recent years has been lower than that of the newcomers of ASEAN, i.e, Cambodia, Burma, Vietnam and Laos, almost at the same level as the better developed countries such as Thailand, Malaysia and the Philippines. But, as a result of a possible slowdown in the abovementioned newly emerging countries' growth in 2007 and 2008, the difference between Indonesia and these countries is expected to narrow. (Fig. 2.1.2-8)

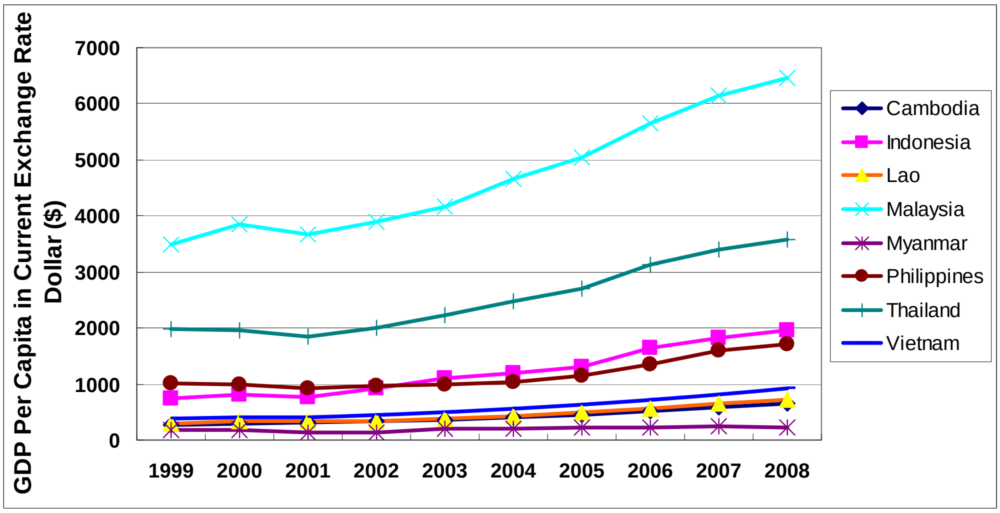


Source: International Monetary Fund, World Economic Outlook Database, October 2007
Note: The values of 2007 and 2008 were given by forecast.

Fig. 2.1.2-8 GDP Growth Rate Compared with the Neighboring Countries

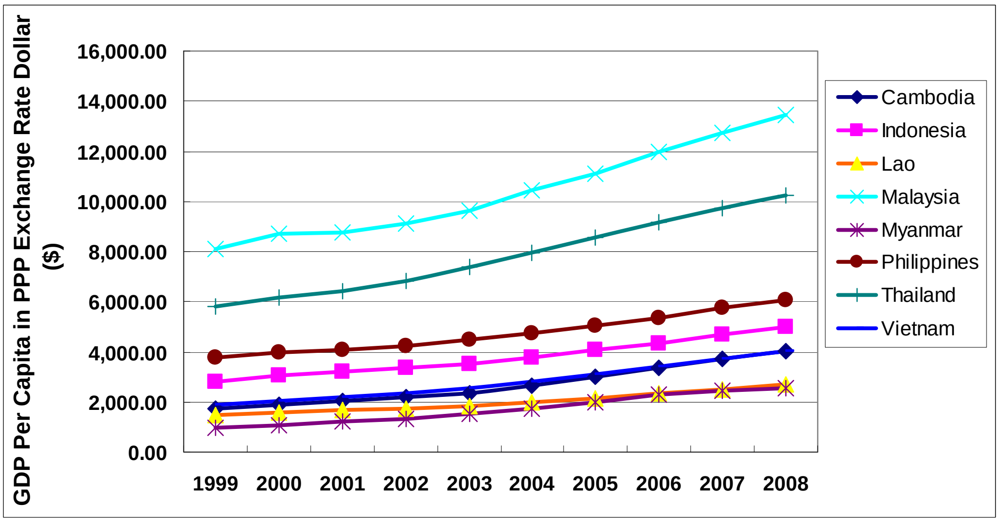
3) Comparison of GDP Per Capita

Indonesian GDP per capita in current exchange rate dollars in 2006 remained at the level of $1,640, which, though higher than the Philippines' $1,352, when compared with the better developed countries of ASEAN, it was only 29% of Malaysia's $6,456 and 52% of Thailand's $3,138. When looking at the newcomers of ASEAN, GDP per capita of Indonesia was 3.2 times Cambodia's $513, 2.9 times Laos's $570, 7.1 times Burma's $232, and 2.3 times Vietnam's $723. (Fig. 2.1.2-9)



Source: International Monetary Fund, World Economic Outlook Database, October 2007
Note: The values of 2007 and 2008 were given by forecast.

Fig. 2.1.2-9 GDP Per Capita Compared with the Neighboring Countries (in Current Exchange Rate Dollars)



Source: International Monetary Fund, World Economic Outlook Database, October 2007
Note: The values of 2007 and 2008 were given by forecast.

Fig. 2.1.2-10 GDP Per Capita Compared with the Neighboring Countries (In PPP Exchange Rate Dollars)

When adopting the PPP exchange rate dollar for comparison, however, the difference among ASEAN evidently becomes narrower. On the one hand, Indonesian GDP per capita in PPP exchange rate dollars increases to $4,356, accounting for 36.4% of that of Malaysia, and on the other, its ratio to those of Cambodia, Laos, Burma and Vietnam falls to 1.4:1, 1.9:1, 1.9:1 and 1.3:1. (Fig. 2.1.2-10)

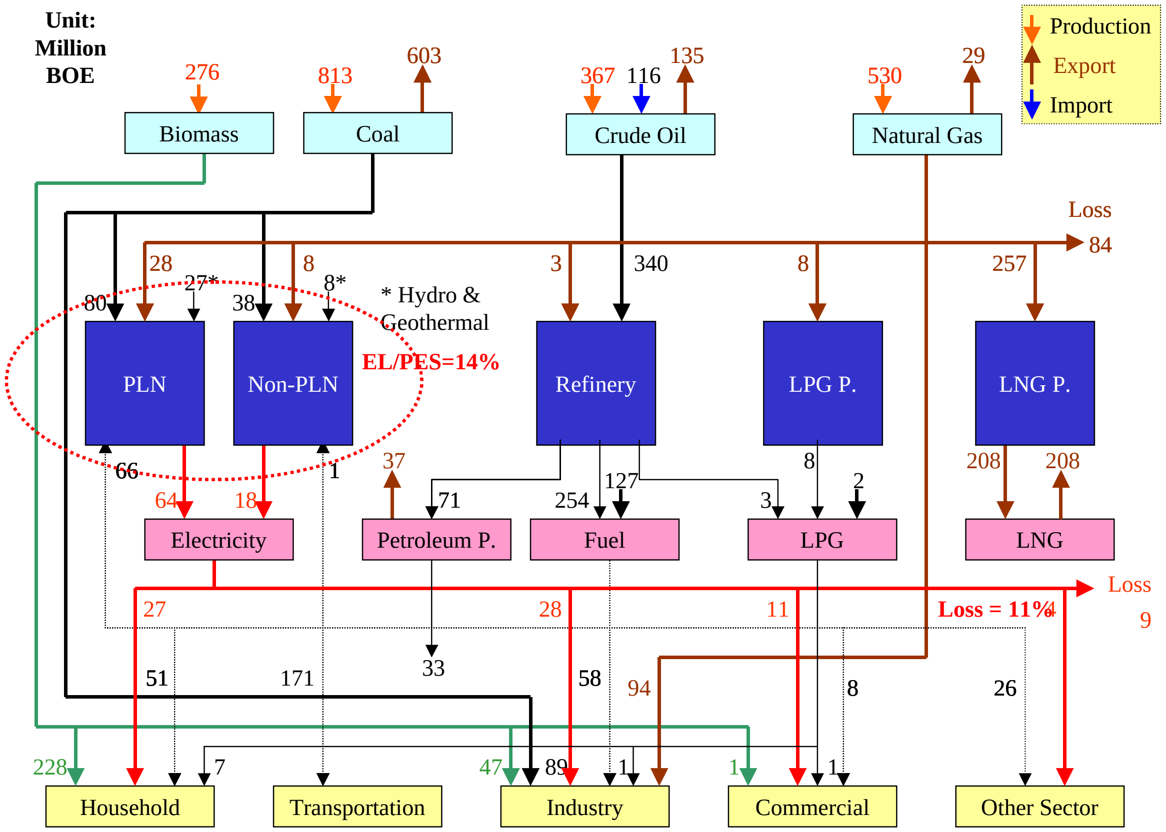
2.2 Energy Situation

2.2.1 Energy Supply and Demand

(1) Macro Energy Flow

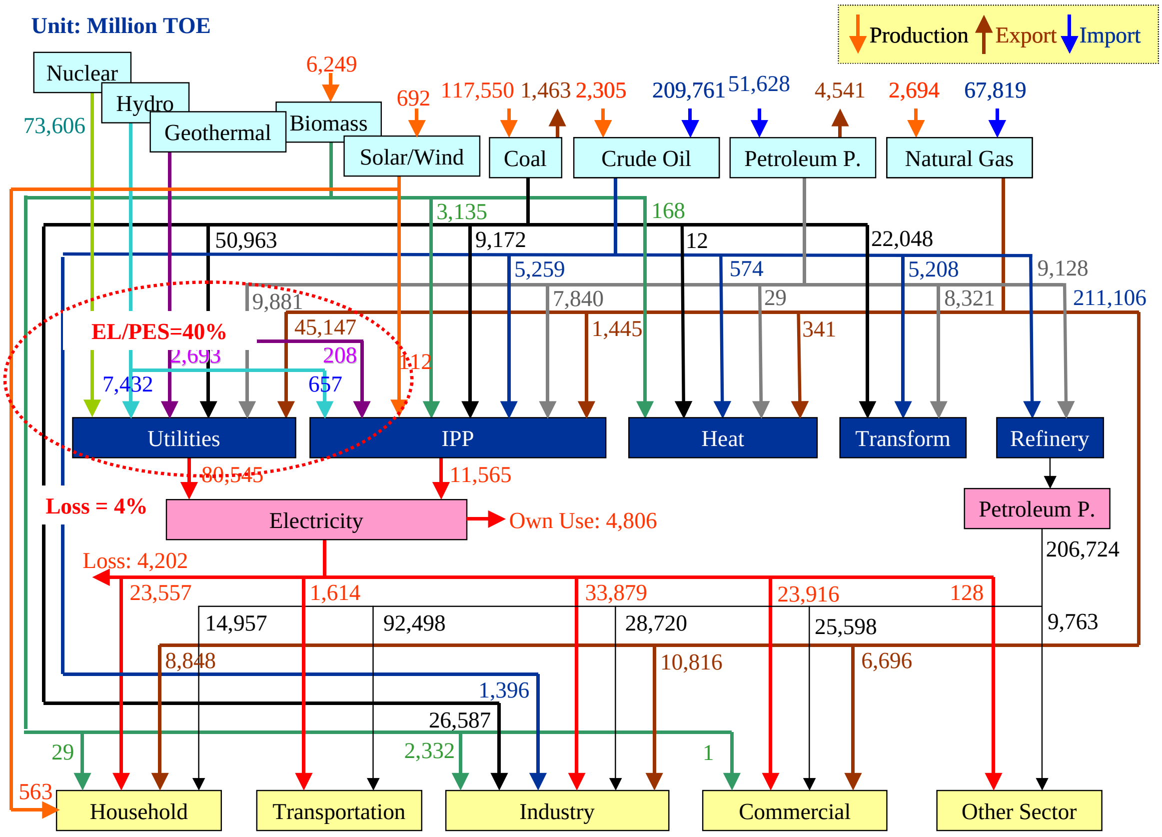
Fig 2.2.1-1 shows macro energy flow of Indonesia in 2004. The features of the macro flow are as follows.

- Main sources of energy are crude oil, natural gas, biomass and coal.
- Biomass is mainly used as fuel in households.
- Coal is used in power generation and the industrial sector.
- Crude oil is refined in refineries for further downstream utilization.
- Natural gas is transformed in power generation, refineries and LPG/LNG plants and used in the industrial sector.
- Power generation plants consume about 14% of the total energy supply of Indonesia (Japan 40%).
- Total of electricity distribution and transmission loss and own use by power plants is about 11% (Japan 4%).



Source: IEA Energy Balance of Non-OECD Countries 2006

Fig. 2.2.1-1 Energy Macro Flow of Indonesia in 2004

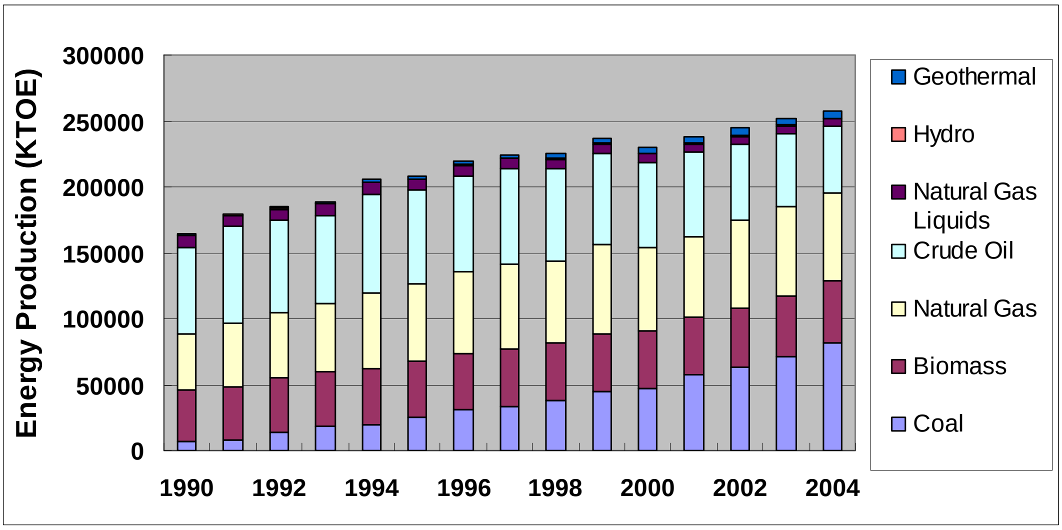


Source: IEA Energy Balance of OECD Countries 2006

Fig. 2.2.1-2 Energy Flow of Japan in 2004 (Reference)

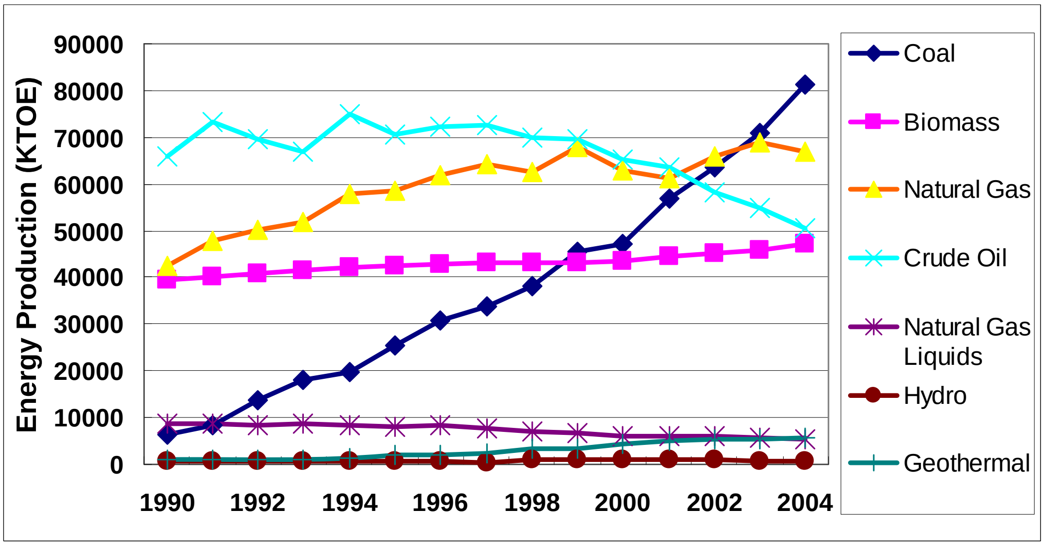
2.2.2 Energy Production and Energy Supply

(1) Energy Production



Source: IEA Non-OECD Countries Energy Balance 2005

Fig. 2.2.2-1 Indonesian Energy Production (1)



Source: IEA Non-OECD Countries Energy Balance 2005

Fig. 2.2.2-2 Indonesian Energy Production (2)

Annual energy production in Indonesia rose to 263,390 KTOE in 2005 from 164,656 KTOE in 1990, registering a moderate annual average growth of 3.18% for the whole period of 15 years.

Regarding the structure of energy production in terms of proportion by energy source, crude oil had always been taking the top place from 1990 to 2001, and was overtaken by natural gas in 2002, which was then replaced in turn by coal. Specifically, the share of crude oil decreased gradually from 40.07% in 1990 to 23.74% in 2002, and fell further to 19.55% in 2004. On the other hand, the share of coal rose from 3.92% in 1990 to 28.1% in 2003, and further to 31.55% in 2004, and similarly, that of natural gas increased from 0.33% in 1990 to 26.92% and further to 27.31% in 2003.

The abovementioned structural change owes a lot to the tendency of increasing domestic consumption of coal and natural gas.

(2) Energy Supply[1]

The total Indonesian primary energy supply had risen from 97,570 KTOE in 1990 to 179,512 KTOE in 2005, with an annual average growth of 4.15%.

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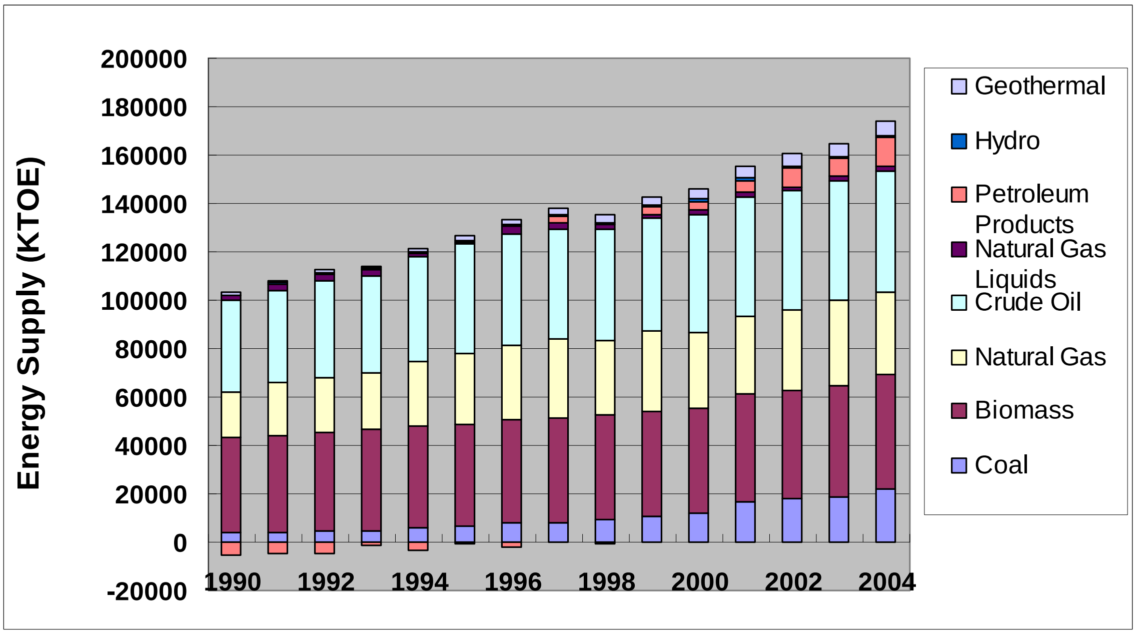
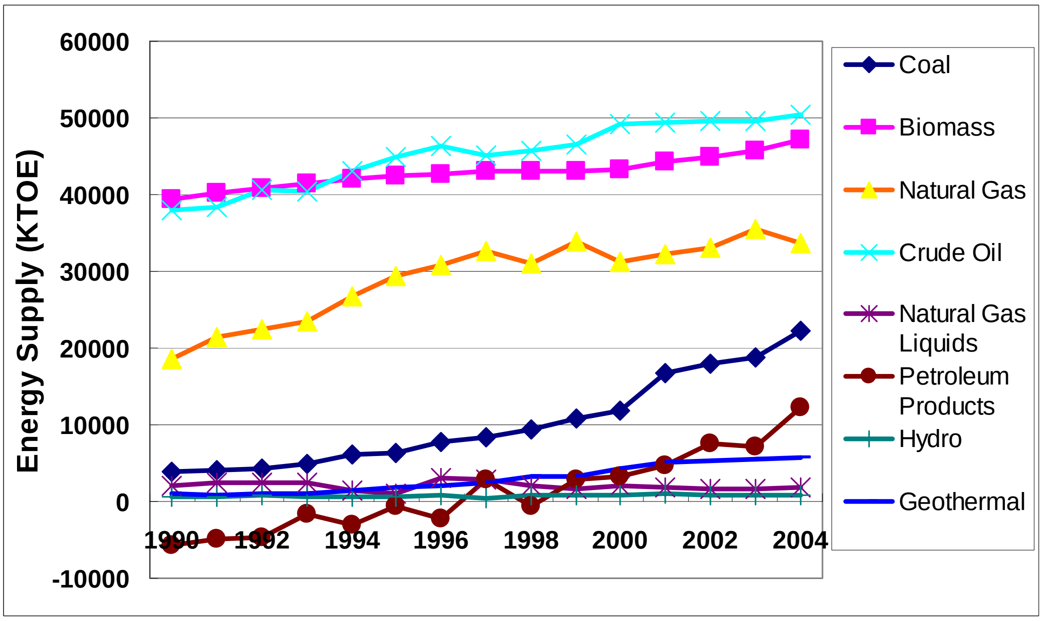
[1] Total Primary Energy Supply=Indigenous production + imports - exports - international marine bunkers ± stock changes (IEA Energy Statistics)



Source: IEA Non-OECD Countries Energy Balance 2005

Fig. 2.2.2-3 Indonesian Energy Supply (1)



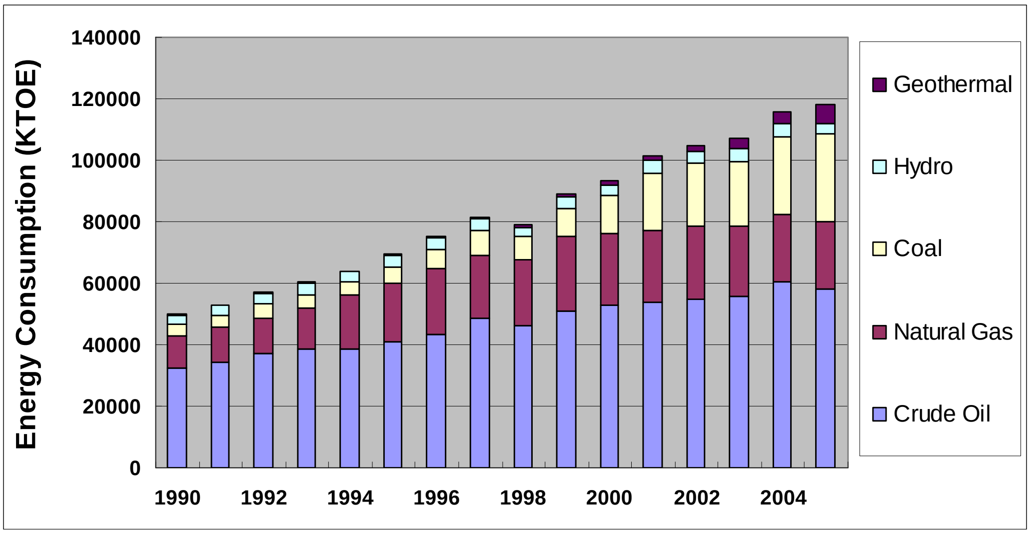
Source: IEA Non-OECD Country Energy Balance 2005

Fig. 2.2.2-4 Indonesian Energy Supply (2)

With regard to the structural change in energy supply, a major change happened in 1994 when crude oil replaced biomass as the top source of energy supply. It is also worth pointing out that the share of coal and petroleum products increased remarkably during the period 2000-2004, with the share of coal growing from 8.1% to 12.79%, and petroleum products from 2.27% to 7.07%. However, crude oil, biomass and natural gas remained the top three sources of energy supply in 2004.

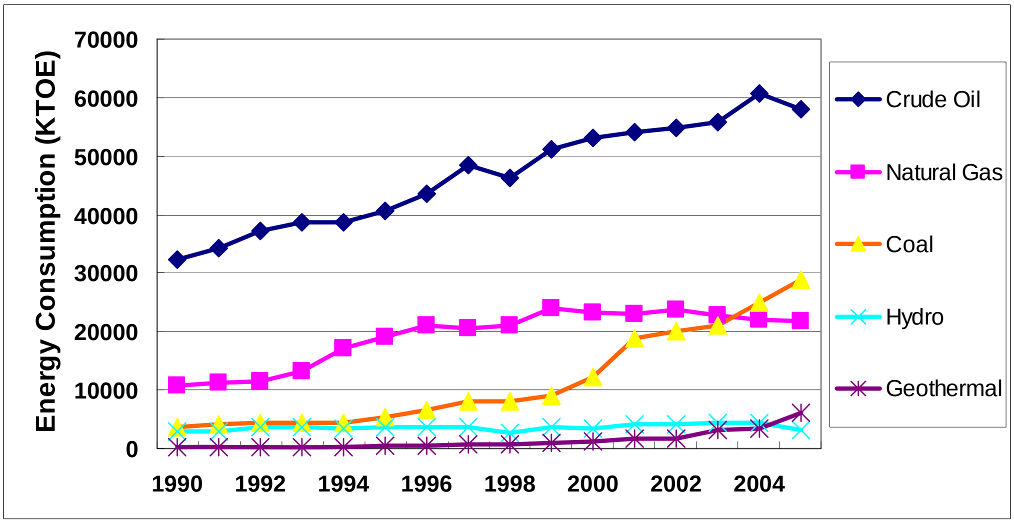
2.2.3 Energy Consumption

The primary energy consumption of Indonesia increased from 47,481 KTOE[2] in 1990 to 112,252 KTOE in 2005, with the annual average growth reaching 5.9%. During this period, though the consumption of oil remained the biggest in the energy mix, its proportion in the total energy consumption fell from 64.4% to 49.2%. The consumption of coal increased from 7.6% to 24.4%, advancing from the 3rd to the 2nd place. At the same time, the consumption of natural gas decreased from 21.6% to 18.5%, and its position in the energy mix slipped from the 2nd to the 3rd place. With regard to renewable energies, whereas hydro decreased from 5.9% to 2.7%, geothermal grew remarkably from 0.6% to 5.2%. Regarding future prospects of energy consumption, it is expected to increase by several % annually, keeping pace with the increase of GDP. This will be described in detail in Chapter 4.



Source: MEMR data

Fig. 2.2.3-1 Indonesian Energy Consumption (1)



Source: MEMR data

Fig. 2.2.3-2 Indonesian Energy Consumption (2)

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[2] . As the data of energy consumption provided by MEMR are expressed in BOE units, the conversion rate of 1 BOE=0.133 TOE calculated on the basis of the book of statistics published by the Indonesian government was used to convert the BOE units of the data into TOE units. The conversion rate is also used in all other cases in this report to convert BOE to TOE units.

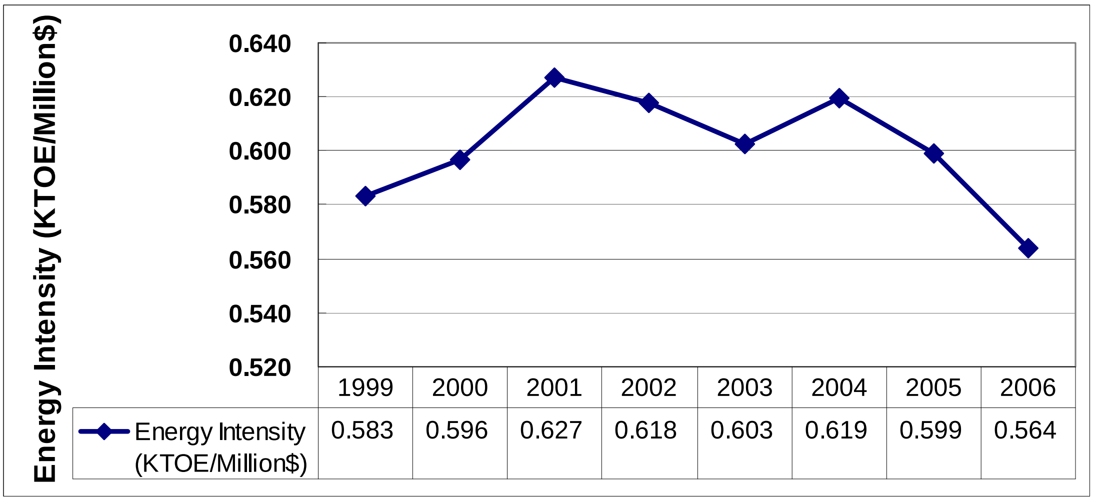
2.2.4 Energy Intensity and Energy Elasticity

(1) Energy Intensity

1) Economy-wide Energy Intensity

According to the definition given by the UN Department of Economic and Social Affairs, energy intensity indicates the amount of energy necessary to produce one unit of economic output, usually expressed in the ratio of energy used to GDP. In this regard, it can also be called “aggregate energy intensity”, or “economy-wide energy intensity”[3].

The figures for economy-wide energy intensity tentatively calculated by using the macroeconomic data published by IMF and the energy data provided by MEMR are presented in Fig 2.2.4-1. The figure shows that the volume of energy consumption needed to produce 1 dollar worth of GDP rose form 0.583 KTOE from 1999 to 0.627 KTOE in 2001, followed by a fall to 0.603 KTOE in 2003. Then it went up again to 0.619 KTOE in 2004. The value of Indonesian energy intensity in 2004 was more than 5 times that of Japan (0.115 KTOE/million$)[4]. Although this value fell to 0.564 KTOE in 2006, it was still nearly 5 times that of Japan, indicating evidently a great potential for Indonesia to promote energy conservation.



	1999	2000	2001	2002	2003	2004	2005	2006
Energy Intensity (KTOE/Million$)	0.583	0.596	0.627	0.618	0.603	0.619	0.599	0.564

Source: The IMF “International Financial Statistics”; MEMR Data

Note: The current exchange rate of $1=Rp 9,385 as of 2000 was used to convert the unit of GDP value into the dollar.

Fig. 2.2.4-1 Indonesian Economy-wide Energy Intensity

2) Energy Intensity of Industrial Sector

The energy intensity of the industrial sector in Indonesia is shown in Fig 2.2.4-2 on the basis of statistical data provided by MEMR. The curve indicates that even though the energy

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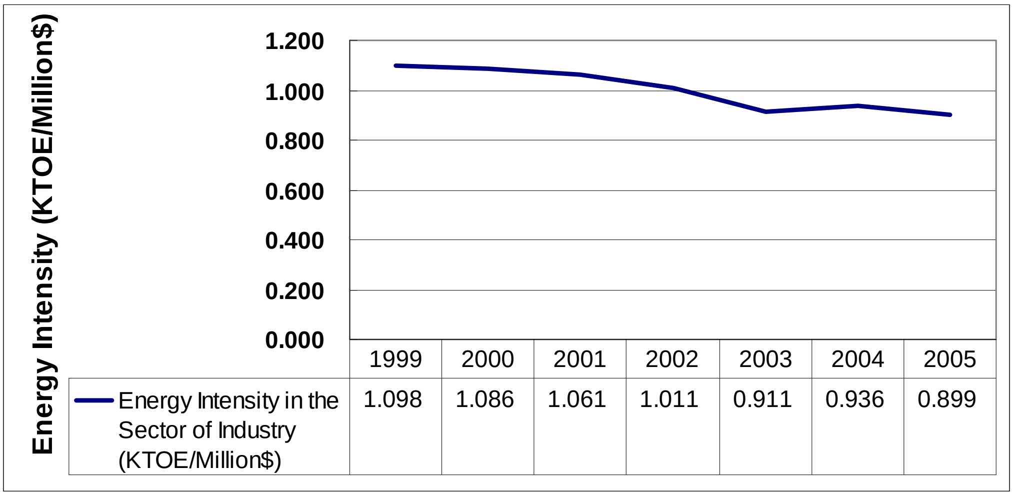
[3] http://www.un.org/esa/sustdev/natlinfo/indicators/isdms2001/isd-ms2001economicB.htm

[4] Shigeru Suehiro, *Energy Intensity per GDP as a Energy Conservation Indicator*（“IEEJ” June 2007 Edition）

intensity of this sector expressed as the ratio of energy consumption to GDP of Rp1 million fell from 1.098 in 1999 to 0.899 in 2005, it was still well above the level of the foregoing "economy-wide energy intensity". This evidently indicates the seriousness of inefficiency of energy consumption in the industrial sector. But it should be borne in mind that the meaning of "industry" here is confined to the manufacturing sector exclusive of mining and other non-manufactures. The term "industrial sector" used in this report means "manufacturing sector" in all cases unless an explanatory note is appended.



	1999	2000	2001	2002	2003	2004	2005
Energy Intensity in the Sector of Industry (KTOE/Million$)	1.098	1.086	1.061	1.011	0.911	0.936	0.899

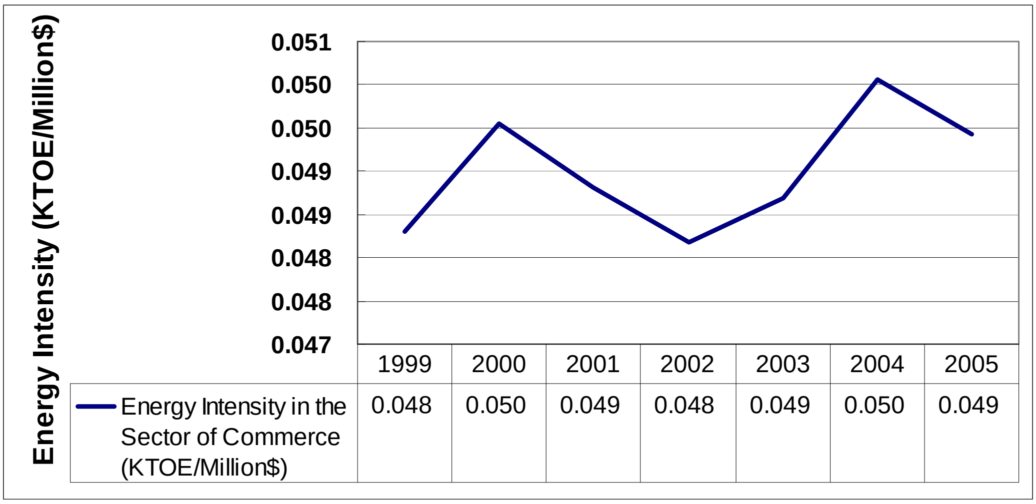
Source: MEMR Data

Note: The current exchange rate of $1=Rp 9,385 as of 2000 was used to convert the unit of GDP value into the dollar.

Fig. 2.2.4-2 Energy Intensity of Industrial Sector in Indonesia

3) Energy Intensity of Commercial Sector

The energy intensity of the commercial sector as seen in Fig 2.2.4-3 was based on the same source of information as that of the industrial sector. The curve shows that energy consumption needed for the creation of Rp1 million GDP in the commercial sector in the period 1999-2005 fluctuated within the range of 0.048-0.050 KTOE. It is noticeable that values of energy intensity in the commercial sector are much smaller than those in the industrial sector.



	1999	2000	2001	2002	2003	2004	2005
Energy Intensity in the Sector of Commerce (KTOE/Million$)	0.048	0.050	0.049	0.048	0.049	0.050	0.049

Source: MEMR Data

Note: The current exchange rate of $1=Rp 9,385 as of 2000 was used to convert the unit of GDP value into the dollar.

Fig. 2.2.4-3 Energy Intensity of Commercial Sector in Indonesia

4) Defects found in the Indicator of Energy Intensity and the View of the Study Team

In spite of the fact that the indicator of energy intensity is now commonly used by countries all over the world, it is by no means an ideal indicator of energy efficiency or sustainability of energy consumption, as is frequently pointed out. Major defects of this indicator can be listed as follows:

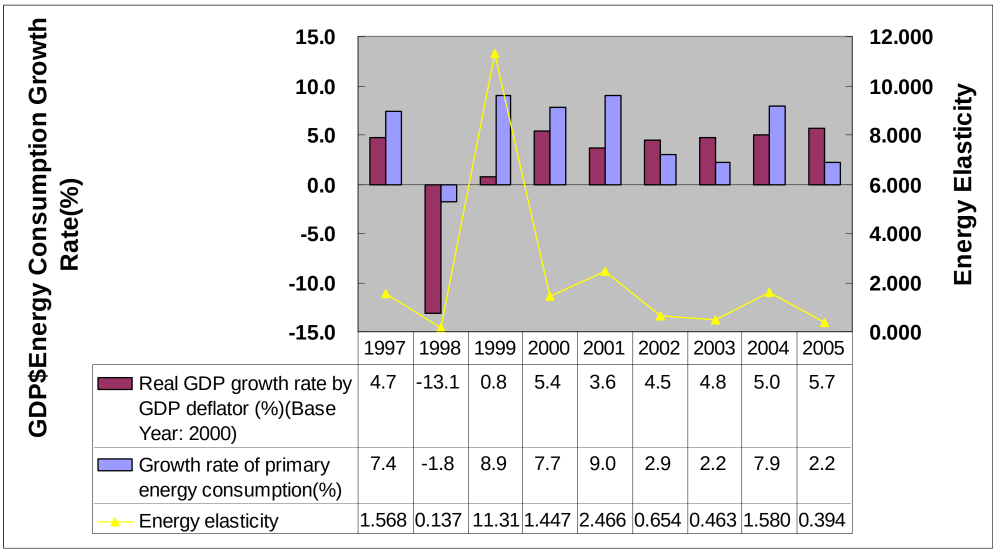
- Susceptibility to Changes in the Economic Structure and Sectoral Energy Intensities
- Increase of national electrification is good for national economy, but also links to increase the value of Energy Intensity more comprehensive Indications should be considered.
- Geographical Factors Influencing the Comparison of Energy Intensity among Countries
- Difference of Energy Sources Confusing the Interpretation of Energy Intensity

In the light of the abovementioned defects in the indicator of economy-wide energy intensity, it has become a common knowledge shared by members of the Study Team and MEMR that the calculation of energy intensity at the level of sector or even sub-sector is more important.

(2) Energy Elasticity

1) Energy Elasticity of Indonesia

Although energy elasticity and energy intensity are both indicators showing the relationship between energy consumption and economic output, while “energy intensity” is a concept with implication of “average”, “energy elasticity” is a concept implying “marginality”. In other words, energy elasticity indicates the ratio of percentage change in energy use associated with one percent change in economic activity.



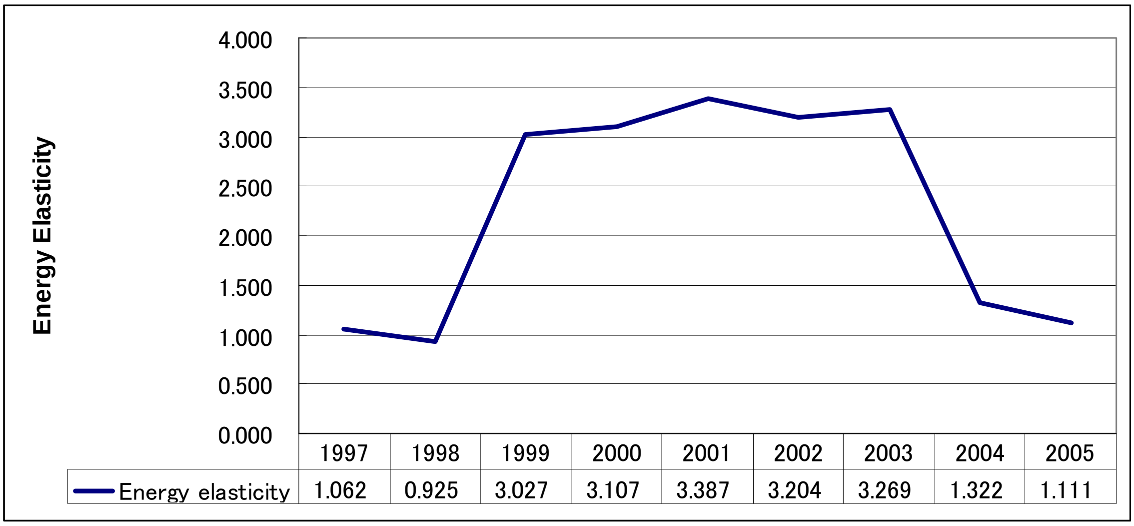
	1997	1998	1999	2000	2001	2002	2003	2004	2005
▆ Real GDP growth rate by GDP deflator (%)(Base Year: 2000)	4.7	-13.1	0.8	5.4	3.6	4.5	4.8	5.0	5.7
▆ Growth rate of primary energy consumption(%)	7.4	-1.8	8.9	7.7	9.0	2.9	2.2	7.9	2.2
▲ Energy elasticity	1.568	0.137	11.31	1.447	2.466	0.654	0.463	1.580	0.394

Source: The IMF "International Financial Statistics"; MEMR data

Fig. 2.2.4-4 Energy Elasticity of Indonesia

The values of energy elasticity of Indonesia seen in Fig 2.2.4-4 are based on the macroeconomic data published by IMF and the energy data by MEMR. They reveal that the indicator fluctuated widely in the period between 1997 and 2005. It should be noticed that the volatility of the values resulting from calculation based on respective single-year data is inevitable, and the economic condition of Indonesia in the period 1997-2005 was in the process of recovery from the Asian financial crisis which broke out in 1997.

2) Energy Elasticity of Indonesia Given by Adopting the Moving Average Method



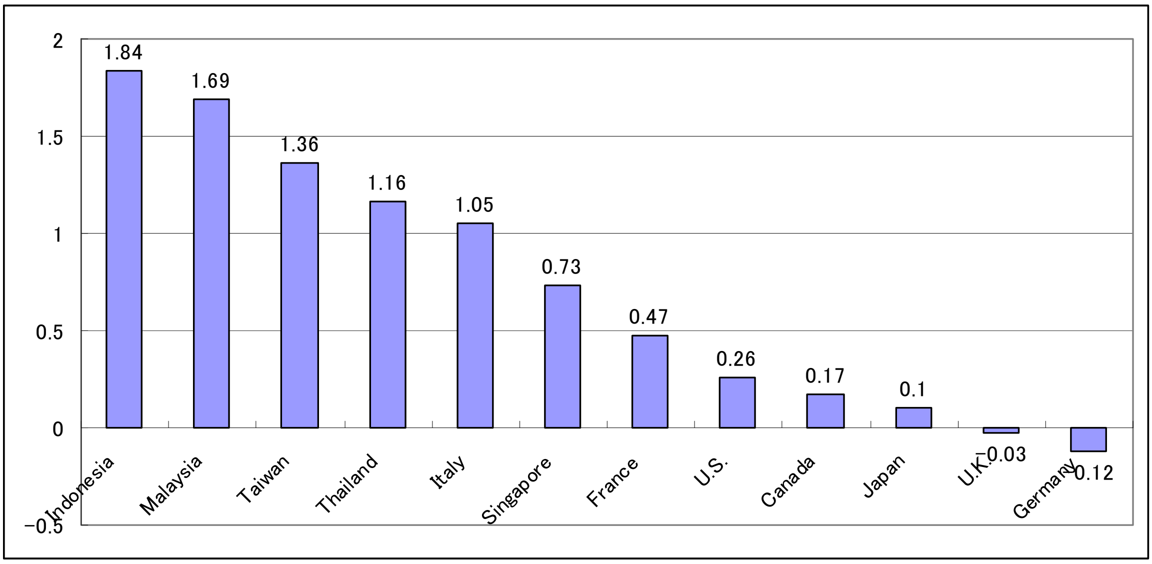
	1997	1998	1999	2000	2001	2002	2003	2004	2005
▬ Energy elasticity	1.062	0.925	3.027	3.107	3.387	3.204	3.269	1.322	1.111

Source: The IMF "International Financial Statistics"; MEMR data

Fig. 2.2.4-5 Energy Elasticity of Indonesia in 5-year Moving Average

In view of the foregoing problem, recalculation was made on the values of Indonesian energy elasticity by adopting the method of 5-year moving average. The results given in this way are revealed in Fig 2.2.4-5, which reflects that the 5-year moving average of energy intensity rose sharply from 0.93 in 1998 to 3.03 in 1999, remaining stable above 3.0 until 2004, when it fell sharply to 1.32 and further down to 1.11 in 2005.

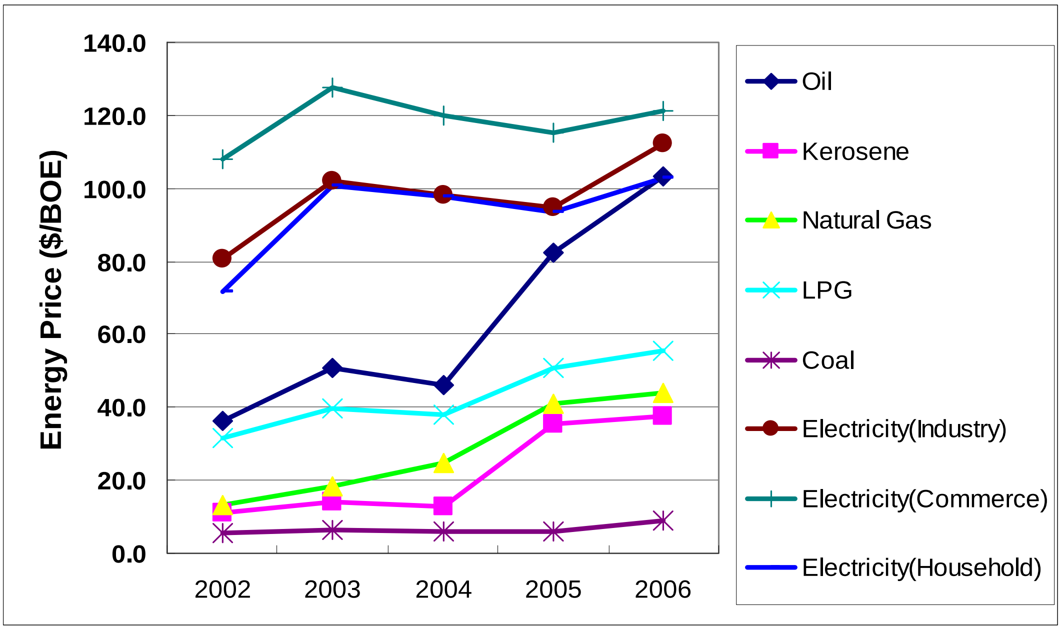
Moreover, the data given by comparing energy elasticity of Indonesia with major countries in the world on the basis of IMF statistics which were provided by MEMR are shown in Fig 2.2.4-6. These data, expressed in average values in the period 1998-2003, indicate that the value of 1.84 as energy elasticity is evidently much higher than that of the developed countries as well as neighboring countries.



Source: MEMR（Based on IMF statistics）

Fig. 2.2.4-6 International Comparison of Energy Elasticity (1998-2000 Average values)

2.2.5 Trend of Energy Price



Source: MEMR data

Fig. 2.2.5-1 Trend of Energy Price (Non-subsidy)

The trend of energy price for various sources during the period 2002-2006 is illustrated by Fig 2.2.5-1. The price of oil per BOE rose from $36.3 to $103.3, an increase of 185% within 4 years. The prices of kerosene and natural gas rose respectively from $11.3 to $37.4 and from $13.2 to $43.8, registering a 231% and 232% increase. As for LPG and coal, the prices rose respectively by 76% and 54% from $31.5 to $55.3 and from $5.7 to $8.8, though not as drastic as the price rise in oil and natural gas. With respect to the price of electricity which consists of prices for industry, commerce and households, the prices for industry and households showed a 39% and 43% increase from $80.8 to $112.4 and $71.7 to $102.7, while the price for commerce rose by only 12% from $108.2 to $121.1. The all-round rise of energy price especially the soaring of oil and natural gas prices is expected to become a great impetus to the promotion of energy conservation for Indonesia.

2.2.6 Generation Sector

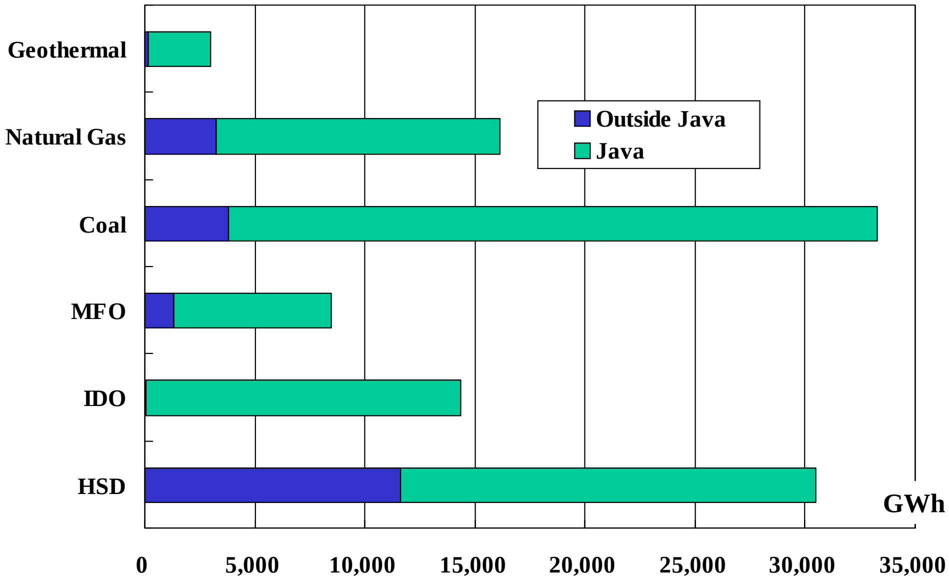
(1) Electricity Supply

PLN generates the majority of Indonesia's electricity and has a total monopoly on transmission, distribution and supply. The rated capacity and peak load are 19,536 (87%) and 12,263 MW (63%) respectively. The ratio of peak load to installed capacity is 63%, but currently PLN faces difficulty in fulfilling the supply responsibility because of problems of operability of installed capacity and rapid demand increase.

PLN is the sole buyer of electricity in the market and purchases the power produced by independent power producers (IPPs): cooperatives, local government and others[1]. In 2005, PLN purchased 26,087GWh (20%) from outside and generated 101,282GWh (80%)[2] in its own plants.

(2) PLN Electricity Production by Type of Fuel

Fig 2.2.6-1 shows PLN's electricity production by type of fuel in 2005.



Source: PLN Statistics 2005

Fig. 2.2.6-1 PLN Electricity Production by Type of Fuel (2005)

As petroleum fuels, HSD (high speed diesel oil), IDO (industrial diesel oil) and MFO (marine fuel oil) are used. The representative specification of sulfur content of each fuel is as follows: HSD 0.20, IDO 1.5 and MFO 3.5 wt% max[3]. The percentages in coal and HSD (kerosene) are high.

Fig 2.2.6-2 shows the trend of consumption of various fuels by PLN. The trend changed quite drastically from oil and gas to coal after 1994. It raises great concern about the influence of PLN's fuel mix on global warming.

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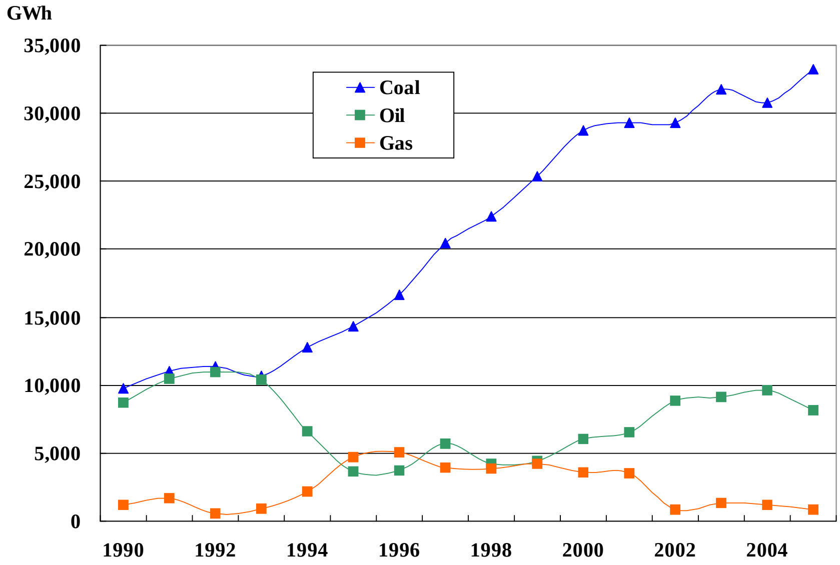
[1] Act no.15/1985
[2] PLN Statistics 2005
[3] Pertamina HP

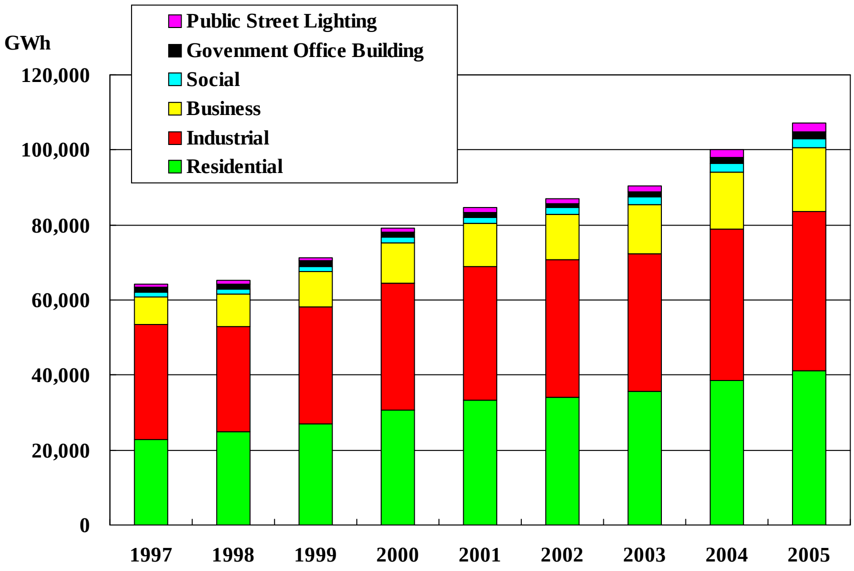


Source: Buku Pegangan Statistik Ekonimi Energi Indonesia 2006

Fig. 2.2.6-2 Trend of Fuel Consumption by PLN

(3) Electricity Consumption by Sectors

Electricity consumption in Indonesia has grown steadily, as shown in Fig 2.2.6-3. In 2005, the residential and industrial sectors accounted for 38% and 40% of total consumption respectively. The growth rate of electricity consumption averaged 6.6%/year from 1997 to 2005.



Source: PLN Statistics 2005

Fig. 2.2.6-3 Electricity Consumption Trend by Sectors

(4) Tariff System Structure of PLN[4]

There are 8 sectors and 19 categories of tariff shown in Table 2.2.6-1. The eight sectors of tariff are social service, residential, business, industry, government & public service, traction, bulk and multi purpose. Furthermore, each sector has respective categories by connected power level.

Table 2.2.6-1 Tariff System Structure of PLN

Sector VA	Social Service	Residential	Business	Industry	Government & Public Service	Traction	Bulk	Multi Purpose
220	**S-1/LV**	**R-1/LV**	**B-1/LV**	**I-1/LV**	**P-1/LV**			
450	**S-2/LV**							
900	**S-2/LV**	**R-1/LV**	**B-1/LV**	**I-1/LV**	**P-1/LV**			
1,300	**S-2/LV**	**R-1/LV**	**B-1/LV**	**I-1/LV**	**P-1/LV**			
2,200	**S-2/LV**	**R-1/LV**	**B-1/LV**	**I-1/LV**	**P-1/LV**			
2,200 - 6,600		**R-2/LV**						
>6,600		**R-3/LV**			**P-1/LV**			
2,200 –200,000	**S-2/LV**		**B-2/LV**	**I-1/LV**				
2,200 – 14,000				**I-2/LV**				
14,000 – 200,000			**B-3/MV**	**I-3/MV**	**P-2/MV**	T/MW	C/MW	
>200,000	**S-3/MV**			**I-4/HV**				
>30,000,000					**P-3/LV**			M/LV/MV /HV

Table 2.2.6-2 shows average PLN tariff of demand charge plus energy charge in 2005. Higher electricity consumption means higher tariff rate, which is sound from the viewpoint of EE&C.

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[4] Basic Electricity Tariff (BET) 2004 by PT PLN (Persero)

Table 2.2.6-2 Average PLN Tariff in 2005

Unit: Rp./kWh

	Residential	**Social**	**Public**	**Business**	**Industrial**
220VA		123			
450VA	400	318	666	523	455
900VA	601	438	778	626	604
1,300VA	683	566	767	676	689
2,200VA	677	608	771	724	840
2.2-6.6KVA	774				
>6.6KVA	910				
Street L.			629		
2.2-14KVA					817
14-200KVA					747
2.2-200KVA		683	804	780	
>200KVA		578	700	659	576
>300,000KVA					510
Total	561	570	680	705	570

(5) Monthly Tariff Calculation Formula

(Detailed residential, business and industrial tariffs are explained Attachment.)

Monthly tariff is calculated by the following formula.

(Monthly tariff: Rp.) = (Demand Charge: Rp.) × (Contracted Power: kVA) + (Energy Charge: Rp.) × (Monthly Consumption: kWh)

(6) Generation Cost

Average generation cost of PLN is shown in Table 2.2.6-3 and Fig 2.2.6-4.

Table 2.2.6-3 Average Generation Cost (Rp./ kWh) in 2005

Generation Type	Variable Cost	Fixed Cost				Total
	Fuel	Maintenance	Depreciation	Others	Personnel	
Hydro	7.53	13.9	74.97	3.84	14.47	114.71
Steam	240.88	14.92	53.90	2.58	4.43	316.72
Diesel	713.38	110.11	60.99	8.47	32.23	925.18
Gas Turbine	778.26	87.17	67.04	3.28	7.03	953.79
Geothermal	433.72	16.62	51.40	2.65	10.31	514.70
Combined Cycle	471.03	46.01	38.67	2.74	2.33	560.78
Total	368.83	37.69	52.61	3.28	7.36	469.78

Source: PLN Statistics 2005

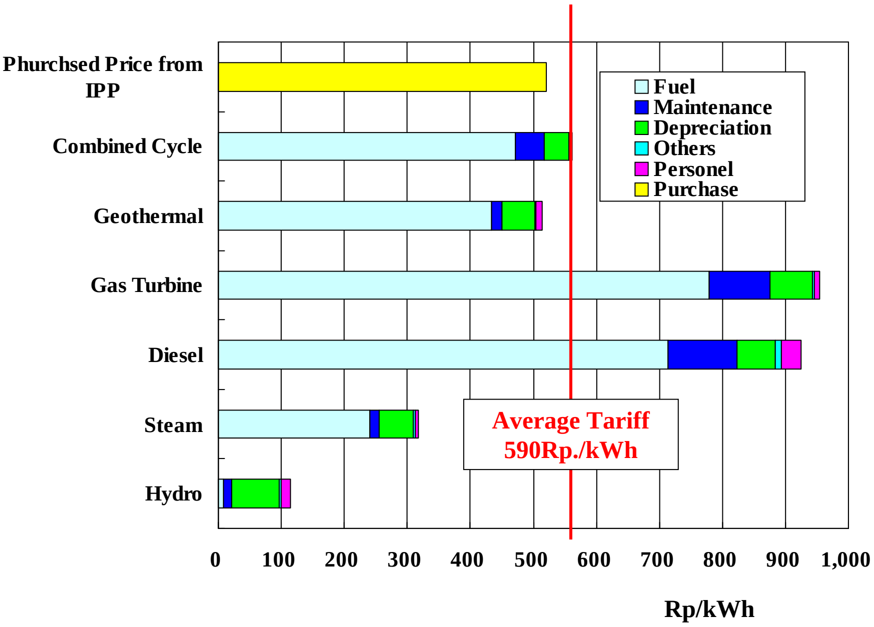
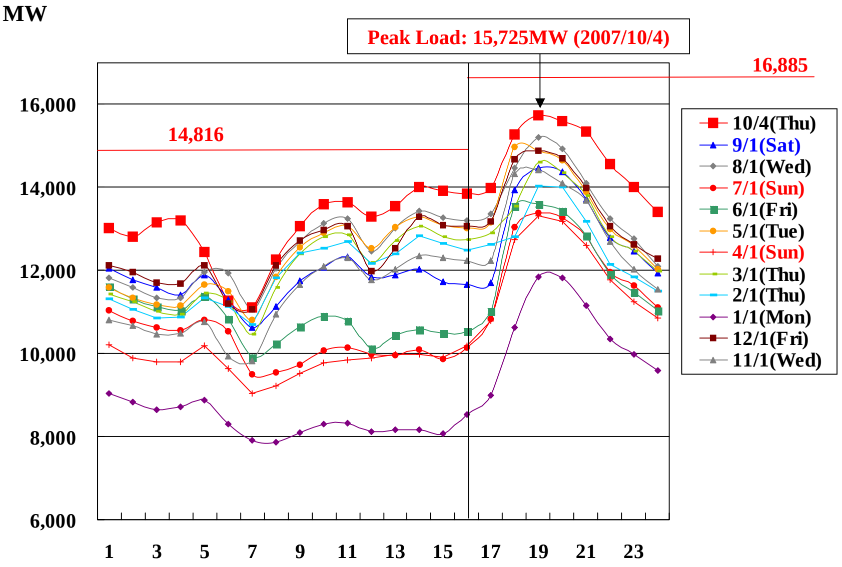


Fig. 2.2.6-4 PLN's Generation and Purchased Cost of Electricity

Generation cost differs significantly by the fuel and technologies adopted. As the average tariff in 2005 was 590 Rp./kWh, the cost of gas turbine (954Rp./kWh) and diesel (925Rp./kWh) are far beyond the tariff value. These generation plants by gas turbine and diesel are mainly for peak period adjustment because of easy start-up and shutdown operations.

(7) Daily and Seasonal Load Curve

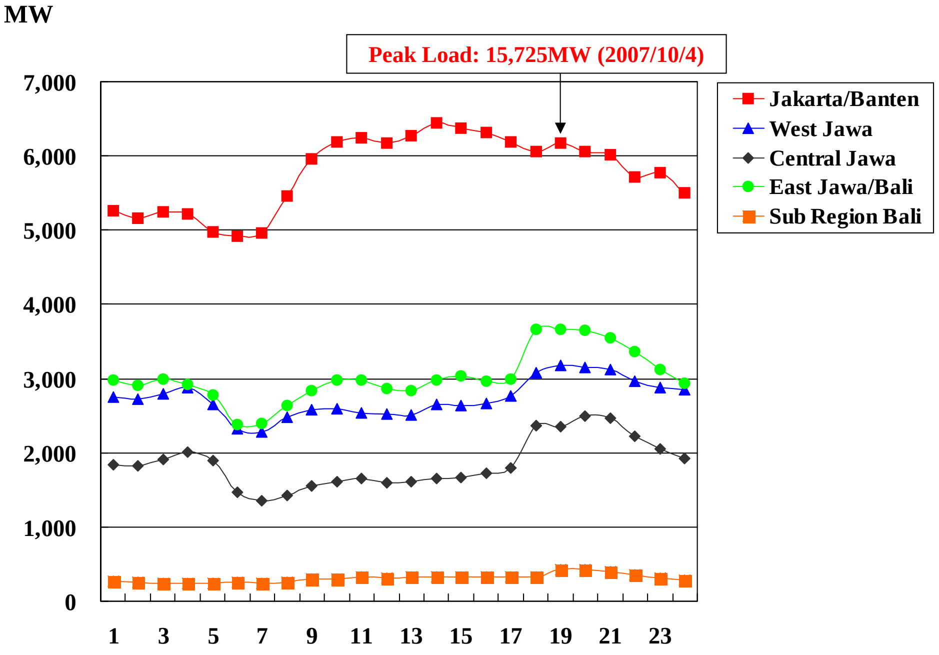
Fig 2.2.6-5 shows the daily load curve of Java Island on the first day of the month during the one year up to the end of October 2007.



Source: PLN Home Page

Fig. 2.2.6-5 Daily Load Curve of Java Island on the First Day of the Month during the Year up to October 2007

- This is the mixed daily load curve of the whole of Java Island. As data for only the first day of each month were collected, they are not representative data.
- Peak period is from 1800 to 2200 hours of the day. Turning on lights in the evening creates the peak.
- In the morning (0600 to 0800 hours) and noon period (1100 to 1300), electricity consumption decreases.
- Temperature changes little from season to season and from one region to the next in Java. There is a dry season (June to September) and a rainy season (December to March). The daily load shown above consolidates the electricity consumption of various regions in the vast Java Island, which are influenced by different climate, economic activities and so on.
- Jakarta/Banten region shows maximum consumption of electricity, followed by East Java and Bali region. High electricity consuming regions exist on the west and east sides of the island. (Fig 2.2.6-6)



Source: PLN Homepage

Fig. 2.2.6-6 Region Wise Daily Load Curve at the Yearly Peak of October 4th 2007

2.3 Existing Registrations and Regulations

2.3.1 Summary

The following registrations, regulations and programs have been implemented by the Indonesian government as national energy policy.

Table 2.3.1-1 Existing Registrations and Regulations

Name of regulation	Contents
Presidential Decree No.2/2008	Enhancing activity for EE&C and water saving, Leadership of government on EEC & water reduction
Ministerial Electricity Saving Blueprint (Draft) (2008.1)	Roadmap & action plan on electricity saving
Government law No. 30 2007	Basic policy on Energy Saving ➢ Government, regional government, business operators and the nation have responsibility for Energy Saving. ➢ “National Energy Council” shall be established. ➢ Practical regulations shall be prepared within 1 year. ➢ The government or local government shall provide incentives and disincentives.
Presidential Regulation No.5/2006	Energy elasticity < 1 by 2025 Optimization of the share of primary energy mix: 1. oil becoming less than 20% (twenty percent); 2. natural gas becoming more than 30% (thirty percent); 3. coal becoming more than 33% (thirty-three percent); 4. biofuel becoming more than 5% (five percent); 5. geothermal becoming more than 5% (five percent); 6. other new energy and renewable energy, in particular biomass, nuclear, water, solar and wind, becoming more than 5% (five percent)
Ministerial Regulation No.100.K/48/M.PE/1995 (RIKEN1995, 2005)	Obligation for energy users that consume energy > 12,000 TOE per year or demand electricity > 6,000 kVA ➢ Appointment of energy manager ➢ Planning and implementation of energy conservation program ➢ Conduct of periodical energy audits ➢ Periodical report on implementation of energy conservation activities
Presidential Instruction No.10/2005	Instruction to central and regional governments: ➢ To implement the energy efficiency measures in the institutions ➢ To enlighten the people about EE&C ➢ To monitor and report to the President
Ministerial Regulation No.0031/2005	Procedure of EE&C in government offices, commercial buildings, industry, transportation, household and others was regulated.
Presidential Decree No.43 1991	Showing the governmental policy on energy saving, such as dissemination, campaigns, education, training, exhibitions, pilot projects, research & development, energy audit system and standardization of energy efficiency

Name of regulation	Contents
Government regulation No.2 1993	Establishment of KONEBA
MEMR Decision No.30.K/48/MPE/1993	Operational guidance for implementation, such as energy manager, energy conservation program, energy audit
DGEEU Decision No.15-12/48/600.1/1994	Technical guidance for energy auditing, implementation of energy management and conservation techniques
Presidential Instruction No.9 1982	Instruction for the governmental institutions

2.3.2 Governmental Activity

The following governmental activities are ongoing.

Table 2.3.2-1 Governmental Activities

Energy Conservation Program	Public Awareness ➢ Socialization measures coordinated by concerned stakeholders ➢ Public advertisements in newspaper and electronic media ➢ National awards and competition on EE&C ➢ Distribution of brochures, leaflets
	Education and Training ➢ Utilizing the Center for Training and Education, Ministry of Energy and Mineral Resources ➢ Participation in training abroad (Japan, Korea, China, etc.)
	DSM Activities ➢ Terang Program; accelerate the spread of compact fluorescent lamps (CFLs) ➢ Public Street Lighting Program ➢ Peduli Program; rebate system for CFLs in households
	Standardization ➢ National Standard Indonesia (SNI) on EE&C in buildings; envelope building, air conditioning system, energy audit procedure, lighting system ➢ Preparation for energy manager accreditation mechanism ➢ Recognition of energy management competence for industry and building management
	Energy Efficiency Labeling ➢ Clear understanding of energy efficiency level for electrical appliances ➢ Assignment of LSPRO (Product Certification Institution) and Equipment Testing Laboratory ➢ Testing procedure of high efficiency lamps is being formulated.
	Partnership Program ➢ Partnership between the government and private enterprises, such as free of charge energy audit and energy conservation monitoring

2.3.3 Relevant Regulations on "The Energy Law"

The Energy Law issued in August 2007 includes the following regulations about energy efficiency improvement and conservation. (Translated from Japanese version)

Chapter 25 (Energy efficiency and conservation)

(1) The government, regional government, business operators and the nation are responsible for "Energy efficiency and conservation".

(2) Energy conservation is conducted from up to down stream.

(3) Energy users and manufacturers of energy saving equipment who implement "Energy efficiency and conservation" shall be given support and / or incentives by the government or regional government.

(4) Energy users who don't implement "Energy efficiency and conservation" shall be given disincentives by the government or regional government.

(5) Concrete stipulations on the implementation of "Energy efficiency and conservation" and the support, incentives, and disincentives given by the government or regional government shall be established in the government regulations or regional regulations.

Chapter 32

"National Energy Council" shall be established within 6 months after the enactment of the Law.

Chapter 33

Actual regulations shall be issued within 1 year after the enactment of the Law.

2.3.4 Draft of Government Regulation about Energy Conservation

MEMR has prepared the draft of "Government Regulation about Energy Conservation" and informed the public about it at a forum held on 12 February 2008. In the regulation, practical rules for managing programs are not stipulated, but ministerial decrees for each program are expected to be issued later, except stipulating the size of energy consumers which are obligated to have an accredited energy manager as more than 12,000 kl oil consumption equivalent per year.

The revised draft of the governmental regulation was submitted on Sep. 2008. The lower limit of energy consumption for the specified energy consumers was changed to 6,000 kL in this version. It means that the specified energy consumers have increased.

The following are main contents of the second draft.

(1) The government shall implement energy conservation policy based on RIKEN which plans for 5 years.

(2) Roles of government, regional government, business operators and society

(3) Role of energy suppliers

(4) Roles of energy-use appliance suppliers (application of labeling program)

(5) Roles of energy users (implementation of the programs for specified energy users, energy managers and energy audit)

(6) Support by the government (information on energy saving technology, etc.)

(7) Incentives by the government (advantageous tax, customs reduction for import, low interest loan and energy audit on Partnership Program)

(8) Disincentives by the government (warning to the violators, announcement to mass media, monetary fine, restriction on energy supply)

(9) Guidance by the government (education, instruction on technology, information, public relations, development of technology on energy conservation)

(10) Supervision by the government (monitoring by assigned staff)

Table2.3.4-1 shows comparison of the Japanese EE&C Law (in exact words, Act Concerning the Rational Use of Energy) and the Indonesian Governmental Regulation. The Japanese EE&C Law covers major energy users including industry, transportation, building construction and products. On the other hand the Indonesian Governmental Regulation doesn’t include transportation and building construction. The methodology of the legislation for countermeasures on these sectors which may be provided by MEMR or other ministries is not clear.

A comprehensive energy conservation enactment such as the Japanese EE&C Law is very rare in the world. In order to promote energy conservation in good cooperation with the ministries of the government, and to aim at achievement of the national target for energy conservation, such comprehensive enactment is supposed to be very effective and should strongly appeal to society. In Indonesia, establishment of such enactment which includes transportation and building construction should be studied. In that case, the ministers who are expected to issue concrete rules for each part of the enactment shall be clearly defined.

Table 2.3.4-1 Comparison of Japanese EE&C Law and Indonesian Governmental Regulation (Draft)

Japanese EE&C Law	Governmental Regulation (Initial Draft)
Chap.1 General provision Art.1. Purpose	Chap.1 General regulation
Art.2. Definitions	Art. 1.
Chap.2. Basic policy Art.3. Basic policy Art.4. Role of energy users	Chap.2 Roles of the government, regional government, business operators and society Art. 2,3,4,5,6,7
Chap.3. Measures Pertaining to Factories, etc. Section 1. Measures Pertaining to Factories Art.5. Evaluation criteria for business operators	Chap.3. Application of energy conservation Part 4 Energy conservation by energy users Art.12
Art.6. Guidance and advice	
Art.7. Designation of type 1 designated energy management factories	Art.12
Art.8. Type 1 energy managers	Art.12
Art.9. Qualified energy manager's license	Art.13
Art.10. Examination for qualified energy manager's license	
Art.11. Duty of type 1 energy managers	Art.13
Art.12. Obligation of type 1 energy managers, etc.	Art.13
Art.13. Type 2 energy managers	
Art.14. Preparation of medium and long term plans	Art.12, 14
Art.15. Periodical report	Art.12, 14
Art.16. Instruction and orders on rationalization plans	
Art.17. Designation of type 2 designated energy management factories	Art.12
Art.18. Application mutatis mutandis	
Art.19. Recommendations	Chap.4 Support, Incentives and Disincentives Part 2 Disincentives Art.9
Art.20. Special provisions on investigations by registered investigation bodies	
Section 2. Designated examination body Art.21-35	
Section 3. Designated training agency Art.36-38	
Section 4. Registered investigation bodies Art.39-51	

Japanese EE&C Law	Governmental Regulation (Initial Draft)
Chap.4. Measures pertaining to transportation Art.52-71	
Chap.5. Measures pertaining to buildings Art.72-76	
Chap.6. Measures pertaining to machinery and equipment Art.77. Role of manufacturers, etc.	Chap.3 Application of energy conservation Part 3 Supply of energy-use appliances Art.10
Art.78. Standards of judgment for manufacturers/importers	Art.10
Art.79. Recommendations and orders concerning improvement of performance	
Art.80. Labeling (Display)	
Art.81. Recommendations and orders concerning labeling	Chap.4 Support, incentives and disincentives Part.2 Disincentives Art. 19, 20, 21, 22, 23, 24, 25
Chap.7. Miscellaneous provisions Art.82. Fiscal measures, etc.	
Art.83. Advancement of science and technology	
Art.84. Measures to increase public understanding, etc.	
Art.85. Consideration of local public entities in educational activities, etc.	
Art.86. Provision of information to general consumers	Chap.4 Support, incentives and disincentives Part 1 Support and incentives Art. 18
Art.87. Reports and on-site inspections	
Art.88. Fee	
Art.89. Special provisions for hearings	
Art.90. Appeal against disposition made by designated examination body	
Art.91. Delegation of transitional measures to order	
Art.92. Competent ministers, etc.	
Chap.8. Penal provisions Art.93.-99.	Chap.4 Support, incentives and disincentives Part.2 Disincentives Art. 19, 20, 21, 22, 23, 24, 25
Supplementary provisions	Chap.3 Application of energy conservation Part 2 Energy supplier Art.9 Part 5 Energy resource preservation

For reference; Table 2.3.4-2 shows laws in foreign countries which have stipulations on energy conservation.

Table 2.3.4-2 Energy Conservation Laws

Country	Name of law and major content
Australia	Sustainable Energy Development Act 1995 (New South Wales) ➢ Establishment and commissioning of Sustainable Energy Department Electrical Products Act 1988 (South Australia) ➢ Labeling program for household electrical appliances Electrical Products Regulations 1990 (South Australia) ➢ Labeling program for household electrical appliances
China	Energy Conservation Law of China (1997) ➢ Mandatory energy management for factories whose annual energy consumption exceeds 10,000 tons coal equivalent, and total annual energy consumption of 5,000 - 10,000 tons of coal equivalent designated by the authorities. ➢ Energy consumption ceiling for products whose energy consumption is high ➢ Prohibition on production, sales and transfer of low energy efficiency products ➢ Indication of energy consumption on the product or manual ➢ Appointment of energy conservation managers ➢ Energy conservation for building design, construction and use
Republic of Korea	Rational Energy Utilization Act (1979, wholly amended by Act No. 4891 of 1995) ➢ Energy management of the designated energy users ➢ Energy auditing institutions ➢ Indication of energy efficiency performance for heat-using machinery ➢ Operators of heat-using machinery
Russian Federation	The Federal Law on Energy Saving (1996) ➢ Indication of energy consumption and certification of products ➢ Mandatory energy audit for energy users which consume 6,000 tons of reference fuel, or over 1,000 tons of motor fuel but which consume less than 6,000 tons of reference fuel and are designated by the authorities ➢ Funds and subsidies
Thailand	Energy Conservation Promotion Act (B.E.2535) (1992) ➢ Energy conservation in the designated factories, energy managers ➢ Energy conservation in buildings ➢ Energy conservation in machinery
United States of America	Energy Policy Act of 1992 - Energy Efficiency (Title One) ➢ Building energy efficiency standards ➢ Support programs for building equipment

Country	Name of law and major content
	➢ Mortgage for high energy efficiency houses ➢ Grant program for industrial facilities
Uzbekistan	Law on the Rational Use of Energy (1997) ➢ Indication of energy efficiency performance for products and services ➢ Mandatory energy audit for energy users which consume 6,000 tons of equivalent fuel, or over 1,000 tons of motor fuel but which consume less than 6,000 tons of reference fuel and are designated by the authorities ➢ Energy consumption accounting and monitoring ➢ Funds and financial support programs
India	The Energy Conservation Act (2001) ➢ Establishment and commission of Bureau of Energy Efficiency（BEE） ➢ Labeling program ➢ Designated energy users, energy managers ➢ Energy auditors and energy audit agencies ➢ Building code for energy conservation
Sri Lanka	Sustainable Energy Authority Act（2007） ➢ Establishment and commissioning of Sustainable Energy Authority (SEA) ➢ Labeling program ➢ Designated energy users, energy managers ➢ Energy auditors and energy audit agencies ➢ Building code for energy conservation

Source; Compendium on Energy Conservation Legislation in Countries of the Asia and Pacific Region
http://www.unescap.org/esd/energy/publications/compend/ceccontents.htm

2.4 Organizational Arrangement for Promoting EE&C

2.4.1 Current State of Organizational Arrangement for EE&C

(1) Ministry of Energy and Mineral Resources (MEMR)

Ministry of Energy and Mineral Resources (MEMR) is an administrative branch of the Government of Indonesia responsible for setting direction and guidelines for planning and implementation of energy policies. MEMR has three intra-ministerial bureaus and several extra-ministerial departments. Figure 2.4.1-1 is the organizational chart of MEMR.

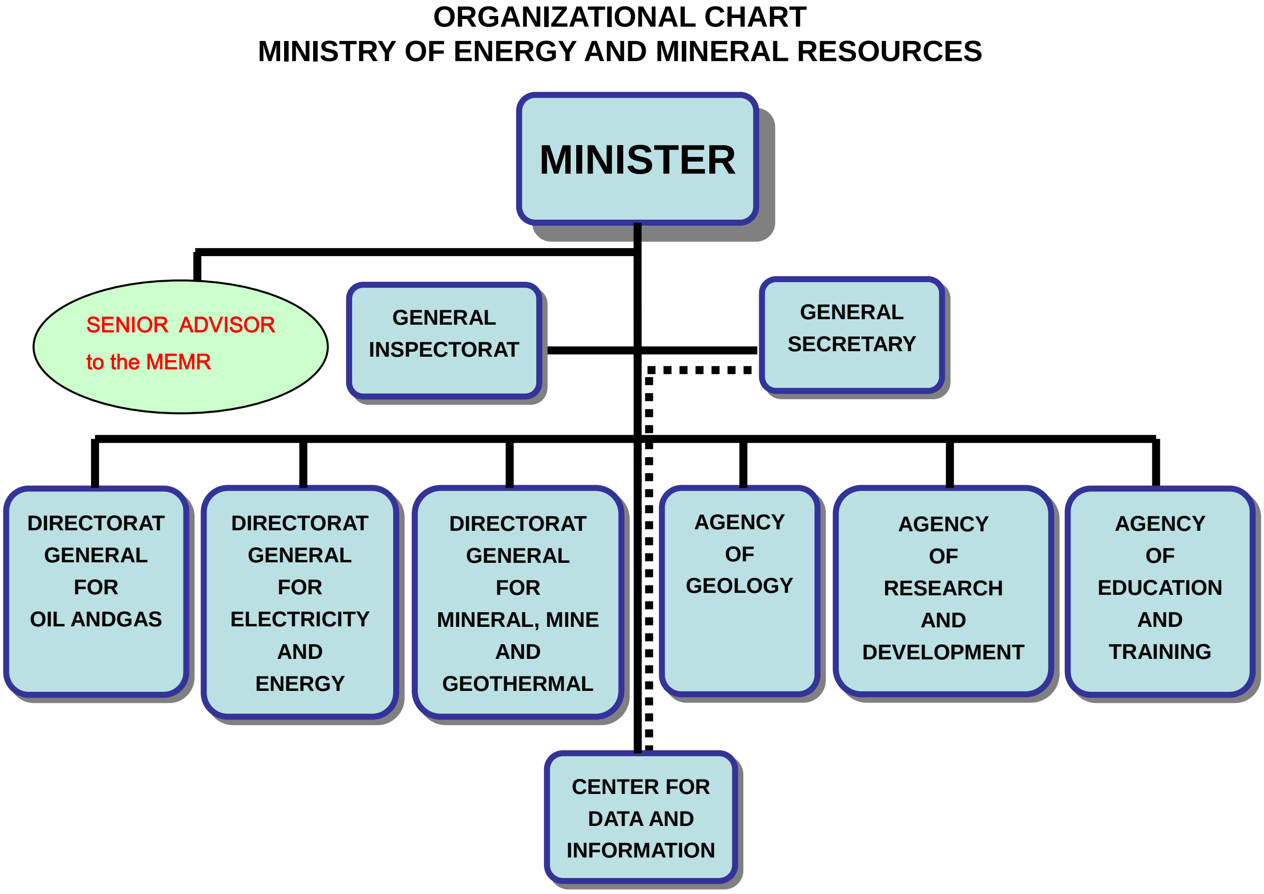


Fig. 2.4.1-1 Organizational Chart of the Ministry of Energy and Mineral Resources

The Director General of Electricity and Energy Utilization (DGEEU) is responsible for the issues related to EE&C. There are four departments under the Director General, namely Director of Electric Power Program, Director of Electric Power Enterprise, Director of Electric Power and Engineering, and Director of New Renewable Energy and Energy Conservation.

(2) Education and Training Agency for Energy and Mineral Resources (ETAEMR)

The Education and Training Agency for Energy and Mineral Resources (ETAEMR) is responsible for providing in-service training for the officials of MEMR on duty. There are currently four training centers, including one each at Jakarta, Bandong and Jabu (See Figure 2.4.1-2). The subjects covered under training include oil and gas, geology, mining and coal technology, and electric power and new and renewable energy. Among these centers, the E&T Center for Electricity & New Renewable Energy (ETCERE) located near Jakarta provides training related to appropriate use of energy.

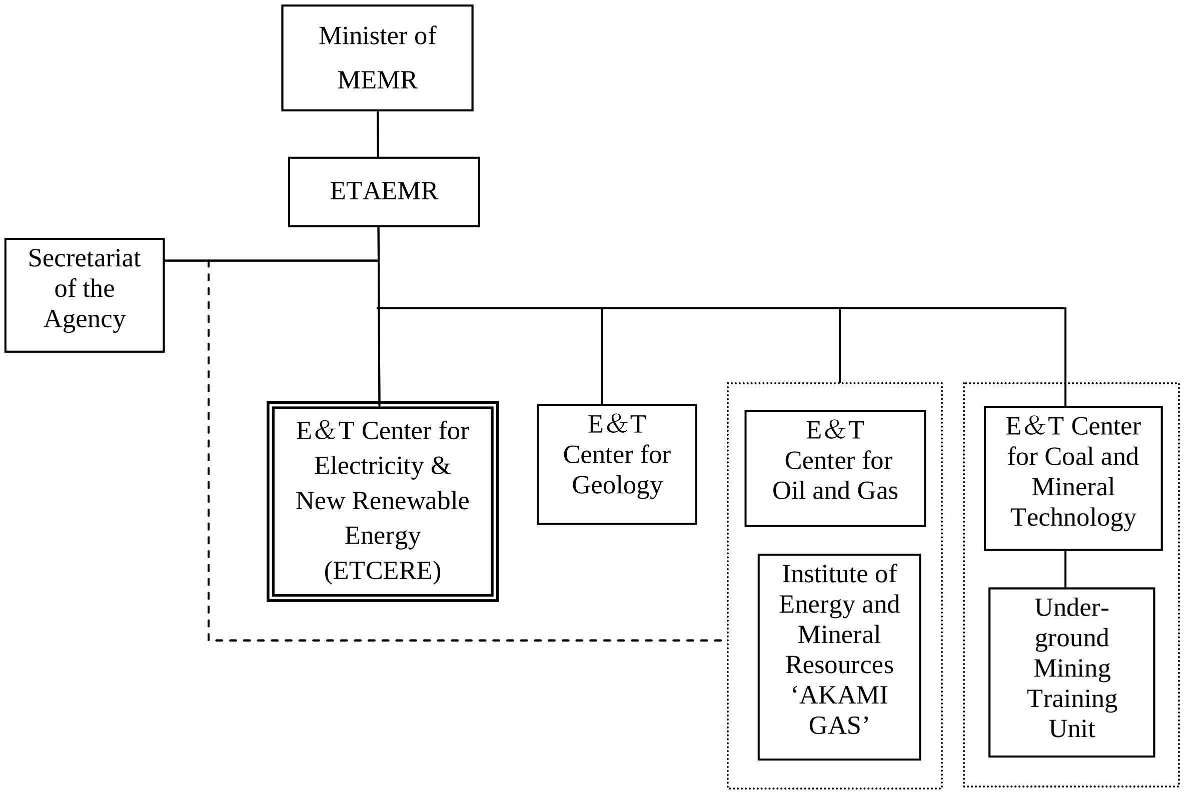


Fig. 2.4.1-2 Organizational Chart of ETAEMR

According to ETCERE's operation plan, all 34 provinces and major municipalities in Indonesia should be capable of dealing with various policy and technical issues related to the field of electricity and renewable energy by being staffed with competent public officers. The total number of competent officials who may be assigned such responsibilities has been projected as high as 1,000 to 2,500. In order to fulfill such a requirement, the Government of Indonesia needs to provide in-service training to the associates of local governments.

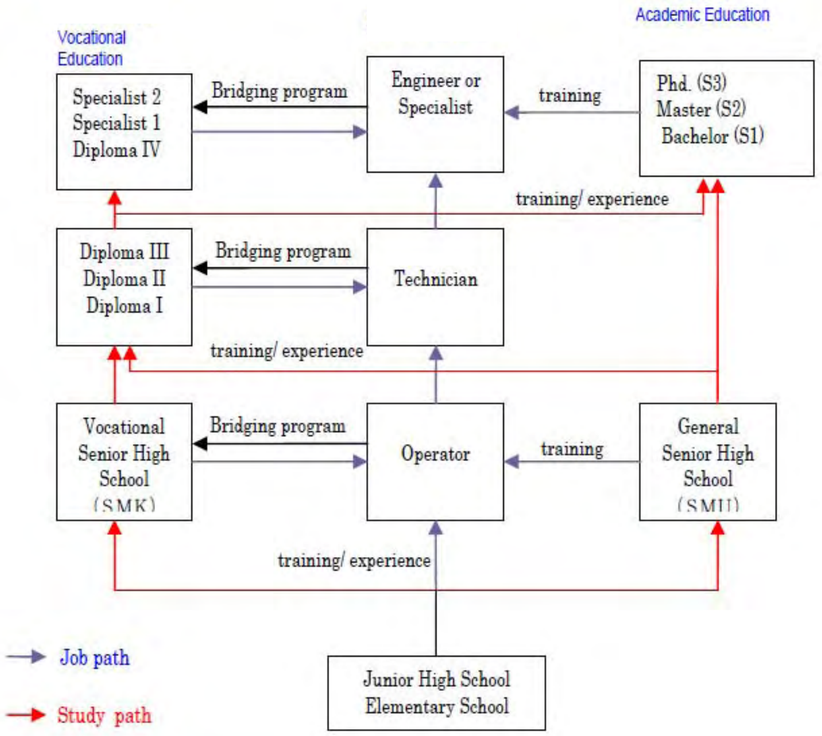
Because of enactment of the Energy Law, the establishment of issuing qualification certificates for energy managers and energy auditors is under consideration. ETCERE is one of prospective training institutes that provide a preparatory training program for the proposed examination for the certificates.

(3) Ministry of Manpower and Transmigration (MMPT)

Ministry of Manpower and Transmigration (MMPT) regulates and administers all labor related affairs. The mission of MMPT is to oversee and inspect labor conditions, to maintain and ensure labor relations between employers and employees on the basis of the labor agreements and rights for labor unions. The ministry also provides directions and guidelines for securing workplace safety and environment. The ministry also oversees and supervises provision of vocational training.

The Government of Indonesia is currently undertaking various kinds of vocational training for youth, the unemployed, job seekers and instructors of vocational training centers. Vocational training is taking place at vocational training centers administered by the central government (owned and operated by MMPT), as well as vocational training centers run by local governments and the private sector. It is estimated that private training centers owned and operated by the private sector account for approximately 32,000 employees.

The vocational training program taught at the training centers operated by MMPT includes seven major subject areas: (i) mechanical engineering, (ii) micro electric industry, (iii) welding, (iv) agriculture, (v) commerce (including ICT and computers), (vi) construction, and (vii) others (e.g. services). Fig 2.4.1-3 shows the flowchart of the education and training system in Indonesia.



Source: Ministry of Manpower and Transmigration

Fig. 2.4.1-3 Education and Training System in Indonesia

Training programs are designed with a variety of courses from short-term training requiring 600 to 700 hours of basic course to long-term training courses such as engineering training courses which require up to several years. Other than the above, there is a mobile training course aiming at participants who live in rural areas and a training course for the private sector or individual tailored to their own training needs.

1) Current state of licensing and certification system of Indonesia

In 2003, the Government of Indonesia issued the new Labor Law (Law No. 13). The new law initiates a reform in the certification system. Currently examination and certification of vocational skills are administered by twelve LSPs (Independent Certification Organizations) authorized by the government. Each LSP administers one specific vocational area.

While certification and licensing in Indonesia were validated on the basis of the hours of training in the past, current validation criteria are based on the predefined “competency” as commonly recognized internationally after the reform in 2003. To do so, competency standards are under development in various sectors including automobiles, mechanical engineering, and textile industry.

The development of competency is to analyze and define tasks and required skills systematically and organize thousands of skills into units. The automobile industry, for example, has analyzed and defined approximately 170 skill units. Qualifications of workers are defined by combinations of units. The required qualifications for Junior Mechanics, Senior Mechanics and Advanced Mechanics, for example, are defined more precisely not only by their difficulty but also tasks and responsibilities required to complete their work such as diagnosis and wheel balancing. For acquiring the qualification of Junior Mechanics, one has to obtain certifications of 43 units out of the 170. Each unit is recognized and defined officially by LSP. The licensing procedures for the energy manager will be administered by MEMR and LSP following procedures similar to those mentioned above (see Fig 2.4.1-4).

2) Proposed framework for Energy Manager Certification Program

MEMR has been negotiating with BNSP on the proposed framework for the Energy Manager Certification Program. According to the officer responsible for the discussions, the proposed certification program will comply with the ministerial decision 2052:2001 allowing the Minister of Energy and Mineral Resources to grant accreditation to a certification institution for undertaking examination and other procedures for the program on behalf of BNSP. The legal ground of this is exemption from the labor law because the professional qualification was defined prior to the establishment of the law in 2003. The proposed professional qualification was defined in the ministerial decision in 2001. According to MEMR, BNSP will still be in charge of consultation and advice on harmonization with other certification programs and the oversight on the qualification framework. Administration and implementation of the program, including setting requirements, establishing competency and standards, and establishment of requirements and procedures, are the responsibilities of MEMR following rules and regulations set by BNSP. HAKE (Energy Conservation Specialist Association) has been established in order to assume the responsibility of a certification institution for the program.

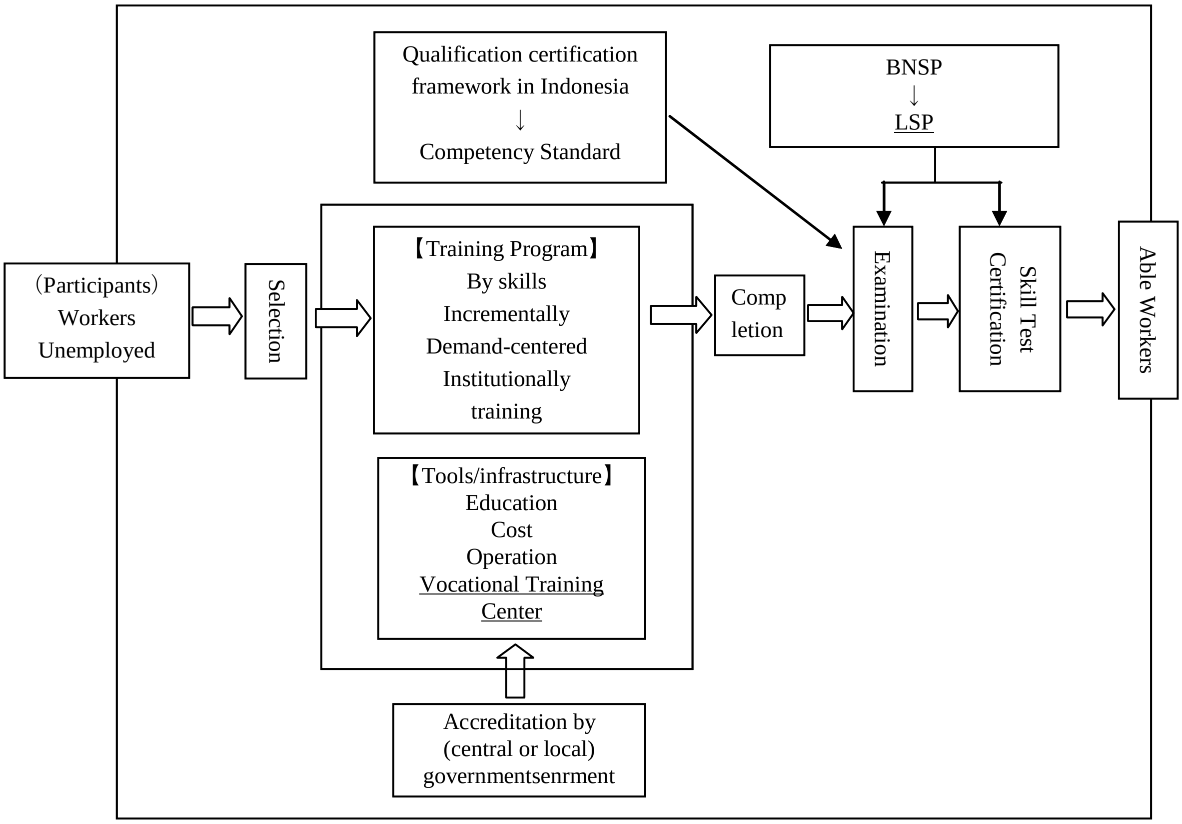


Fig. 2.4.1-4 Qualification and Licensing System in Indonesia

An additional issue is that the qualification will not be categorized as "National Certification" because the program is administered by MEMR on behalf of BNSP. It is therefore to become either "Special Certification" or "International Certification", according to MEMR. At present, there is no international standard for Energy Manager, therefore the proposed certification will be categorized as "Special Certification[1]".

(4) Energy Conservation Specialist Association (HAKE)

HAKE was established in 2007 as the professional association for energy conservation specialists under the framework provided by Director General's decision No. 1894: 2001. The main purpose of HAKE is to serve as LSP (certification institution) for the Energy Manager Certification Program.

HAKE is expected to play a leading role to disseminate EE&C technology. More specifically, HAKE will prepare various guidelines on EE&C. It will prepare competency standards for the Energy Manager. It will provide various EE&C related consultation services.

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[1] There will be no difference between the "National" and "Special" standards because, according to the Energy Law, large energy users are required to nominate a qualified energy manager with the certification to carry out energy conservation activities in the factories.

2.4.2 Issues Related to Organizations for Promoting EE&C

(1) MEMR

MEMR's jurisdiction includes planning, implementation and regulation of overall policies related to EE&C in Indonesia. The ministry has sole authority to regulate and promote rational use of energy in commercial buildings and the electric power sector in Indonesia. One of the major issues regarding EE&C policy in Indonesia is its long-term policy goal of "achieving energy elasticity less than 1.0 by 2025" (Figure 2.4.2-1) while it does not have specific objectives in line with the said policy goal. To promote and implement EE&C policy in developing countries, it is not realistic to set a long-term policy goal without specific and measurable short- and mid-term objectives. The office of the Director of New Renewable Energy and Energy Conservation administers all aspects of EE&C in Indonesia despite limited human resources, experience and budget. In particular the department heavily depends on foreign economic assistance for its programs because of budget limitations.

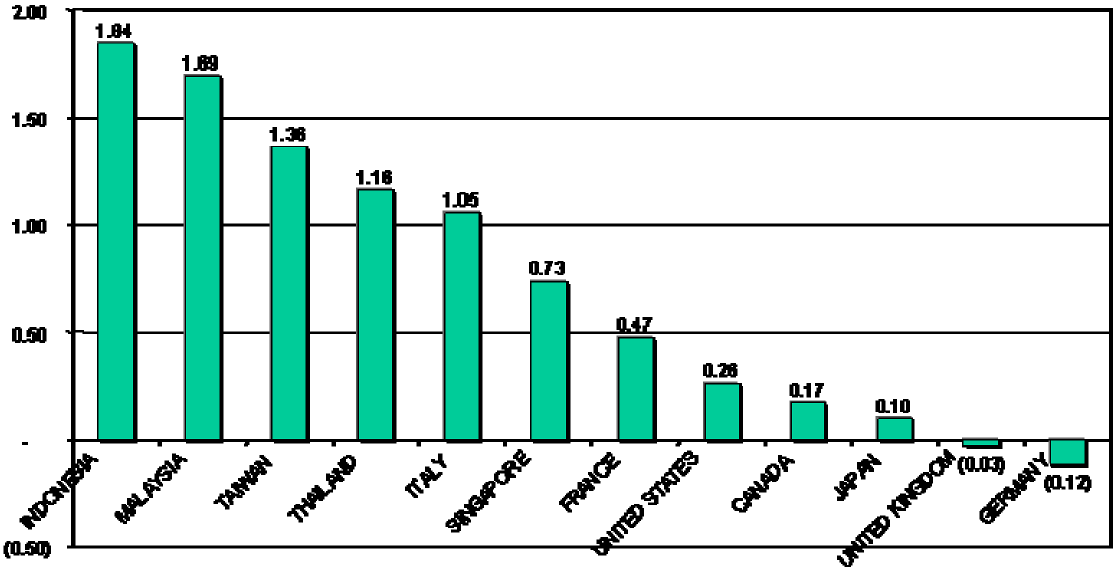

Fig. 2.4.2-1 Comparison of Energy Elasticity of Selected Countries

(2) ETCERE

ETCERE under the jurisdiction of MEMR provides a range of training related to appropriate energy use. It is one of the few training institutions in Indonesia to provide such training. Presently, ETCERE has 69 employees as shown in Table 2.4.2-1.

Table 2.4.2-1 Number of Employees at ETCERE

Classification	Number of Employees
Management[2]	10
Administration[3]	30
Instructors and lecturers	24
Others（other than above）	5
Total	69

Source: ETCERE

Training programs implemented by ETCERE are divided into two groups: the first category is on efficient use of energy; the other is on electric power use. Table 2.4.2-2 shows subjects taught in ETCERE. Despite these subjects, only five (5) EE&C related training courses with a total of 98 trainees participating were carried out between 2004 and 2006 (Table2.4.2-3). There was no training in 2007 because of renovation of the facility.

As shown in Table 2.4.2-2, the EE&C related subjects for which training is carried out at ETCERE are limited to general subjects. Because the center is only equipped with general training materials and machinery such as simple training simulators and hand-held measuring devices. Its training methodologies are dominated by lecturing despite the use of practical training being the most effective approach for the subjects listed above. At the time of writing, MEMR has developed the competency standard for energy managers on the basis of the national standard. The subjects at ETCERE should be reorganized and developed on the basis of the new competency standard when the center becomes a primary training provider for the proposed certification program.

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[2] Persons who assume responsibilities for the management of the organization such as director, vice-director, chief of each department.

[3] Employees who execute administrative tasks with regard to operation of the school in order to support executives and/or managers under their direction. Generally, they are not instructors or lecturers.

Table 2.4.2-2 Subjects Covered in Training by ETCERE and Participants (Example）

ENERGY FIELD	
Energy Conservation	**Participants**
Basics of Energy	Officials from central/ local governments
Community Development in the field of Electricity and Renewable Energy	Officials from central/ local governments
Supervision on Micro Hydro Power Plant Development	Officials from central/ local governments
Energy Management for Buildings	Officials from central/ local governments
Energy Planning	Officials from central/ local governments
Energy Audit	Officials from central/ local governments
Micro Hydro Power Plant Development and Operation	Officials from central/ local governments
Electricity	**Participants**
License of Electricity	Officials from central/ local governments
Commissioning for Micro Hydro Power Plant Installation (Small Scale)	Officials from central/ local governments
Rural Electrification Development	Officials from central/ local governments
Electricity Management	Officials from central/ local governments
Environmental Management and Monitoring on Electricity	Officials from central/ local governments
Residential Installation Inspection	Officials from central/ local governments
Electricity Inspection	Officials from central/ local governments

Source: ETCERE

Table 2.4.2-3 Record of EE&C Related Training Implemented by ETCERE

Year	2004	2005	2006	2007	Total
No. of Training Courses Implemented	2	1	2	(Facility Renovation)	5
Male	37	20	34		91
Female	3	0	4		7
Total Participants	40	20	38		98

Source: ETCERE

Table 2.4.2-4 indicates the list of teaching materials prepared by ETCERE for EE&C training. They were prepared mostly before the Energy Law was established. The textbook, however, was prepared without considering the newly established competency standard for the Energy Manager Program.

Table 2.4.2-4 List of Teaching Materials Available at ETCERE

Name, subject and description	Language
Energy Conservation Implementation Policy	Indonesian
Energy Management for Buildings	Indonesian
Electricity Installation System and Operation	Indonesian
Illumination System for Buildings	Indonesian
Heating, Ventilating, Air Conditioning System for Buildings	Indonesian
Building Envelope	Indonesian
Energy Conservation for Equipment in Buildings	Indonesian
Financial Analysis in Energy Conservation Projects	Indonesian
Reporting System on Energy Conservation	Indonesian

Source: ETCERE

(3) MOI

MOI and MEMR jointly promote EE&C for the industrial sector while MOI oversees overall industrial policy. MOI intends to improve productivity and EE&C to strengthen the industrial competitiveness of Indonesia. MOI is particularly interested in strengthening the capacity of Indonesian industry for EE&C, focusing on production processes. MOI is preparing for carrying out EE&C related policy focusing on industrial processes while the ministry is keeping an eye on MEMR's progress on enforcement of the Energy Law and the Energy Manager Program. It is expected that MOI will implement a couple of EE&C measures targeting industrial processes including preparation of competency standards and development of education and training programs.

There seems to be some duplication between the two energy management certification programs proposed by MEMR and MOI. For example, qualifications of common technologies in so-called utility areas including water and electricity should not be certified by two separate ministries. The demarcation of the two separate qualification standards needs to be clarified and coordinated to avoid unnecessary duplication and overregulation.

(4) Coordination among Ministries

Other than above, all ministries in Indonesia may need to collaborate for EE&C because comprehensive approaches in all industrial sectors are indispensable for promoting EE&C in Indonesia effectively. For instance MOI plays an important role in promoting EE&C in industry. In the transportation sector, MOT needs to play the leading role in reducing the irrational use of energy. MOI, in particular, can play significantly important roles in regulating and directing major energy-consuming industries such as iron and steel, glass making, ceramics, cement and textiles. MOI therefore needs to coordinate with MEMR to promote EE&C policies in Indonesia. Such policy coordination, however, is not sufficiently implemented because of lack of central leadership and initiatives. To promote EE&C in a more comprehensive manner, a platform for coordination inclusive of the concerned ministries and representatives of the private sector needs to be set up and made functional.

(5) Roles of Local Government

The roles of local government in addition to those of central government are significant to promote various EE&C policies including the proposed Energy Manager Program.

The roles and responsibilities of local governments are defined in Article 18 (1) of the Energy Law, stipulated as “Local government shall prepare comprehensive a local energy master plan complying with the national energy master plan in Article 17 (1) of the Law”; Article 25 (1) as “The national initiatives on promoting EE&C is the responsibility of the central government, local governments, the private sector and the people of Indonesia”. These articles clearly stipulate that the local government is one of the major players responsible for implementing EE&C policies in Indonesia. In Article 26 of the Law, the roles of central and local governments are explained as (i) “to prepare prefecture/city rules and regulations”, (ii) “to promote and oversee the private sector activities in the respective prefecture/city”, (iii) “to prepare management policy in the respective prefecture/city”. The current situation, however, is that the demarcation of roles between the central and local governments is still unclear and, in some parts, they are overlapping because various rules, regulations and bylaws are not finalized. For example, on-going efforts by the Eastern Java Government for implementing training and development of energy managers are somehow under oversight by MOI, and the coordination with MEMR is insufficient. Various issues still remain to be clarified, such as accreditation of the training program, and certification of the trainees.

(6) PLN

The human resources for DSM & EE&C in PLN are quite small. And the cost of electricity is about twice its price. Promoting EE&C will reduce PLN’s expense and governmental subsidy. But in PLN there are people who understand that to reduce governmental subsidy is not PLN’s issue but is a governmental issue. To enhance PLN and MOIT’s organizational functioning is an urgent issue.

(7) EMI (Energy Management Indonesia)

EMI is a State owned energy service provider. But its current activity is only in the consulting field. Enhancing its consulting skill and conducting ESCO projects is required.

(8) Role of the Private Sector

To promote EE&C, the role of the private sector cannot be disregarded because it is the final consumer of energy. Therefore Indonesia needs to accelerate EE&C promotion particularly in the industrial sector and commercial buildings which use a large quantity of energy. Because of the current price hike, large commercial buildings in Jakarta, for example, are shifting their energy use from fuel oil to electricity. The need for promoting EE&C is gradually being acknowledged because the industrial sector realizes that increased cost from the energy price hike cannot be converted into the price of its end products. The industrial sector is seeking any measures to improve energy efficiency by not compromising quality. In order to match the needs of industry and the government's efforts for promoting EE&C, balanced measures of strict control by mandatory energy control over designated factories and financial support by tax reduction and government supported low interest loans are needed. Another reform that may be needed is to the corporate value added tax system in Indonesia. The current corporate value added tax rate of 10% is hindering accurate tax filing of sales and production because of its high rate and the tax collection system. Energy related statistics could be furnished from the data filed with the tax collector, but such a high tax rate hinders maintenance of accurate statistics.

2.5 Existing Study and Projects in EE&C

2.5.1 Trend in International Cooperation Institutions and Other Donor Organizations

(1) Japanese Assistance

1) Japan External Trade Organization（JETRO）

In 2006, the project “Capacity Building in East Java Aimed at Improving Ability of Energy Audit” (JEXSA) was implemented. The results of the project have been highly acknowledged and acclaimed by the relevant government agencies of both Indonesia and Japan, and further progress in the future is expected. It is considered indispensable to fully utilize and further develop these results in this Study. In the second mission the Study Team visited the East Java Government, KADIN and Slabaya Institute of Technologies and had meetings about the present conditions and future direction to promote EE&C in East Java. The team confirmed that all these organizations have strong intention to promote EE&C activity there. But the subsequent JETRO supported program has not been implemented.

2) New Energy and Industrial Technology Development Organization（NEDO）

NEDO, a Japanese R&D institution specializing in development of new energy, has carried out altogether 5 pilot projects in Indonesia since 1993 under the program entitled “International Model Projects for Increasing the Efficient Use of Energy”. Information about these projects is shown in the following table. In addition, energy audit in the sectors of cement, food and beverages, and iron and steel focusing on a few factories was conducted in 2006 An EE&C demonstration project in a textile/dye factory started in Nov. 2008. Results from all these activities are sure to be made good used well for future penetration pf EE&C.

Table 2.5.1-1 List of International Demonstration Projects for Efficient Energy Use

Name of Demonstration Project	Counterpart	Project Site	Contracted Company	Project Period
Model Project for the Application of Pre-grinder	MOI	PT. Semen Padang (Persero)	Ishikawajima-Harima Heavy Industries Co. Ltd	1993~1996
Model Project for Utilization of Paper Sludge and Solid Waste	MOI	PT. Fajar Surya Wisesa	Babcock-Hitachi K.K.	1997~2000
Model Project for Improvement of Boiler and Turbine Efficiency	MEMR	PT. PLN Pembankitan Tenaga Listrik Jawa Bali II	Chubu Electric Power Co. Inc./ International Center for Environment Technology Transfer	1999~2002
Model Project for Flare Gas and Hydrogen Recovery Systems in Oil Refinery	Directorate General of Oil & Gas/ MEMR	Balikpapan Refinery of Pertamina	Cosmo Engineering Co. Ltd.	2002~2005
Model Project for High Performance Industrial Furnace	MOI	PT. Gunung Garuda	Nippon Steel Corp.	2003~2006
Model project for introduction of energy- and water-saving type textile dyeing and processing systems	MOI	Bandon	KRI	2008-2011

Source: NEDO

3) Energy Conservation Center, Japan (ECCJ) / Association for Overseas Technical Scholarships (AOTS)

In the framework of bi-national policy talks, the ECCJ offered the regular training programs listed below to government officials and private factory personnel in managerial positions.

Jan. 24 to Feb. 24, 2005: General training in the promotion of energy conservation for 21 trainees

Sep. 20 to Sep. 30, 2005: Assistance in enforcing energy conservation legislation for 25 trainees

Feb. 19 to Feb. 27, 2007: Assistance in constructing an energy manager program for 26 trainees, consisting of MOI personnel, those from the East Java Local Government and private factory personnel in managerial positions

Dec. 4 to Dec. 13, 2007: Assistance in constructing a program for energy conservation promotion organizations and an energy manager program for 29 trainees, including personnel of the East Java Local Government and those from MOI

Within the framework of Japan- Indonesia bilateral policy dialogue, the Energy Conservation Center, Japan (ECCJ) and the Association for Overseas Technical Scholarships (AOTS) joined together in holding two-week training courses in 2004 and 2005 with the staff of Indonesian government agencies as beneficiaries. Again in 2006, ECCJ sponsored training courses with the staff of East Java State government agencies as beneficiaries, were conducted in cooperation with the afore-mentioned JEXSA program carried out by JETRO. Major issues dealt with here were energy conservation laws and energy manager systems. Moreover, in the area of multilateral cooperation for ASEAN, ECCJ has conducted “Promotion on Energy Efficiency and Conservation Program (PROMEEC)” since 2000. Japanese experts implemented energy audits of factories and buildings in Indonesia in 2001 2004 and 2005. One-week training courses with high-ranking government officials of ASEAN countries as beneficiaries were conducted from 2004 to 2006, with ASEAN Center for Energy (ACE) as the counterpart.

4) Japan International Cooperation Bank（JBIC）(present JICA)

JBIC has provided Indonesia with yen loans for more than 100 energy related projects. Nearly all of them are power station related projects such as thermal power, hydro power, power transmission and distribution etc., but no yen loan has been provided to EE&C projects so far. (except a Cool Earth program loan formulated by the present JICA)

5) Japan International Cooperation Agency（JICA）

JICA has been carrying out a two-month group training course in the field of EE&C annually for 12 or 13 countries in the world. In addition, it has implemented more than 10 international aid projects relevant to the field of primary energy and power resources development.

JICA disbursed an ODA loan to the Republic of Indonesia based on the “Cool Earth Partnership.” The main targets of this program loan are as follows;

a) Increase national energy efficiency ratio by 12 to 18 % by 2025

b) Prepare legal framework for EE&C implementation

c) Draw up CO_2 emission reduction roadmap and setting targets for major industries

The French international organization, AFD will co-finance the above program, mainly focusing on supporting MOI’s activity to draw up a road map on industrial CO_2 emission reduction in the steel and cement sectors.

(2) Assistance by the Other International Organizations

1) United Nations Development Programme（UNDP）

To expand the market for high efficiency equipment and energy conservation products and coordinate the energy efficiency standards and labeling programs in Asia, a project is being planned called Barrier Removal for Energy Standards and Labeling in Asia, or BRESL for short. UNDP will act as an office for this five-year project, which will run from 2008 to 2012, involving studies among different nations and financed by the UNDP-supported Global Environment Facility (GEF). The project aims to help Asian countries establish energy conservation standards and labeling systems. Functional cooperation with this program should be considered.

2) United Nations Industrial Development Organization (UNIDO)

In collaboration with the GEF, UNIDO is planning to provide assistance in the optimization of energy control and ISO standardization of the energy management program. The project identification form (PIF) was produced in 2007 and the project preparation grant (PPG) documents will be drafted in 2008. Coordination is underway for a plan for $2.1 billion plus co-funding from 2010 to 2014. The ISO standardization of the energy manager program is being discussed internationally. Consideration must be given to consistency between this program and the Indonesian energy management program.

3) The World Bank（WB）

The World Bank is giving support to Indonesia in the field of CDM project formation using the Prototype Carbon Fund (PCF). It is also undertaking study projects relevant to the effective use of Indonesian energy resources, with an eye to making appropriate policy recommendations to GOI.

In 2006, the WB conducted systematic research to support the demand side management (DSM) program. The results are used in this study as well.

a) CDM Project Formation Related Assistance

As regards CDM project formation in EE&C, the one particularly worthy of note is “The Project for Sustainable Cement Production in Indonesia” undertaken by PT Indocement Tunggal Perkasa. This project consists of two EE&C components, “Improvement of Cement Producing Efficiency Regarding Mixed Cement Production” and “Shift of Fuel in Cement Factories”, both of which are being carried out in the factories of PT Indocement Tunggal Perkasa.

Besides this project, the Indonesian government also holds workshops similar to the kind of consultation meeting aiming at the formation of CDM projects, and joins hands with NEDO in the promotion of EE&C capacity building in Indonesia.

b) Study Projects Relevant to the Effective Use of Indonesian Energy Resources

With regard to the effective use of energy resources, study projects sponsored by the World Bank aiming at providing the poor with affordable energy service are now in progress. Besides, the World Bank also sponsors projects for evaluation of technical options in connection with new power station construction as well as introduction of IGCC or clean-coal technology into existing oil thermal power stations.

4) The Netherlands Government

The Netherlands government is giving financial support to the Indonesian Ministry of Environment though on a relatively small scale. The Netherlands International Cooperation Agency started to promote project formation in Indonesia in the year in 2001, and has been actively persuading GOI to consent to the conclusion of a bilateral agreement on CERUPT (Certified Emission Reduction Unit Procurement Tender). The Indonesian

Ministry of Environment has basically consented to the agreement to sell the Netherlands government 20,000 to 111,000 CERs of 2 CO_2 by 2012, which will be confined to the energy sector with PLN and Pertamina as the implementation agencies.

Apart from that, the Netherlands government is currently negotiating with its partner bodies to offer education, training and capacity development assistance especially for the chemical industry. It is imperative to keep an eye on future developments.

5) Danish Government

The Danish government opened a CDM Capacity Building Training Course for a term of 18 months starting in July 2005 with the Indonesian private sector as the beneficiary. This training course was intended not only for capacity building, but also for identification of excellent CDM projects and collection of relevant information. Besides, its international cooperation agency, DANIDA, is now carrying out a cooperation program relevant to the field of EE&C (conduct a clearing house and publicity activities for energy conservation and optimization of the use of energy), which will last 5 years from 2008 onwards.(the planned budget is $10,000,000）

2.6 Status on Energy Conservation Efforts at the Practical Business Level

For the purpose of identifying the estimated potential for energy conservation throughout Indonesia, the Study Team adopted two approaches. The first is to estimate the energy saving potential of highly efficient equipment and/or labeling programs through researching the electric appliance market. The second is to reckon the potential of the energy manager system and/or facility improvement by means of sector-specific, on-site investigation, specifically consisting of simplified energy conservation surveys, including interviews on the practice of energy management and a questionnaire.

With a focus on the on-site investigation mentioned above as the second approach, this section takes a look at:

- A review of the results of the energy conservation surveys in major sectors conducted by EMI, formerly known as KONEBA, as an approach at the practical business level, and
- The results of the simplified energy conservation surveys conducted at steel factories, textile dying factories and buildings including a commercial office building, government office buildings, a supermarket, a hotel and a hospital.
- Questionnaire on the energy manager system, as sent to approximately 100 selected factories and buildings that might have certified energy managers in the future

2.6.1 Review on the Results of the Past Energy Conservation Surveys

(1) Survey Results by Sector

Indonesia has had at least 400 energy audit. They include surveys for factories and buildings under MEMR’s partnership program to promote energy conservation, factory examinations performed by MOI and energy saving checks performed by international cooperation agencies and overseas governmental institutions. The Study Team collected the data from these examinations to study the country’s energy consumption and energy control efforts.

The Study Team asked EMI to summarize the results of energy audit which were conducted in the past.

The table below shows the timetable for the compilation of the results of past energy audit as well as duty assignments:

Table 2.6.1-1 Timetable for the Compilation of Results of Past Energy Audit

No.	Task	Assigned to	Date	
1	Development of data compilation specifications	JICA Team	Sep. 2007	
2	Service contract agreement	JICA Team/EMI	Oct. 2007	Primary survey
3	Collection of check result reports	EMI	Oct. to Dec. 2007	
4	Compilation of check data	EMI	Dec. 2007	
5	Review of check data	JICA Team/EMI	Dec. 2007 to Jan. 2008	Secondary survey

Past energy audit reports each had their own formats. It was therefore necessary to integrate the data into a unified format after gathering the survey reports. As a result, a total of 107 valid audit reports for factories and buildings in 13 subsectors were processed in the compilation process and reviewed.

The table below indicates the number of audit reports subjected to the review by sector.

Table 2.6.1-2 Number of Audit Reports Subjected to the Review by Sector

Sector	Subsector	Survey reports reviewed
Industry	Textile	26
	Steel	19
	Food	12
	Glass	7
	Ceramics	3
	Chemical	3
	Rubber	2
	Papermaking	1
	Plywood	1
	Mining	1
Buildings	Business and government office buildings	26
	Hotels	4
	Hospitals	2
Total		107

(2) Review of the Factory Audit Results

1) Steel-making sector

a) Energy management situation

Among 19 factories, only one factory reported carried out energy management, but concrete activity is unknown. 3 factories reported that energy conservation is not grasped as an important problem, and the other 15 factories reported nothing. It is considered in past factory energy audits, interviews and investigation on energy management activities were not conducted.

In order to promote energy management activities, top management of a factory such as a factory manager is required to recognize the importance of energy conservation, which also leads to reduction of manufacturing cost, to exercise leadership and to establish an organization, set targets, carry out energy intensity management, and follow-up the activity through meetings.

Moreover, in the energy audit of a factory, an energy auditor should investigate energy management activities specified in the energy audit manual and let top management recognize the importance of energy management through an interview and discussion.

b) Energy conservation potential

Table 2.6.1-3 Energy Conservation Potential in Steel & Iron Industry in Indonesia

No.	Factory number	Production process	Products	Production		Energy consumption		Energy potential(%)		
								1st	2nd	Total
1	No.6	Hot rolling	Steel sheet	36,478	t/y	97,811	GJ/y	12.3	0.1	12.4
2	No.7	Hot rolling	Bar	11,200	t/y	54,711	GJ/y	7.2	17.6	24.7
3	No.8	Hot rolling	Bar & section	117,120	t/y	394,510	GJ/y	0.2	0.5	0.7
4	No.13	EAF + Hot rolling	Billet	185,000	t/y	100,683	GJ/y	0.0	38.9	38.9
5	No.14	EAF + Hot rolling	Billet & wire rod	1,440,000	t/y	1,179,723	GJ/y	7.3	1.6	8.9
6	No.15	EAF + Hot rolling	Billet & bar	290,000	t/y	470,185	GJ/y	0.3	0.4	0.7
7	No.16	EAF + Hot rolling	Billet & bar	81,000	t/y	115,273	GJ/y	1.1	1.4	2.5
8	No.18	EAF + Hot rolling	Bar & rod	100,000	t/y	306,480	GJ/y	1.9	0.1	2.0
9	Total					2,629,987	GJ/y	4.2	2.8	7.0

Source: Report by EMI

Since equipment of the steel industry in Indonesia is in operation for 20 to 30 years, if the measures with large-scale investment including renewal of equipment are implemented, the energy conservation potential increases to 30% or more.

Energy conservation measures on fuel consumption include combustion control improvement such as air ratio improvement of the steel billet heating furnace, waste heat recovery, and prevention of the cold air infiltration into the furnace.

Energy conservation measures on electric power consumption include change of contract demand, capacitor installation for power factor improvement of a power receiving transformer and process equipment, scrap pre-heater installation of electric arc furnace, improvement of operation of electric arc furnace, control of operation control of cooling tower and pump, and inverter control of a rolling mill drive motor from a DC motor.

2) Textile Dyeing and Finishing Industry

a) Energy management situation

11 factories have the target for energy management among 26 factories surveyed. But the targets mentioned are themselves not concrete.

13 factories hold periodical meetings on topics including energy management.

Many factories have collected data, but for energy management he data is not utilized.

Energy management training for workers has been held in 10 factories.

Incentives for energy management are established in 2 factories. It is necessary for the activity of energy conservation for the management such as factory managers to be aggressive. They should consider energy issues more seriously to reduce production cost. More leadership is expected inform the managing personnel who are responsible for the production site. The main tasks that should be performed are establishing an organization, setting targets, energy intensity control and following up the activity through meetings. Analysis of collected data should also be conducted to figure out the present conditions and trends. Finally, abnormal situations and issues to be cleared up should be found out quickly..

b) Energy conservation potential

There are 26 factories and the sector classification is as follows; Synthetic fiber manufacture (3),Spinners (9),Spinning and Dyeing (1),Spinning and Weaving (1), Weaving and Dyeing (2), Spinning, Weaving and Dyeing (6), Textile Printers (2). Therefore it is very hard to make energy intensity comparisons.

- In terms of energy conservation potential, 18 factories can achieve less 10%, saving 4 factories,11 to 20% , and 4 factories more than 21%.
- Some spinning companies have potential of 79.6% and 64% by means of changing spindle rotation speed from 10,500 rpm to 13,000rpm after changing drive motors.

As mentioned above, spinners consume electric power mainly for motors. Yarn manufacturing range from fine counts to big counts and electric power for the motor is the production cost. Reducing electric power consumption and cutting demand is the most serious proposition for them.

For the speed-up in rotation it is necessary to procure new motors, and spinners are afraid that they may not maintain the yield of standard products. So speed-up of spindles does not always contribute to the energy conservation. In the operation of a train ,a faster train can not attain the energy conservation instantly.

In some factories whose potential is less than 10% , improvements in the production line have not been considered , the focus has only been on utilities i.e. boiler, air compressor and chiller for air conditioning. This means, if rationalization penetrates to the production side, the energy saving might reach an estimated 20 to 30%.

To achieve the conservation in the production line, process technology should be improved. The investigation and audit skill of EMI is limited in the industrial processes. The skills needed for general or utility energy management and process engineering should be considered separately. This indicates a suggestion for the energy management system in factories.

To reap a bigger harvest , the process engineer and energy manager must work together for energy saving.

In the textile industry, energy conservation in thermal equipment is achieved by fuel to air ratio, waste heat recovery, insulation of steam pipes and some heat recovery from heated wastewater in dyeing factories. In electrical equipment, the following factors must be considered; demand change, condenser introduced for power factor improvement, prevention of voltage drop, adjustment of imbalance among the phases, motor maintenance and inverter operation of blowers, circulation pump and fans, and exhaust fans.

3) Food, Glass, and Other manufacturing Sectors

The summary of data on energy conservation by industrial sector of the past factory audit is shown in Table 2.6.1-4.

Energy audit data of glass factories covered 2 sheet glass factories, 4 glass container factories, and 1 glass processing plant. 7% of energy-conservation potential is in primary energy conversion. Energy conservation measures of the 1st phase are combustion control improvement, heat insulation strengthening of furnace wall, and improvement of air compressor operation system of glass melting furnace, hence the energy-saving effect is large. Energy conservation measures of 2nd phase are power factor improvement, renewal of glass melting furnace etc. Although it is not contained in the diagnostic data, the energy-conservation potential of improving the pass rate of products and improving the product yield is large.

Energy audit data of food-processing factories pertain to beverage manufacture, confectionery manufacture, seasoning manufacture, palm oil manufacture, milk manufacture, sugar manufacture, and meat processing. Energy conservation potential is 0.3% in primary energy conversion. Generally, the scale of a food-processing factory is small, the ratio of energy cost to sale price is 2-5%, and so energy-saving potential is small. Energy conservation measures of the 1st phase are combustion management of boilers, steam piping heat insulation strengthening, steam condensate recovery, air compressor operation system improvement, chiller operation system improvement, and stopping idle operation of grinders, and so the energy-saving effect is large. Energy conservation measures of the 2nd phase are waste heat recovery of boilers, power factor improvement, waste heat recovery in private generators, fluorescent light ballast change, and upgrading to efficient equipment, and so these measures can be implemented with small investment.

Table 2.6.1-4 Energy Conservation Potential by Industry Sector from the Past energy Audit Report

		Steel	Textile	Glass	Food	Ceramic	Chemical	Total
Numbers of Sample Factory		19	28	7	12	3	3	72
Fuel Consumption (TOE/yr)		538,026	941,771	159,403	10,307	12,497	244,202	1,906,205
FO (kL/yr)		10,934	562,488	51,664	3,167			628,253
IDO/HSD (kL/yr)		559,908	374,519	10,653	6,299	5,608	270,892	1,227,878
Coal (Ton/yr)		165	106,147					106,312
NG (m3/yr)		25,350,408	16,719,730	111,927,550	1,801,896	8,268,415		164,067,999
LPG (kg/yr)			180,810					180,810
Electricity Consumption (kWh/yr)		859,705,033	725,298,643	90,657,327	59,688,496	4,790,152	5,635,452	1,745,775,103
(TOE/yr)		209,249	176,535	22,066	14,528	1,166	1,372	424,915
Fuel Energy Consumption (MJ/yr)		22,194,866,758	22,333,847,870	6,948,474,000	63,228,842,064	543,823,157	10,293,896,000	125,543,749,849
Electrical Energy Consumption (MJ/yr)*		3,094,938,118	2,611,075,114	326,366,379	214,878,586	17,244,547	20,287,627	6,284,790,372
Total Energy consumption (MJ/yr)	D+E	25,289,804,877	24,944,922,984	7,274,840,379	63,443,720,650	561,067,704	10,314,183,627	131,828,540,221
(TOE/yr)		747,275	1,118,305	181,468	24,835	13,663	245,573	2,331,120
Total Primary Energy Consumption (MJ/yr)		32,194,036,161	30,769,745,905	8,002,903,066	63,923,074,807	599,537,082	10,359,441,550	145,848,738,569
Potential Fuel Saving volume (TOE/yr)		1,769	1,176,346	1,625	185	184	6	1,180,115
Fuel (kL/yr)		9,246	2,480	11,935	887	23	6,901	31,471
Coal (Ton/yr)			2,281,410					2,281,410
NG (m3/yr)		831,958	578,216	880,876	204,825	204,825		2,700,700
LPG (kg/yr)		870,000	9,464	705,880				1,585,344
Potential Fuel Energy Saving (MJ/yr)		144,280,969	177,092,790	540,553,240	65,800,334	34,093,528	262,238,000	1,224,058,861
Potential Electricity Saving Volume (kWh/yr)		169,827,996	78,478,017	2,007,944	8,900,222	89,577	555,503	259,859,258
(TOE/yr)		41,336	19,101	489	2,166	22	135	63,249
Potential Electricity Energy Saving (MJ/yr)		293,125,522	314,190,945	11,823,205	31,638,572	322,477	1,999,811	653,100,533
Total Potential Energy Saving Volume (MJ/yr)	G+H	437,406,491	491,283,736	552,376,445	97,438,906	34,416,005	264,237,811	1,877,159,394
(TOE/yr)		43,105	1,195,447	2,113	2,351	206	142	1,243,364
Total Primary Energy Saving (MJ/yr)		2,119,538,574	1,089,865,141	563,907,497	169,318,199	35,135,391	268,699,017	4,246,463,818
Potential Fuel Energy Saving Ratio (%)	G/D*100	0.7	0.8	7.8	0.1	6.3	2.5	
Potential Electrical Energy Saving Ratio (%)	H/E*100	9.5	12.0	3.6	14.7	1.9	9.9	
Total Potential Energy Saving Ratio (%)	I/F*100	1.7	2.0	7.6	0.2	6.1	2.6	
Total Potential Primary Energy Saving Ratio (%)		6.6	3.5	7.0	0.3	5.9	2.6	2.9

Source: Report by EMI

(3) Review of Energy Audit Report of Buildings

Table 2.6.1-5 shows classification by sub-sector of past building energy audit results.

The energy audit results of school / university are for 4 rectorate offices, 2 training centers, 1 lecturebuilding, and the potential energy saving ratio is 12.44% by primary energy conversion. At government officse, the energy audit results are for 15 buildings, and the potential energy saving ratio is 12.59% by primary energy conversion.At commercial (office) buildings, the energy audit results are for 2 private enterprise buildings, and the potential energy saving ratio is 7.18% by primary energy conversion.

At these kind of office building, the first grade items and measures for improvement are to adjust thermostat setting, to conduct routine maintenance on office equipment (housekeeping), to increase chiller/AC performance, to turn off all air conditioning units/lamps and unnecessary office equipment after office hours, etc. By these only mostly operative improvements, a considerable saving energy saving effect can be expected.

The second grade items and measures for improvement are to replace magnetic ballasts by electronic ballasts, to establish electric harmonics by installing harmonic filters, to improve power factor by installing capacitor banks, to replace refrigerant R-22 by hydrocarbon, to conduct training on energy management and energy conservation to increase awareness among occupants, to repair pumps automation systems, to install glass film on windows, etc. These have to be accompanied with investment, but, a bigger saving effect can be expected.

Next, for hotels, the energy audit results are for 4 buildings, and the potential energy saving ratio is 17.31% by primary energy conversion. The first grade items and measures for improvement are to improve chiller/AC performance, to turn off unnecessary lamps, and so on. The second grade items and measures for improvement are to replace magnetic ballasts by electronic ballasts, to replace incandescent lamps by energy saving lamps, etc. A big energy saving can be expected.

Lastly, for hospitals, the energy audit results are for 2 buildings, and the potential energy saving ratio is 4.4% by primary energy conversion. The first grade items and measures for improvement are to adjust thermostat setting, etc. The second grade items and measures for improvement are to implement an energy management system, to replace refrigerant R-22 with hydrocarbon, etc.

Table 2.6.1-5 Energy Saving Potential of Building by Sub-sector (Classification of Past Building Energy Audit Results) Source：EMI(Local Consultant)'s Report

			School/University	Government Office	Commercial Building	Hotel	Hospital	Total
A	Fuel Consumption Volume (kL/y)							
B	Fuel Consumption Volume (MJ/y)							
C	Electricity Consumption Volume (kWh/y)		3,642,106	32,957,177	13,966,173	19,135,442	1,561,756	71,262,655
	(TOE/y)		886	8,022	3,399	4,658	380	17,345
	Primary Energy Consumption (MJ/yr)		42,361,087	383,322,637	162,439,586	222,562,994	18,164,675	828,850,979
D	Electricity Energy Consumption (MJ/y)*		13,111,583	118,645,839	50,278,223	68,887,591	5,622,322	256,545,558
E	Total Energy Consumption (MJ/y)	B+D	13,111,583	118,645,839	50,278,223	68,887,591	5,622,322	256,545,558
F	Numbers of Sample Building		7	15	2	4	2	30
G	Potential Fuel Saving (kL/y)							
H	Potential Electricity Saving Volume (kWh/y)		453,219	4,148,853	1,003,177	3,313,299	68,695	8,987,243
	(TOE/yr)		110	1,010	244	806	17	2,187
	Potential Primary Energy Saving (MJ/y)*		5,271,359	48,255,020	11,667,878	38,536,750	798,987	104,529,994
I	Potential Energy Saving (MJ/y)		1,631,588	16,318,184	3,611,436	11,927,876	247,302	33,736,387
J	Potential Energy Saving Ratio (%)	I/E*100	12.44	13.75	7.18	17.31	4.40	13
	Potential Primary Energy Saving Ratio (%)		12.44	12.59	7.18	17.31	4.40	

2.6.2 On-site Energy Conservation Surveys

(1) Criteria for Facilities Subject to On-site Preliminary Energy AuditEnergy Conservation Surveys

The objectives of the on-site Preliminary Energy Auditenergy conservation surveys are to identify the status of energy management at the practical business level and the energy saving potential and to provide basic material for an energy manager system.

In the light of these objectives, MEMR was asked to select the facilities subject to on-site surveys from among the factories and buildings in and near Jakarta fitting two criteria:

- No energy audit had been conducted in the preceding twelve months.
- The annual energy consumption in fiscal 2006 reached or exceeded 1,500 kiloliters in crude oil equivalent.

The first requirement was aimed at removing from the calculation of the energy consumption reduction effect of the on-site surveys any factor that impedes comprehension of the realities of energy consumption, such as any remedial action already undertaken in response to the past audit.

The second requirement was introduced on the basis of the thinking that the energy manager program should be compulsory at facilities with an annual energy consumption of 12,000 tons or more in crude oil equivalent or with a power receiving capacity of 6,000 kVA or more in accordance with RIKEN (Master Plan of National Energy Conservation). (See 2.4.1-(2)-1) Energy Manager System in the Fiscal 2005 Edition of RIKEN)

(2) Conducting On-site Energy Conservation Surveys

On-site energy conservation surveys for factories and buildings were conducted in steel factories, textile factories and buildings such as a commercial office building, governmental office buildings, a supermarket, a hotel and a hospital located in the city of Jakarta and within a 150 kilometer radius of the capital.

The survey team consisted of two specialists from the Study Team and three measurement personnel. The measurement process was outsourced to BPPT.

The initial plan envisioned that the primary survey would be a preliminary survey of factories and buildings subject to the real surveys and that the real checks would be conducted in the secondary survey. However, the primary survey failed to identify factories or buildings that met the above criteria. The survey team visited those business establishments where energy saving checks were conducted under the partnership program of MEMR’s grant-aided project in fiscal 2007. The survey was performed using an audit sheet.

In the secondary survey, the team visited one steel factory, two textile factories and five buildings that had been recently selected to perform the on-site energy saving checks, including a fact-finding study on energy management and data gathering through measurement.

Fig. 2.6.2-1 portrays the steps of the on-site energy conservation surveys.

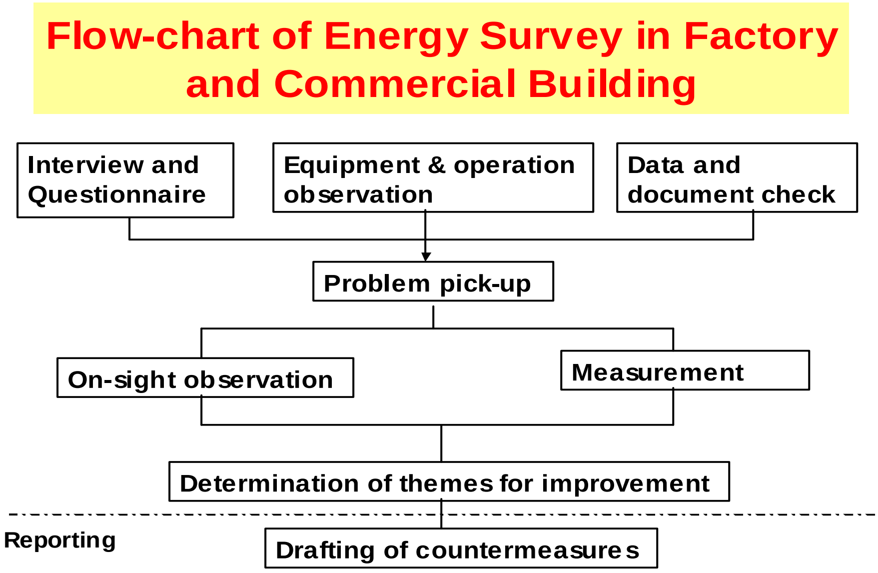


Fig. 2.6.2-1 Flow-chart of the On-site Energy Audit

Table 2.6.2-1 shows the timetable of operations for the on-site energy audit.

Table 2.6.2-1 Timetable of Operations for the On-site Energy Audit

No.	Task	Assigned to	Date	Remark
1	Preparation of preliminary audit sheets	JICA team	Sep. 2007	
2	Selection of business establishments to be surveyed	MEMR	Sep. 2007	
3	Dispatch of the preliminary audit sheets	MEMR	Sep. 2007	
4	Preliminary audit	JICA Team/MEMR	Sep. 2007	Primary audit
5	Preparation of the checklist	JICA Team	Oct. to Nov. 2007	
6	Selection of business establishments to be surveyed and schedule coordination	MEMR/BPPT/ JICA Team	Oct. to Nov. 2007	
7	Study on check items and selection of measuring instruments	JICA Team/BPPT	Nov. 2007	
8	Real checks for steel and textile factories and buildings such as commercial and government office buildings, a supermarket, a hotel and a hospital	JICA Team/BPPT	Nov. to Dec. 2007	Secondary survey
9	Preparation of audit result reports	JICA Team/BPPT	Dec. 2007 to Jan. 2008	
10	Reporting of the audit results to the partner body and those surveyed	JICA Team	Feb. 2008	Tertiary survey

(3) Results of the On-site Energy Audit

This section merely outlines the survey results. More detailed information is summarized in 2.6.3 and later sections.

- Energy conservation efforts
  - Certain energy management efforts were seen in those buildings where the need to introduce energy cost controls was relatively high, such as commercial office buildings, a supermarket and a hotel. However, there were no organizational efforts.
  - Those personnel who directly engage in facility management were found to be conscious of energy management. However, it is difficult to offer their views to those with the authority to make decisions on specific matters such as new investment and organization setups.
- Energy conservation potential
  - Although outputs were commensurate with the capacity for power receiving, manufacturing, air-conditioning and other systems, several cases of excessive energy consumption were observed. It was thought that there was considerable potential for energy saving on a nationwide scale.
  - Second-hand manufacturing machinery was purchased and used at many factories. At several such plants, energy consumption could be cut by performing appropriate modifications without sacrificing quality and productivity.
  - A tendency can be observed, that the potential for lowering energy consumption is limited at those buildings where the equipment is relatively well maintained and well managed, and high at those where such maintenance and management are inadequate.

(4) Questionnaire on Energy Manager System

1) Implementation Details

In the light of the formulation of the energy manager system, a questionnaire was sent to factories and buildings to obtain basic information on the attitudes at the practical business level.

The questionnaire was sent to approximately total of 100 selected factories and buildings that might have certified energy managers in the future. Table 2.6.2-2 provides the number of selected establishments surveyed by subsector.

Table 2.6.2-2 List of Respondents of Questionnaire Survey

No	Respondents	Number of Respondents	Response			No Response
			By On-site Survey	By Letter	Investigation By Telephone	
INDUSTRY						
1	Steel Industry	15	1	0	8	6
2	Textile Industry	15	2	0	5	8
3	Food Industry	15	0	1	4	10
4	Paper Industry	15	0	0	3	12
	TOTAL INDUSTRY	60	3	1	20	36
BUILDINGS						
1	Government Buildings	8	1	0	3	4
2	Office Buildings	8	1	1	3	3
3	Hotels	8	1	0	2	5
4	Shopping Centers	8	1	0	2	5
5	Hospitals	8	1	0	3	4
	TOTAL BUILDING	40	5	1	13	21

Only 2 respondents responded to the questionnaire on their own, although the questionnaire was delivered to all by handl. The reason seems to be a difficulty in understanding the purpose of questionnaire and lack of experience of similar survey. In order to increase the number of effective respondents of the questionnaire survey, , the Study Team conducted a direct on-site survey to collect 8 respondents, and conducted a survey via telephone to collect 33 respondents. Including partial answers, in total 43 answers were finally received from about 100 potential respondents.

2) Questionnaire Results

The main results of the questionnaire survey of 24 factories and 19 buildings are shown in Table 2.6.2-3.

Evaluation of energy management activities of factories and buildings is shown in Fig. 2.6.2-2. Although buildings implement the measure for energy conservation, the systematic energy management activities such as energy-saving target setup are not implemented. Although factories set up the energy-saving target, it is insufficient of the knowledge to implement a target. Capacity building for energy management is required.

Electricity intensity per floor area in buildings of Indonesia and Japan by the questionnaire survey is shown in Fig. 2.6.2-3. The energy conservation potential of buildings of Indonesia is 20% to 35%.

Table 2.6.2-3 Main Results of Questionnaire Survey

Question	Result		
Respondent's characteristics /General Information	Counted result	Industries	Almost all respondents from steel factories have production capacity less than 100,000 tones per year. Only one factory has annual production over 800,000 tones
		Buildings	62% of the respondents from buildings have less than 1000 employees. 53% of buildings have gross floor area less than 30,000 m2, and only one building has gross floor area more than 50.000 m2
	Inferences		In industries, even in the same sub sector, there is difference between kind and quantity of product by factories. Therefore, energy intensity becomes a benchmark, however, to use it for comparison is difficult.
/Energy Consumption Profile	Counted result	Industries	More than half of the respondents from industries have electricity contract demand less than 10,000 kVA. Electricity consumption of respondents from industries varies widely. Electricity intensity for steel industries is in the range of 67 kWh/ton to 1,752 kWh/ton.
		Buildings	Average electricity intensities of buildings for the categories of government office, hotel, shopping centre and hospital, were 61 kWh/ m^{2}, 180 kWh/ m^{2}, 261 kWh/ m^{2}, 269 kWh/ m^{2} and 239 kWh/ m^{2}, respectively.
	Inferences		In buildings, buildings of every sub sector (office, hotel, shopping center, hospital) have their own characteristics of energy consumption. Furthermore, each sub sector's value of energy intensity can be used as an index to compare between other buildings belonging to the same subsector. forgiven the insufficiency of the above-mentioned responses, it seems that energy consumption is considerably more than in Japan.
Energy Conservation Activity /energy efficiency activities and specific targets	Counted result	Industries	More than half of the respondents from industries have energy conservation targets (58.3%), and only 30% of respondents said they had no target in energy conservation. Among the respondents who have energy conservation targets, 37.5% of the respondents have specific target value, and the remaining 20.8% have no specific target value. The data of energy consumption is mainly used to calculate energy cost (66.7%) and to get the trend curve of energy consumption (62.5%). Some industries have also analyzed the relationship between production and energy consumption (54.2%). Most respondents from industries did not mention the simple pay-back period for investment on energy conservation technology (45.8%). Among the respondents, 25% of them said the simple pay-back period for investment on energy conservation technology is between 1-2 years.

Question	Result		
		Buildings	Half the respondents (50%) claim to have energy efficiency activities in the building, but the remaining respondents did not answer the question. It seems that energy efficiency activities are conducted relatively well in buildings, but only 22% of the buildings have specific targets in energy conservation.
	Inferences		More industries than buildings have set specific targets, because setting targets is an organization activity.
/formal organization and meetings	Counted result	Industries	Most respondents (75%) said no energy manager was appointed in the factory. Although an energy manager was not formally appointed, activities of energy conservation in the factory were mainly managed by the maintenance manager (54%). And since there is no formal organization of energy manager, most respondents have meetings on energy management only when necessary (37.5%).
		Buildings	Similar to respondents from industries, there was no formal organization for energy management in buildings. Energy conservation activities in buildings are mainly managed by the Maintenance Department. And since no formal organization of Energy Management exists, meetings on energy management are held only if necessary (47%).
	Inferences		In both industries and buildings, there is neither an energy manager nor a formal organization. Energy saving activity is not only facility maintenance, but also includes management and use and investment. Therefore, it is very effective for EE&C to establish a formal organization having meetings with an energy manager.
/Obstacles and Support	Counted result	Industries	Lack of information on government measures (83.3%) seems to be the main obstacle to energy conservation activities, followed by shortage of engineers (66.7%). About half the respondents (54.2%) require support from government in the form of training courses on energy management and energy conservation technology.
		Buildings	Low awareness among employees of energy conservation (50%) seems to be the main obstacle to energy conservation activities, followed by lack of information on government measures (45.8%). Support from government is required to open some training courses on energy management and energy conservation technology.
	Inferences		Administrative support information and talented personnel who have received education are necessary for EE&C. Support from government is required to open some training courses on energy management and energy conservation technology.
/Global Warming	Counted result	Industries	62.5% of the respondents from industries have no experience in calculating greenhouse gas emissions such as CO_2, but 80.2% of the respondents are interested in CDM.

Question	Result		
		Buildings	Almost all buildings (84.2%) have no experience in calculating greenhouse gas emissions such as CO_2, but 73.7% of the respondents are interested in CDM.
	Inferences		In both industries and buildings, the respondents are interested in global warming. It also seems to be known that CDM is useful for EE&C.

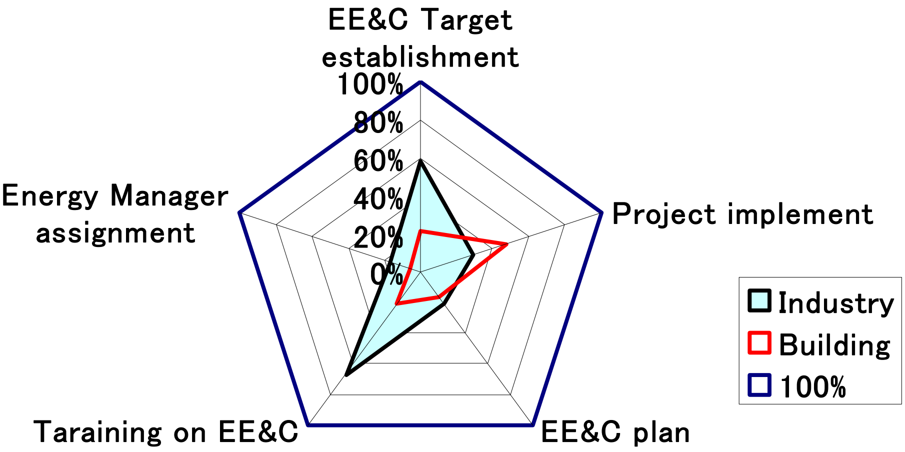
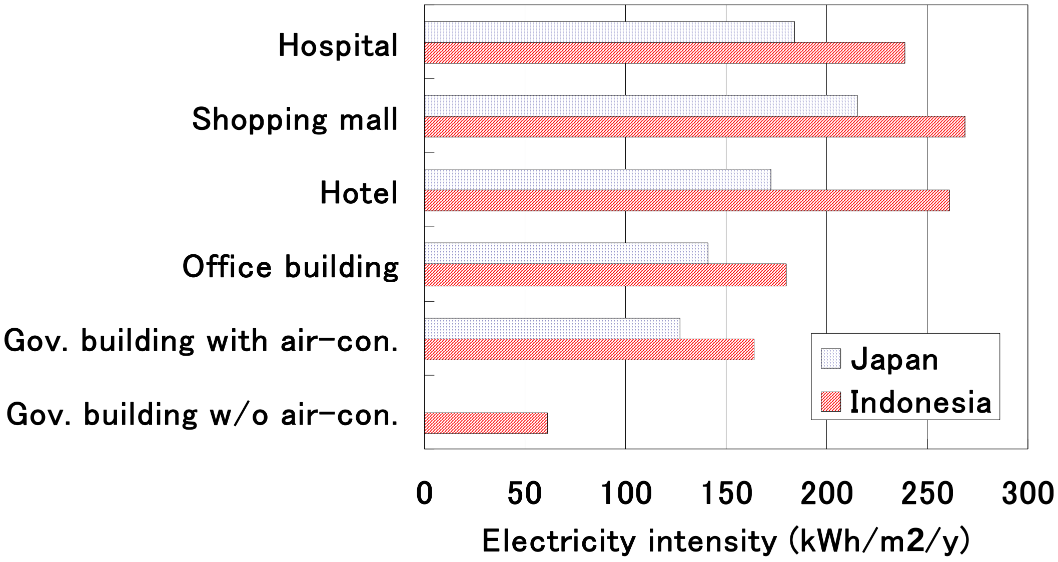


Fig. 2.6.2-2 Evaluation of Energy Management Activities in Factories and Buildings



Source: Indonesian data: Questionnaire study by BPPT
Japanese data: Questionnaire data by Ministry of Environment in 2004

Fig. 2.6.2-3 Electricity Intensity per Floor Area of Buildings in Indonesia and Japan by Questionnaire Survey

2.6.3 Energy Management Situation and Energy Conservation Potential of Factory

In the first and second missions, preliminary energy audit was conducted in factories of the steel-making industry and the textile dyeing industry, the situation of energy management was investigated, and energy conservation potential was estimated by energy audit with measurement.

(1) Steel-making industry

1) Energy audit results of steel making factory

The outline, energy use situation and activities pertaining to energy use aspects of the steel-making factory (A) are shown in Table 2.6.3-1, Table 2.6.3-2 and Table 2.6.3-3 as the results of the site survey and analysis in the 2nd study.

As shown in Table 2.6.3-2, the energy intensity of Steel-making Factory (A) is different from that of a Japanese steel-making factory.

The production process flow diagram of Steel-making Factory (A) is shown in Fig. 2.6.3-2.

Table 2.6.3-1 Outline of Steel-making Factory (A)

Item	Steel-making factory - A
Products	Steel bar: 6mm to 9mm in diameter
Equipment	1 – Reheating furnace, 2 – Rolling mill line
Production	Capacity: 8000 ton/month Production amount: 50,000 ton/year in 2007
Material	Purchased steel billet
Establishment	Re-established in 2001
In-house generator	Emergency 100 kVA for office building
Transformer	7,500kVAx2, 6,300kVA, 2,500kVA
Technical support	Japanese company at starting stage

Table 2.6.3-2 Energy Use Situation of Steel-making Factory (A)

Item	Steel-making factory - A	Japanese steel-making factory
Fuel	Heavy oil	
Fuel consumption	2,750 kL/y	
Electricity	Contract demand 4,150 kVA	
Electricity consumption	9,200 MWh/y	
Production (ton/year)	50,000	300,000
Fuel intensity (kcal/ton)	537,000	264,000
Electricity intensity (kWh/ton)	184	100 – 130

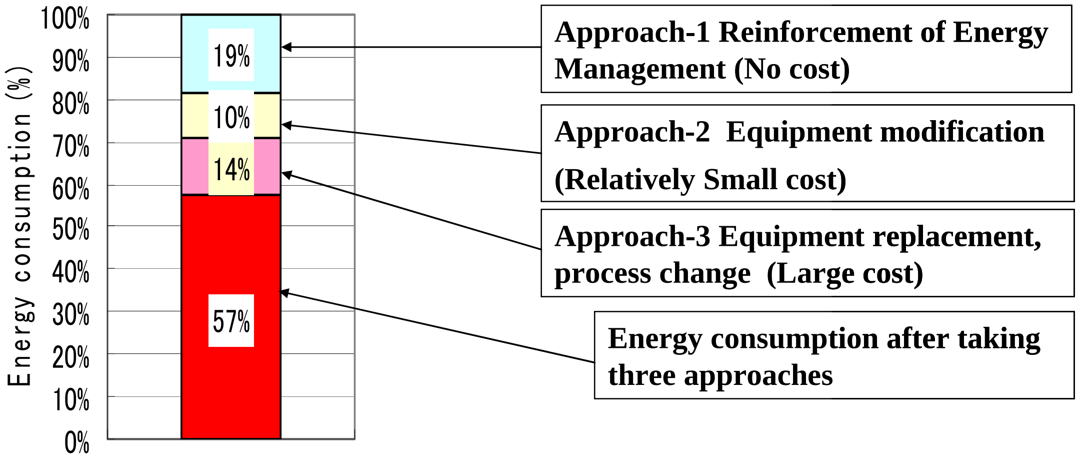
Table 2.6.3-3 Activities Pertaining to Energy Use Aspects

Jump in heavy oil price	- Use of water gas using coal is planned. - Improvement of fuel intensity by pre-heated air with exhaust gas heat recovery unit (under construction)
Jump in electric power price	- Nothing in particular
Exhaust-heat recovery	- The pre-heating unit of the combustion air by the exhaust gas of the heating furnace is under construction.

The proposals for improvements resulting from the energy audit and the expected effects after implementation of the improvement measures are shown in Table 2.6.3-4. In the billet reheating furnace, compressed air system, rolling yield improvement and regenerative burner, energy conservation potential is 23.5%. Energy conservation potential of fuel consumption in billet reheating furnace is shown in Fig. 2.6.3-1, in which the introduction of regenerative burner makes 42% of energy conservation.

Table 2.6.3-4 Recommendations and Estimation of Effects of the Countermeasures

Item No.	Step of EE&C	Improvement items (Itemized corresponding to an appended observation list)	Expected effects		
			Kind of energy	Amount of energy conservation (kl/y, kWh/y etc.)	Amount of energy saving (1000 Rp/y)
b)-1	1	Air ratio improvement of billet reheating furnace from 1.7 to 1.25	Fuel oil	201,600 kg	1,290,000
b)-2	1	Reduction of the amount of infiltration air from charging port of billet reheating furnace	Fuel oil	192,000 kg	1,229,000
b)-3	2	Repairing of fire-resistant refractories of side wall of billet reheating furnace	Fuel oil	22,200 kg	142,000
b)-4	2	Implementation of air pre-heating by waste heat recovery of billet reheating furnace (under construction)	Fuel oil	199,800 kg	1,278,700
b)-5	3	Introduction of regenerative burner in reheating furnace	Fuel oil	294,300	1,883,500
c)-1	1	Operation numbers of cooling tower are changed into 1 set from 2 sets for cooling water of billet reheating furnace	Electric power	133,200 kWh	58,608
d)-1	1	Air leakage repair of compressed air piping	Electric power	16,920 kWh	7,445
e)-1	1	Improvement of rolling yield from 95% to 95% by operation improvement	Fuel oil	155,000 kg	992,000
e)-2	1	Improvement of rolling yield from 95% to 95% by operation improvement	Electric power	552,000 kWh	242,880
Total of expected results			Fuel (total)	1,064,900 kg/year	6,825,400 1000 Rp/year
			Electric power (total)	702,120 kWh/year	308,933 1000 Rp/year
Crude-oil equivalent of fuel and electric power (total)				1.267 kL/year	
Reduced volume of carbon dioxide (CO_2)			Fuel	2,903 tonCO_2	
			Power	535 tonCO_2	
			Total	3,438 tonCO_2	
Energy conservation rate of the whole factory			Fuel (total)		36.4 %
			Electric power (total)		7.6 %
			Total in factory		23.5 %



Energy conservation ratio
29% in Approach-1& 2
14% in Approach-3

Fig. 2.6.3-1 Fuel Energy Conservation Potential of Billet Reheating Furnace

Production process flow diagram of steel-making factory is shown in Fig. 2.6.3-2.

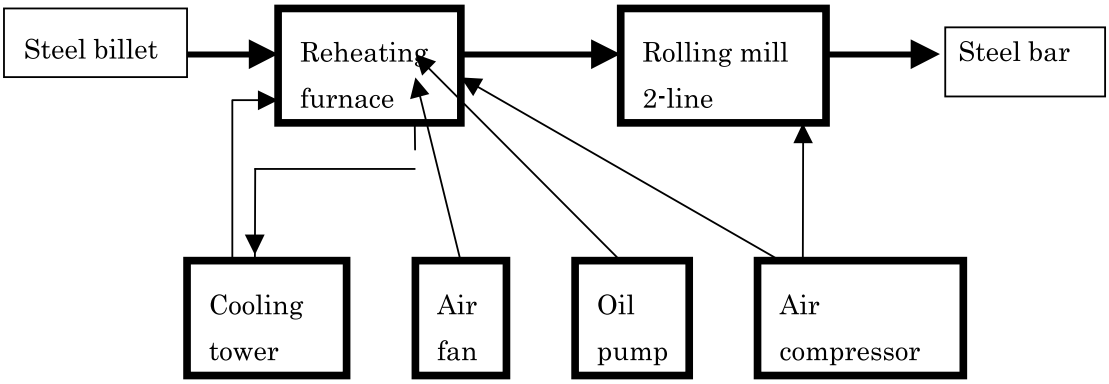


Fig. 2.6.3-2 Production Process Flow of Steel-making Factory (A)

2) Parameters measured in energy audit

The data shown in Table 2.6.3-5 are measured in the energy audit..

Table 2.6.3-5 Parameters Measured in Energy Audit

Item	Parameters	Purpose
(1) Billet reheating furnace: Heat balance	Fuel flow-rate and temperature Combustion air temperature Temperature in the furnace Charged billet volume and billet temperature Temperature of discharged billet Exhaust gas temperature with continuous measurement Qxygen content in exhaust gas Surface temperature of furnace wall Infiltrated air volume Cooling water temperature at the inlet and outlet	Calculation of heat loss, fuel intensity and thermal efficiency ⇒ Improvement measures for reduction of heat loss
(2) Billet reheating furnace: Distribution of surface temperature	Thermal picture of surface of furnace wall with infrared camera	Survey of heat intensive part of furnace wall by thermo color
(3) Cooling tower: Cooling effects	Cooling water temperature at the inlet and outlet Cooling water flow-rate Ambient temperature, wet bulb temperature and humidity Motor current and delivery pressure of circulation water pump Motor current and delivery pressure of feed water pump Opening ratio of valve in line Motor current of cooling tower fan	Operation condition ⇒ Improvement of operation condition and pattern
(4) Air compressor: Loading condition	Motor current of compressor with continuous measurement Delivery pressure of air	Loading ratio ⇒ Operation number control and delivery pressure reduction
(5) Compressed air system: Air pressure and leakage	Air pressure of piping by pressure gauge reading Detecting air leakage with sound	Examination of necessary pressure and line pressure Estimation of air leakage volume
(6) Rolling mill: Operation observation	Interval of rolling and number of missed rolls	Estimation of missed rolls⇒ Improvement of rolling yield

3) Summary of audit results

a) Energy management and organization

The energy management organization of the factory has not been established, and also measurement records, equipment maintenance management, and energy consumption management are inadequate. It is necessary to improve the energy management organization, to nominate an energy manager, and to improve daily management and daily equipment maintenance for meeting set energy-saving targets, compressed air leak checking, etc.

Evaluation results of energy management are shown in Fig.2.6.3-3, judging from energy management activity under the heads of organization, measurement and records, equipment maintenance, energy consumption management, and energy intensity management.

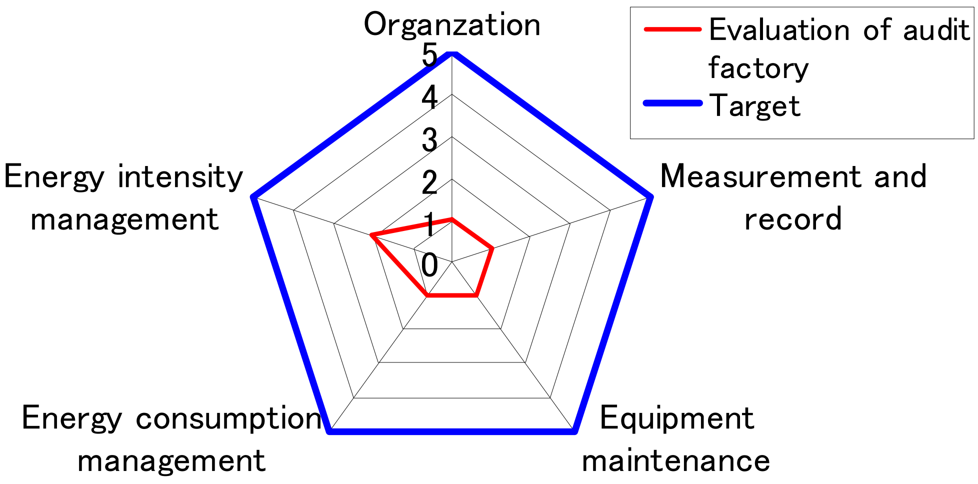


Fig. 2.6.3-3 Evaluation of Energy Management

b) Improvement of energy intensity of billet reheating furnace

The fuel intensity of the reheating furnace can be improved from 550 Mcal/t at present to 385 Mcal/t.

There are many measures for energy conservation which can be implemented in daily work such as air ratio improvement of the reheating furnace, prevention of infiltration of cold air, repair of leaks of compressed air piping, and operation system of cooling tower. The air preheating equipment and combustion control equipment by exhaust heat recovery are under construction. Due to improvement of the air ratio, prevention of cold air infiltration, use of air pre-heater and improvement of heat loss of furnace wall, billet heating efficiency is improved from 36.9% to 46.8% as shown in Table 2.6.3-6 and Table 2.6.3-7, and so 10% fuel saving is possible. As shown in Table 2.6.3-8, billet heating efficiency is improved from 49% to 65% by introduction of regenerative burner.

Cold air infiltration condition is shown in Fig. 2.6.3-4.

Thermal pictures of surface temperature distribution of furnace wall with infrared camera are shown in Fig. 2.6.3-5.

Table 2.6.3-6 Present Heat Balance of Billet Reheating Furnace

1	Input heat	MJ/h	%	2	Output heat	MJ/h	%
a	Fuel combustion heat	15,285	99.4	g	Heat content of discharged billet	5,670	36.9
b	Sensible heat of fuel	96	0.6	h	Sensible heat of exhaust gas	7,124	46.3
c	Sensible heat of air	0		i	Heat loss by incomplete burning	0	0.0
d	Heat content of billet	0		j	Heat loss by cooling water	382	2.5
e	Recovered heat in REC			k	Emission heat loss of body	303	2.0
f				l	Other heat loss	1,902	12.4
				m	Heat recovery in REC		0.0
	Total	15,381	100.0		Total	15,381	100.0

Table 2.6.3-7 Heat Balance after Improvement of Billet Reheating Furnace

1	Input heat	MJ/h	%	2	Output heat	MJ/h	%
a	Fuel combustion heat	10,839	99.4	g	Heat content of discharged billet	5,670	46.8
b	Sensible heat of fuel	24	0.6	h	Sensible heat of exhaust gas	2,195	18.1
c	Sensible heat of air	1,248		i	Heat loss by incomplete burning	0	0.0
d	Heat content of billet	0		j	Heat loss by cooling water	382	3.2
e	Recovered heat in REC			k	Emission heat loss of body	142	1.2
f				l	Other heat loss	2,474	20.4
				m	Heat recovery in REC	1,248	10.3
	Total	12,111	100.0		Total	12,111	100.0

Table 2.6.3-8 Heat Balance after introduction of regenerative burner of Billet Reheating Furnace

1	Input heat	MJ/h	%	2	Output heat	MJ/h	%
a	Fuel combustion heat	8,724	100.0	g	Heat content of discharged billet	5,670	65.0
b	Sensible heat of fuel	0	0	h	Sensible heat of exhaust gas	1,309	15.0
c	Sensible heat of air	(3000)		i	Heat loss by cooling water	436	5.0
d	Heat content of billet	0		j	Emission heat loss of body	872	10.0
e				k	Other heat loss	1,840	5.0
f				l	Heat recovery in REC of burner	(3000)	
	Total	11,403	100.0		Total	11,403	100.0

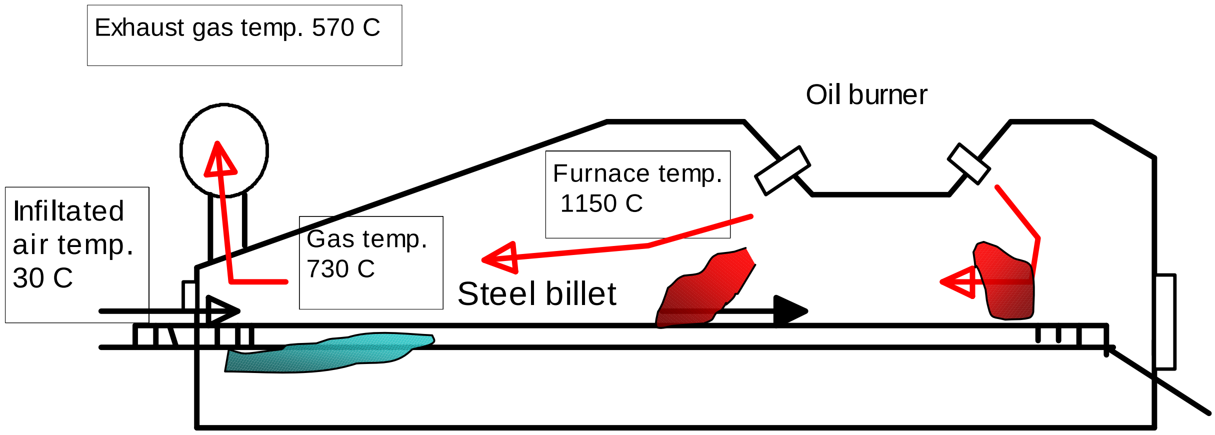


Fig. 2.6.3-4 Cold Air Infiltration of Billet Reheating Furnace

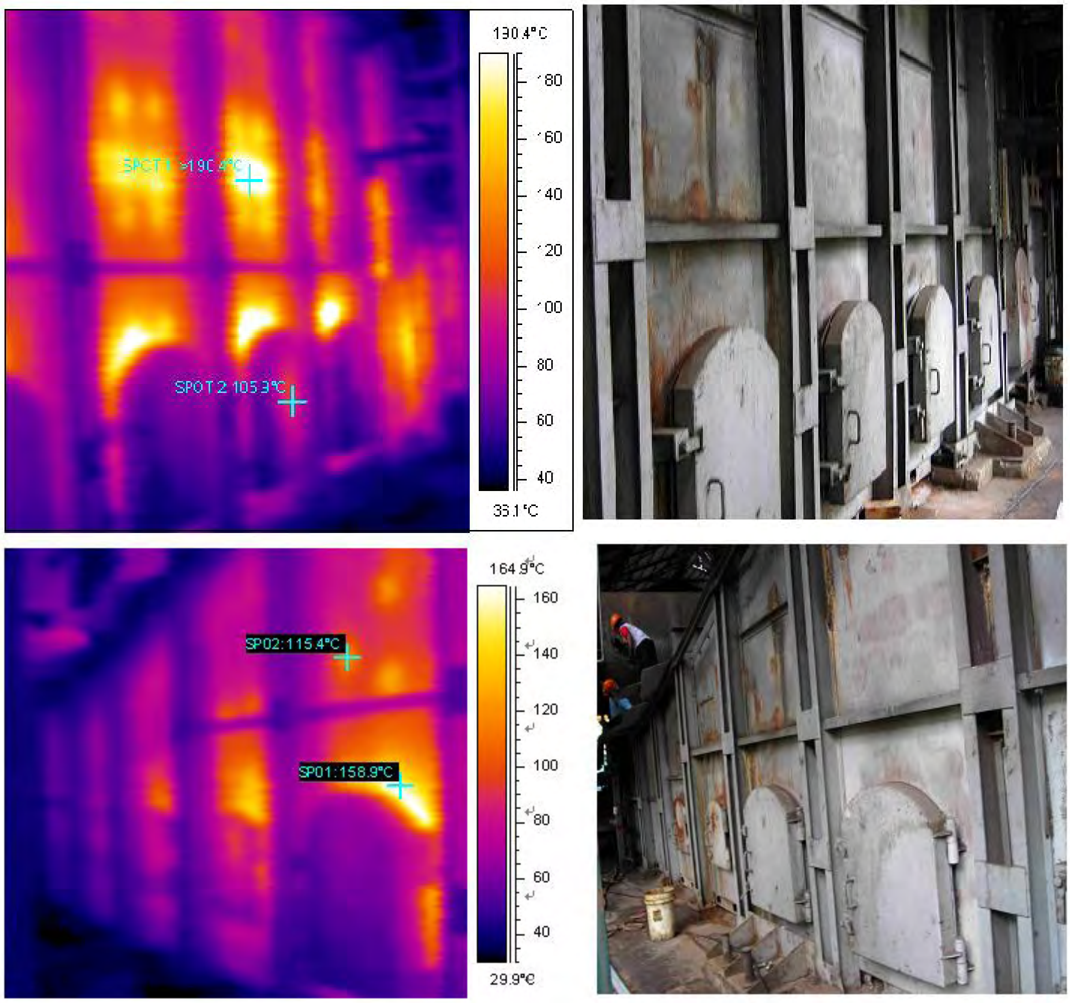


Fig. 2.6.3-5 Thermal Picture of Surface Temperature Distribution of Furnace Wall with Infrared Camera

Fuel intensity is improved by 15 to 30% with the introduction of regenerative burner system. The system of regenerative burner is shown in Fig. 2.6.3-6. The air temperature by which heat exchange was carried out with the regenerator of burners becomes 1000^{0}C or more, the exhaust gas temperature discharged to the chimney becomes 200 to 250^{0}C, and billet heating efficiency becomes 65 to 75%.

In order to introduce regenerative burner system into the present heating furnace, it is required to change fuel to gas from heavy oil and to modify the upper part of furnace body structure. Fire-resistant refractories of furnace wall and ceiling are replced with ceramic fiber.

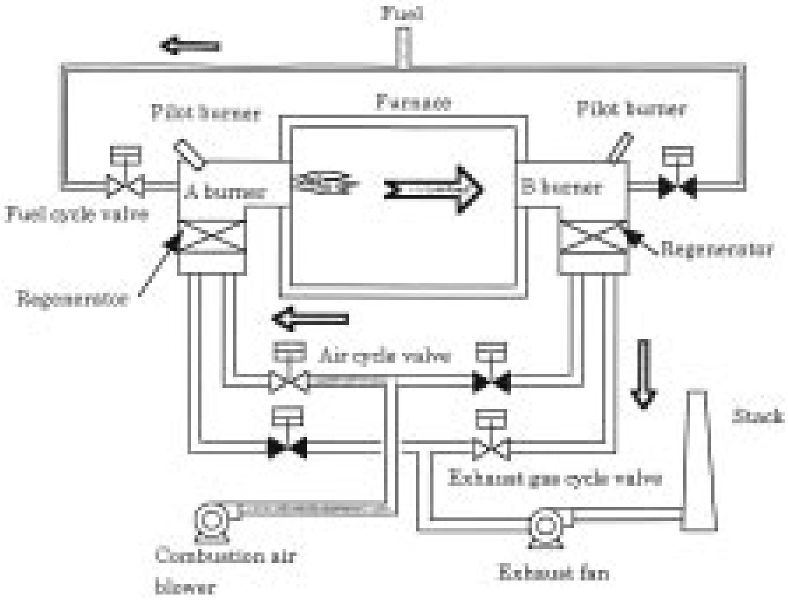


Fig. 2.6.3-6 Regenerative System

c) Cooling tower for cooling water of reheating furnace

The measurement data and the flow sheet of the cooling-water system of the billet reheating furnace are shown in Fig. 2.6.3-7.

The difference of temperature of cooling water at the outlet and inlet of the cooling tower is 2^{0}C, and the margin is in the capacity of the cooling tower.

Although the cooling towers are designed as counter flow type, the cooling fan is reverse-rotated and the cooling towers are operated as parallel type so that cooling efficiency is low.

If rotation of the cooling fan is changed and the cooling towers are operated as counter flow type, cooling water can be processed at 1 set of cooling towers, although 2 sets of cooling towers are operated.

If water volume to reheating furnace is reduced to change the temperature difference of cooling-water from 2^{0}C to 4^{0}C, the power consumption of the feed pump can be reduced. Since the capacity of the feed pump is too large, the pump may be changed to a pump of smaller capacity, or valuable speed control (VSD) can be adopted.

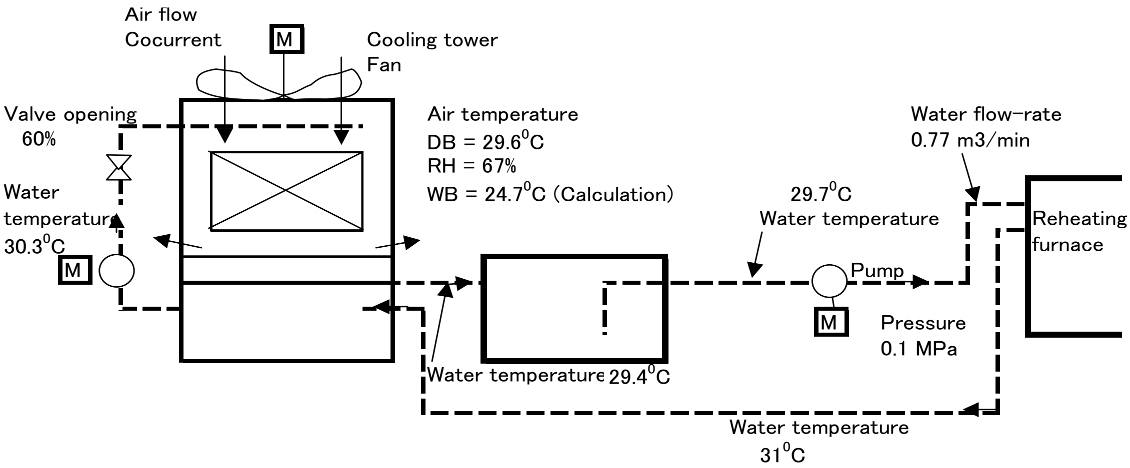


Fig. 2.6.3-7 Cooling Water System of Billet Reheating Furnace

d) Compressed air system

5 sets of reciprocating type air compressors are installed and 1 set of air compressor is in operation always. The main users of compressed air are the opening-and-closing cylinders of the discharging door of the reheating furnace, bar steel shearing machine and maintenance shop. The compressed air flow sheet of the factory is shown in Fig. 2.6.3-8.

No.2 air compressor is operated at 50% load of unloading unit, and current value at 50% load is higher by 15% than the rated value, so adjustment of the unloading unit is required.

3 points of large compressed air leakage from air piping were found using leak sound in the rolling mill. Judging from the leak sound, the air leak volume is more than 0.6 m^3/min total in the 3 points.

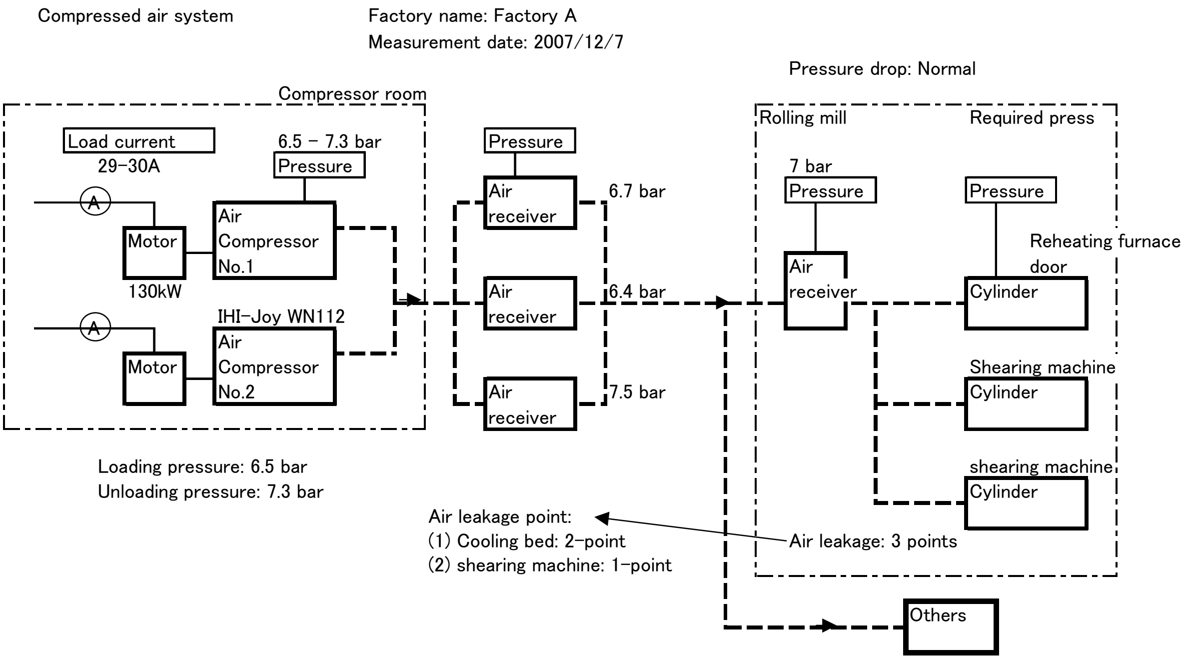


Fig. 2.6.3-8 Flow Diagram of Compressed Air System

e) Improvement of rolling yield

The energy consumed by the wire rod rolling equipment is the electric power of the rolling mill drive and electric power of the cooling-water circulation pump. Electric power intensity is 184 kWh/t, and has potential for improvement. Currently, many missed rolls are found in rolling work such as deformation of wire rod under rolling with poor roll guides, and so the rolling yield is 92%. When the rolling losses are analyzed, they are 5% of missed rolls, 2% of crop loss and 1% of oxidization loss in the reheating furnace. Missed rolls can be reduced by the improvement of the roll guide of the rolling mill, the guide of the return part, the cooling bed guide, etc., and maintenance. If 3% of missed rolls are eliminated, the rolling stop time will decrease by 6%, and 6% of rolling mill drive electric power and 6% of heating furnace fuel consumption will be saved.

f) Energy conservation potential

The steel industry in Indonesia manufactures steel products with the electric arc furnace and rolling mill which use scrap steel, except Krakatau Iron and Steel Works.

In the steel industry, fuel is used in the electric arc furnace, reheating furnace and in-house power generation equipment.

Energy conservation potential in Steel-making Factory A is 29.8% in the fuel use of the heating furnace. Also in the survey conducted by NEDO of Japan in 2006, energy conservation potential was estimated as 15% by combustion control and waste heat recovery of the reheating furnace in the rolling mill.

Electric power is used for the electric arc furnace equipment for the steel-making shop, rolling mill equipment and utility equipment such as air compressors, fans and pumps. The energy conservation potential of utility equipment is large in the surveyed factory. In the survey by NEDO of Japan in 2006, the energy conservation potential in the electric arc furnaces is estimated as 25%. Electric power in the rolling mill shop is consumed mainly for the rolling mill drive, and energy consumption in the rolling mill is determined by equipment maintenance and operation process control.

The energy management consciousness of the top management of the steel -making factory is still inadequate. When fuel prices rise, they change to cheap fuel etc., but the energy management activities are inadequate in the factory. Establishing energy management organization and granting an energy administrator authority are necessary for systematic energy management activities. Energy conservation measures with no investment are implemented with systematic energy management activities, and so energy conservation potential of 5% to 10% will be realized.

4) Energy conservation potential of the steel-making industry in Indonesia

The steel industry of Indonesia consists of the Krakatau Steel group which has a national integrated iron and steel works, and groups of private steel-making factories, as shown in Table 2.6.3-8. Although the crude steel production in 2005 was 3,100,000 tons, the consumption was 7,000,000 tons and the difference of 3,900,000 tons was imported. Most of the imported steel consists of cheap Chinese products and it hinders the development of the Indonesian steel industry. Most of the equipment and plant of the steel factories of Indonesia were installed 20 to 30 years ago, and their export competitiveness is weak. The steel industry development master plan was prepared with the cooperation of JICA in 2002.

Since the annual production capacity of crude steel is 6,600,000 tons, plant operation rate is 45% and energy loss is large. Steel plate is manufactured by Krakatau iron mill and the Gunung Garuda company. Steel rod bar, wire rod, and section steel are manufactured at other private steel factories.

Fuel oil, natural gas and electric power are used in steel factories. Fuel oil is used for the reheating furnace of the rolling mill, and natural gas is used for reduced iron furnaces and reheating furnaces of rolling equipment. Electric power is used for scrap melting in electric arc furnaces and for roll driving power in the rolling mill.

At an electric arc furnace factory, 70% of energy is consumed in the electric furnace steel-making shop, and 30% is consumed in the hot-rolling shop. The example of the energy consumption ratio of a hot-rolling shop in Japan is shown in Fig. 2.6.3-9.

The comparison graphs of energy intensity of an electric arc furnace and billet reheating furnace in Indonesia and Japan are shown in Fig. 2.6.3-10 and Fig. 2.6.3-11.

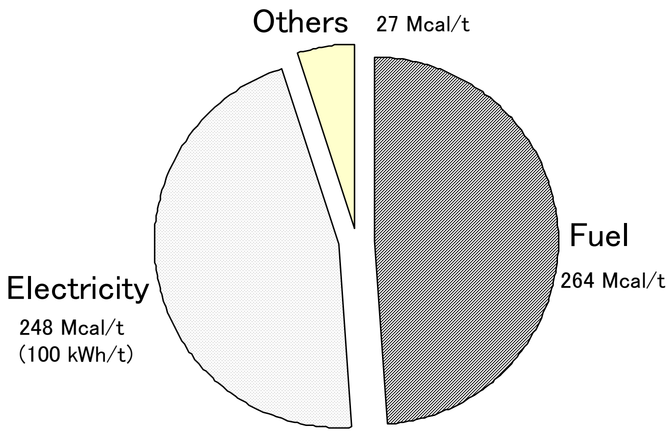
The fuel intensity of the reheating furnace is 264 Mcal/t, and the electric power intensity of the rolling mill is 248 kcal/t (100 kWh/t). The fuel intensity of the hot-rolling shops of the Indonesian steel industry is 300-500 Mcal/t. Energy-saving potential is large.

According to the energy balance of IEA in 2003, in the final energy consumption, the energy consumption shares of the household sector, industry sector and transportation sector are 46%, 26.6% and 20.7% respectively. The energy consumption in the steel industry has a 7% share in the industrial sector, and energy consumption in the steel industry in 2003 decreased by about 8% compared with 2002 due to electric arc furnaces being out of operation etc.

Table 2.6.3-9 Iron and Steel-Making Companies and Groups in Indonesia

No.	Iron- and steel-making company and group	Production capacity crude steel (t/y)	Products and plant equipment
1	Krakatau Steel Company （State owned）	3,500,000	National integrated iron and steel works Production started in 1975 Products: Hot-rolled plate, cold-rolled plate, steel bar for reinforcement, wire rod, section steel Equipment: Iron ore reduction furnace (Hyl Technology), electric arc furnace, ladle furnace, slab continuous caster, billet continuous caster, hot strip mill, cold rolling mill, bar mill, section steel mill, wire rod mill
2	Master Steel Group	1,000,000	Products: Wire rod, bar steel, section steel Equipment: Electric arc furnace, billet continuous caster, bloom continuous caster, rod mill, bar mill, section steel mill
2	Gunung Garuda Group	700,000	Products: Wire rod, bar steel, large section steel, steel plate, steel pipe Equipment: Electric arc furnace, billet continuous caster, bloom continuous caster, rod mill, bar mill, section steel mill, plate mill, reheating furnace with regenerative burner
3	Ispat Steel Group	700,000	Products: Wire rod, wire steel Equipment: Electric arc furnace, ladle furnace, billet continuous caster, rod mill
4	Argo Pantes Group	300,000	Products: bar steel Equipment: Electric arc furnace, billet continuous caster, bar mill
5	Jakarta Steel Group	150,000	Products: bar steel Equipment: Electric arc furnace, billet continuous caster, bar mill
6	Others: Inter-world Steel	700,000	Products: bar steel, section steel Equipment: Electric arc furnace, billet continuous caster, bar mill, section steel mill
7	Rolling mill		Products: bar steel, flat bar Equipment: bar mill, flat bar mill
8	Manufacturers making steel by hi-frequency induction furnace	700,000	Products: bar steel, section steel Equipment: Hi-frequency induction furnace, billet continuous caster, bar mill, section steel mill
9	Special steel manufacturers		Joint venture companies of Sanyo Special Steel, Daido Special Steel, Hitachi Metal, etc. with Indonesia companies

Source; Indonesian economic outlook 2007 and others



Source: Hand of Iron and Steel, JISI

Fig. 2.6.3-9 Energy Consumption Ratio in Hot Rolling Shop

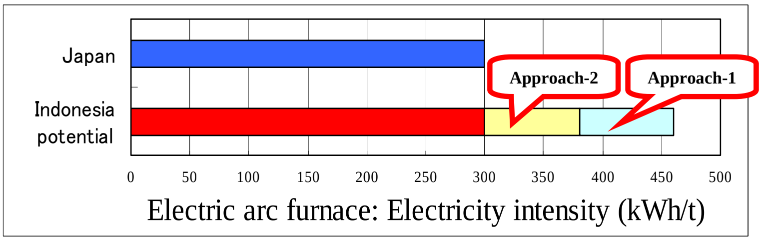
Electric arc furnace

Electricity intensity:

Japan: 300 kWh/t

Indonesia: 464 kWh/t

(Source: Energy audit report, 2007, NEDO)



Reheating furnace

Fuel intensity:

Japan: 264 Mcal/t

Audited factory: 466 Mcal/t

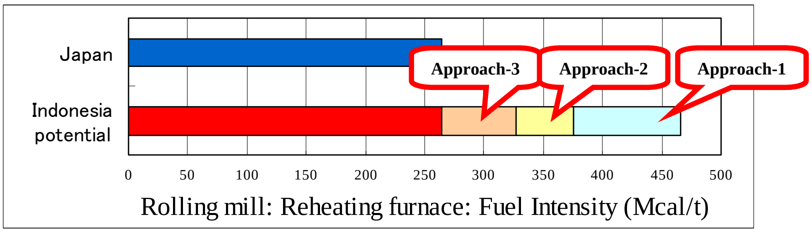


Fig. 2.6.3-10 Fuel intensity and EE&C Potential of Electric are Furnace and Billet Reheating Furnace

(2) Energy audit results of textile industry2

1) Outline of energy andit

The outline, energy use situation and activities pertaining to energy use aspects of two textile factories are shown in Table 2.6.3-10 to Table 2.6.3-12, as the results of the site survey and analysis.

Table 2.6.3-10 Outline of Audited Factories

	Textile Factory (B)	Textile Factory (C)
Type of processing	Spinning, Weaving, Dyeing and Finishing (Integrated)	Dyeing and Finishing
Material	Cotton & polyester blended	Polyester/Rayon blended
Employees	3,347 (400 for dyeing)	217
Annual production	42 million yards	14.4 million yards
Annual operation	350 days	300 days
Equipment	Japanese・European continuous operation	Japanese used equipment, continuous operation
Technical Support	Formerly; Japan Presently; Sri Lanka	Indonesia (Head hunting)

Table 2.6.3-11 Energy Consumption Outline of Audited Factories

	Textile Factory (B)	Textile Factory (C)
Heat Source	Natural Gas andCoal	Coal
Natural Gas	6,400 x $10^3$$m^3$/year	0
Coal	22,000ton/year	6,600ton/year
Generation	Main; in-house generator Partial; PLN	PLN (In-house Coal Generation; planned)
Electricity consumption	94,000MWh/year	5,560MWh/year
Electricity Demand	16,500kVA	1,110kVA
Energy cost	-	About20%

Note: Energy consumption data of Factory (B) is for the whole factory, and data for each sub-sector such as dyeing and finishing has not been collected.

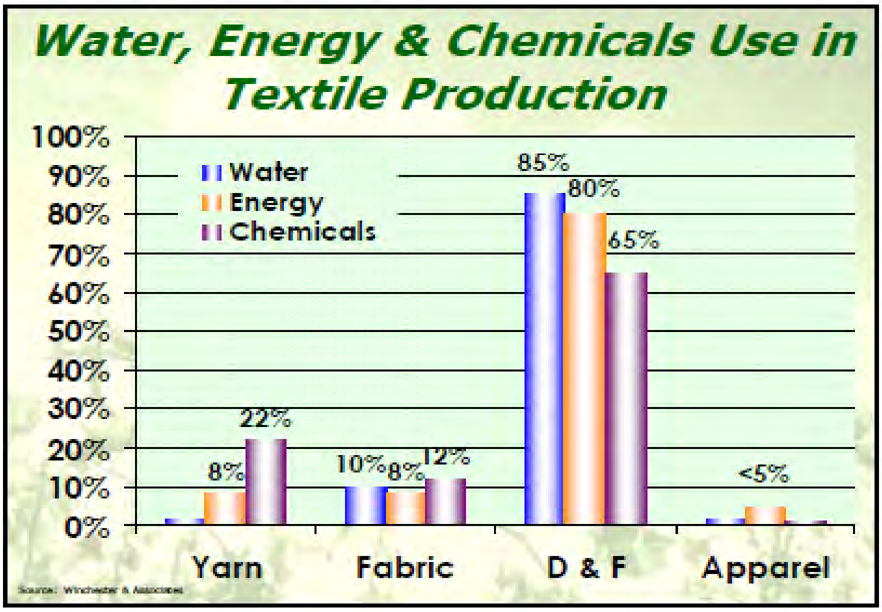
Table 2.6.3-12 Activities Pertaining to Energy Use Aspects

	Textile Factory (B)	Textile Factory (C)
Jump in heavy oil price	・Switch from oil boiler to coal ・In-house generation; from oil to natural gas	・Switch from oil boiler to coal
Jump in LPG price	・Conversion to natural gas	Natural gas use for the singeing machine
Jump in electricity price	・Increase in in-house generation	・Lighting electricity reduction ・Introduction of in-house coal generation (planned)
Exhaust-heat recovery	・Utilizing exhaust hot water from gas engine ・Utilizing exhaust heat in absorption chiller	・Condensed water supply to washing machine (formerly wasted)
Change the process	Reduction of whitening process steam (adopting cold bleach)	・Nothing in particular

2) Parameters measured in energy audit

In the textile industry, there are two types of fiber (raw materials). One is from natural sources, and the other is man-made by chemical process, named chemical and synthetic fiber. Fiber and textiles are produced from these materials, additionally there are processes of dyeing and sewing.

Energy consumption and other materials consumed by sub-sector are shown in Fig.2.6.3-11. We can see that the energy consumption in dyeing and finishing (D&F) processes is dominant.



Source: "Sustainable Development in Textile Processing" by Mr. Skip Gorden, Cotton Incorporation, USA, presented in Dubai on 1 June 2008

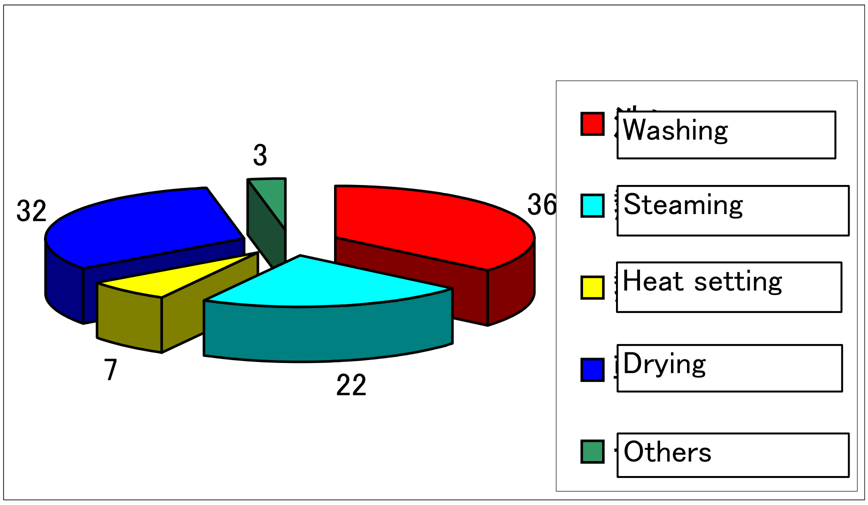
Fig. 2.6.3-11 Energy and Chemicals Use in textile Production by Sub-sector

In this context we selected dyeing process as the main study target. Various kinds of manufacturing equipment and procedures are applied in dyeing and finishing processes, and 100 dyeing factories have 100 technical standards (i.e., each factory has its own standards).

Each factory also has its own methods for EE&C; there are no common standardized EE&C procedures in the textile industry. The current dyeing industry production process is quite different from that of traditional craft production and consumes much more energy, water and chemicals. On the other hand it remains labor-intensive, and there are factories with only dozens of employees and others with several thousands.

On site survey was conducted for an integrated manufacturer (B), whose production style is popular in Indonesia, and one specialized in dyeing (C). Fig 2.6.3-12 shows the breakdown of thermal energy consumption in the dyeing industry. Washing and drying energy takes up 68% of total energy consumption. The target of research was packaged equipment of washing and drying.

Washing and Heating by Steam, Heating by Dried Air, Drying, Others



(Source; Japan Textile Finishers' Association)

Fig. 2.6.3-12 Breakdown of Thermal Energy Consumption by Dyeing Process

3) Purpose and outline of the research

Table 2.6.3-13 Research and Measurement Outline at Textile Factory

Item	Content	Purpose
Walking through	Check the whole process	Confirmation of submitted survey slip
Process of dyeing	Confirmation of equipment operation and energy source	Selection of survey target
EE&C conditions in utility department	About steam, boiler, electricity access, chiller and compressor	Check the implementation level of EE&C equipment
EE&C conditions in production department	About spinning, weaving and dyeing & finishing	Confirmation of factory's attitude to EE&C
Measurement of washing and drying	Measurement of relevant equipment condition, for example ; water consumption and deviation of temperature	Confirmation of potential for reduction of steam consumption
Thermal insulation of dyeing process	Measurement of heat radiation	Confirmation of potential for reduction of steam consumption
Measurement of electricity consumption on stenter machine	Detailed daily trend of electricity consumption	Confirmation of potential for reduction of electricity consumption of large equipment

4) Summary of audit results

We conducted research especially focusing on the dyeing process whose energy consumption is quite large compared with other processes in the textile industry. Both the factories which we audited clarify that EE&C is one of the most important issues for sustainable factory operation under skyrocketing oil prices.

Generally EE&C is understood as an issue of the utility department, but in dyeing process where the departments of energy supply (utility) and demand (production) are different, the room for EE&C is quite small, and it is not understood that the room for EE&C in the production process is bigger than that on the utility side.

There are 2 reasons why EE&C has not been implemented in the production line. Firstly production line personnel fear that changing the production process might cause problems with production quality. Secondly there exists a lack of knowledge about new EE&C equipment and fear of new investment, so they are not proactive about replacing the existing equipment or implementing EE&C technologies.

The biggest expenditure on energy sources is in the boilers. These have switched recently from oil to domestic coal (mainly low quality coal). .Regarding electricity supply, conversion from diesel oil fired in-house generation to gas-engines or coal fired thermal power plants is spreading. In this case cogeneration (exhaust heat recovery) is also being implemented.

The economic effect of fuel conversion from oil to coal is estimated at about 80% reduction in fuel cost. There exists a misunderstanding that fuel conversion (lowering cost) is EE&C.

a) Energy management and organization

As mentioned above, energy management is entrusted to the utility department, and it has only operation records of each piece of equipment. But the purpose of this record is only checking the production operation, and there is no record of energy consumption. One of the reasons is that each piece of equipment has no monitoring measures of energy consumption.

When oil was being used for boilers, hourly record of fuel consumption was kept. But now after converting to coal burning, there is only the accountant’s purchase record.

According to the EMI report, 13 of 26 companies have held periodical meetings on energy conservation. Their energy use means they are not interested in energy conservation activity.

The reasons are considered as mentioned below,

1. The activity is not attractive.
2. There is less room for further saving.
3. There is lack of countermeasures or manpower to implement them.
4. They have changed to cheaper energy sources.
5. Others.

It is necessary for the management of such enterprises that they be shown the most attractive reasons for EE&C by some Indonesian organization..

b) Proper usage of steam and exhaust heat recovery

The biggest energy source in the dyeing industry is steam. The basic issue related to EE&C is how to use generated steam more effectively. But not much attention is paid to steam treatment in the audited factories. No attention is paid to temperature management in washing, recovery of condensed water in the dryer and overdrying. Condensed water from the dryer is at 90ºC, has high purity and should be reused as boiler water.

Exhaust high temperature heat recovery system from washing equipment has not been implemented. Also, in spite of setting the recycle pipeline of cooling water from the jet dyeing machine, due to lack of capacity of the stock tank, recycled hot water is overflowing. (It doesn't work well.)

c) Control of temperature and exhaust air in dryer

In the dryer input energy is converted into moisture or vapor and exhausted outside. By input energy, air temperature in the dryer also rises. Increase of exhaust power makes the moisture drop and evaporation takes place from wet fabrics in the dryer. It also causes atmospheric temperature drop in the dryer. In order to keep the proper temperature and moisture in the dryer, control of exhaust air is necessary. To accelerate the speed of drying, maximizing the exhaust air and keeping the air temperature in the dryer over 100ºC is effective. But this measure conflicts with EE&C. Proper control and management to adjust exhaust air from the drying chamber has not been carried out.

d) Introduction of valuable speed control (VSD)

In dyeing and finishing processes many pumps and fans are operated by drive motors.

Induction motors need large torque at starting, so usually motors with a little bit greater torque than operational need are selected and installed. Also, the normal operation speed of rotation is about half of the starting speed. By introducing valuable speed drive (VSD) in this situation, electricity consumption becomes 1/4 of the rated power. Recently it has become popular to install an (VSD) in these cases, but there are few VSD in the audited factories. There is only one sampler in a stenter machine, a secondhand one from Japan, installed in Textile Factory (C) recently. Comparison between electricity consumption of an VSD type (C) and a non-VSD type (B) motor will be described later.

e) Heating by coal

In Japan gas thermal dryers are popular, but in South Eat Asia oil thermal dryers have been popular. But recently because of rapidly increasing oil prices switching from oil to cheaper coal has been increasing. In dyeing and finishing processes the operation pattern very frequently changes, and frequently the machine stops. It is comparatively easy to control the boiler temperature in the oil thermal system, but it isn't so easy in the case of a coal thermal boiler. (After stopping combustion air it retains high temperature for about 1 hour.) In the process of continued operation, the energy loss of coal thermal is small, but it is not suitable for intermittent operation.

5) EE&C potential in textile industry

a) Target sub-sector for EE&C

The dyeing sub-sector (process) consumes more energy than any other. EE&C potential in dyeing is also the largest. (Fig 2.6.3-11) In the other sub-sectors electricity is the dominant energy source. The major methodology here for EE&C is "increasing production amount with same energy input".

But this methodology works only in conditions of a growing market, otherwise it can't lead to EE&C.

The potential for energy conservation in Indonesia depends on the renovation of facilities and reconstruction of the process approach.

Textile dyeing and finishing processes have many options for renovation. Therefore setting universal figures of energy intensity is very difficult.

An example has been set by a NEDO model project in an ASEAN country for knitted cotton fabric dyeing and finishing processes (2002-2007).

This project was carried out to change from some existing old Taiwanese and European equipment to the highest performance equipment from Japan. The figures (of energy consumption reduction ratio) were monitored for 3 months continuously.

Table 2.6.3-14 Energy Saving Potential from NEDO Dyeing and Finishing Project

	Jet-Dyeing	Dryer	Stenter	Total
Electric power	80.1%	84.4%	78.9%	
Steam	62.2%			
LPG		65.4%	45.8%	
			Reduction Ratio	66.3%

According to this project, the reduction figure above focused on only major equipment (jet-dyeing machine, dryer and stenter), which run batch-wise processes on cotton knitted fabrics. Other equipment and the administration building, which had less potential to be converted, were not included, therefore total reduction of energy consumption would be half of the listed figures (about 30%).

EMI, which has been involved in energy investigation for a long time in Indonesia, reported less than 10% energy conservation potential in the textile industry. It has made big efforts to collect actual data from some enterprises through letters and interviews.

But unfortunately EMI is not able to sufficiently assess the energy intensity and the energy conservation potential of the textile industry.

What is the reason? Because EMI personnel are experts of utilities, so they cannot investigate the production process properly.

In Japan in the 1970s, TQC (total quality control) activity was introduced in production processes.

Afterwards it had been spreading in commercial services. We Japanese faced the petroleum crisis at the same time, and many proposals (KAIZEN) were brought intp TQC activities. Energy conservation was one countermeasure to help the company's TQC activity.

Those proposals (KAIZEN) had many levels. One of them was very small reform, others needed innovation,, and some were issues of financial management. At that time, many organizations met the challenges of a lot of issues to reduce costs in the face of the petroleum crisis. Manufacturing companies built new facilities which were energy saving oriented, and the government supported them to purchase new machines through some subsidies, particularly for small and medium enterprises.

(By governmental law, EMS was introduced in industries which consume quite large amounts of oil. This system contributed to dissemination of energy saving and education, but did not alway contribute to energy conservation.)

b) Example of energy conservation activities in dye-houses

f-1: Small investment and a little effect

- Heat insulation on large surface facilities
- Prevention of overdrying through temperature detection of fabric surface
- Fixing valuable speed control (VSD) equipment for ventilation fans and circulation pumps
- Neutralization in the process of mercerizing
- Cooling water management in jet-dyeing

f-2. Medium investment and better effect

- Moisture control in the chamber of dryer and stenter machine
- Prevention of overdrying with moisture detection of fabric surface
- Heat recovery system from hot wastewater
- Control of rotation of circulation fans by inverter and interlock system by machine operation
- Condensed water collecting system to supply boiler

f-3 Big investment and the best effect

- Control system for washing machine with temperature, water supply and turbidity
- Circulation pumps changing to valuable speed control (VSD) with programmed controller
- Management of squeezing ratio in final mangle in washing range
- Control system for dissolved oxygen concentration in wastewater treatment

Lighting, air conditioning, steam leakage, boilers, air compressors and transformers should also be focused on.

There exist some Kaizen without investment, but they could only be effective when daily programmatic action under the whole company's action plan is defined. (switching on and off lighting, shutting and recovery of exhaust steam etc)

EE&C potential with the measures above is summarized in Table 2.6.3-15.

Table 2.6.3-15 Estimation of Energy Conservation Potential for Each Sub-sector in Textile Industry

	Fiber making & Spinning	Knitting & Weaving	Dyeing & Finishing	Sewing & Garments	Total
Percentage energy use	8%	8%	80%	4%	100%
	Energy conservation potential for each sub-sector				Total textile industry
2015	2.5%	2.5%	12%	0	10%
2025	20%	20%	35%	0	30%

(Example of calculation: Percentage energy use comes from Fig 2.6.3-1, in 2015 EE&C potential is 12% for Dyeing & Finishing, so the total EE&C potential from these processes is 12% x 80%＝9.6%. Applying the same methodology EE&C potential for Fiber making & Spinning and Knitting & Weaving are calculated as 0.2% each. As a whole for the textile sector it becomes 10%.)

6) EE&C Kaizen proposal example

a) Washing machine

Both Textile Factories (B) and (C) operate many washing machines with dryers. A lot of steam is used in the process of heating and drying, and by applying proper management and Kaizen in the production process below, EE&C can be gained.

At the dryer, because of the bad condition of the rotary joint, temperature drops and generally no-attention is paid to overdried condition, so proper control of moisture on clothes and steam supply can achieve EE&C.

In Textile Factory (C), water supply for each washing trough is excessive, because the conductivity value is quite low compared with the ideal conductivity curve (TDS). By controlling water supply (measuring conductivity and flow control) and changing the location of the water feeding tank and drain tank, a large amount of EE&C is expected.

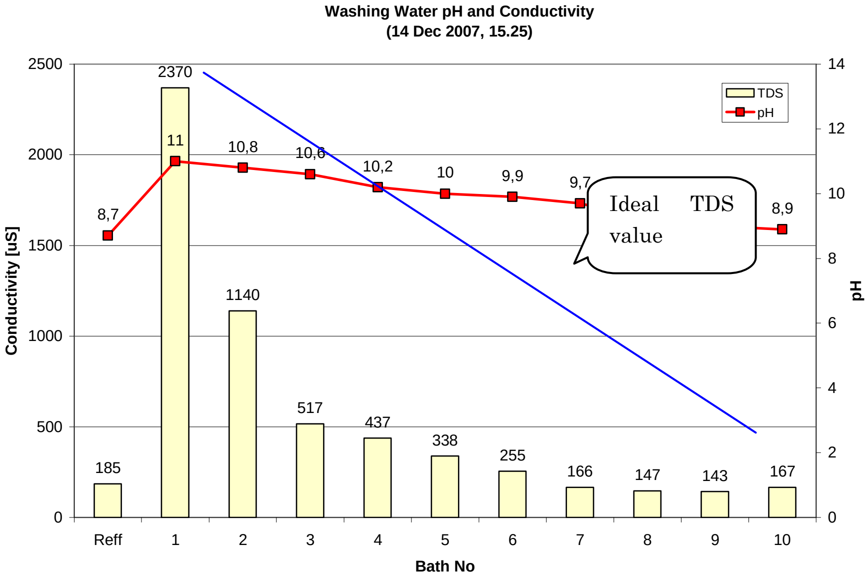


Fig. 2.6.3-13 pH and Conductivity Value in Each Trough in Textile Factory (C)

Continuous washing machine after fixing dyestuffs

Controlled water supply by the turbidity and temperature adjustment, and water flow should be a counterflow to fabrics.

Saving energy : 21,840Mcal(91.4GJ)/day→15,015Mcal(62.9GJ)/day = 28.5GJ
Others: wastewater reduced : 105M3/day
Heat recovery system : (90-35)°C× 130M3 (wastewater) = 7,150Mcal (30.0GJ)/day
Joint effect of two saving measures: 28.5GJ+30.0GJ=58.5GJ
58.5/91.4x100=64%

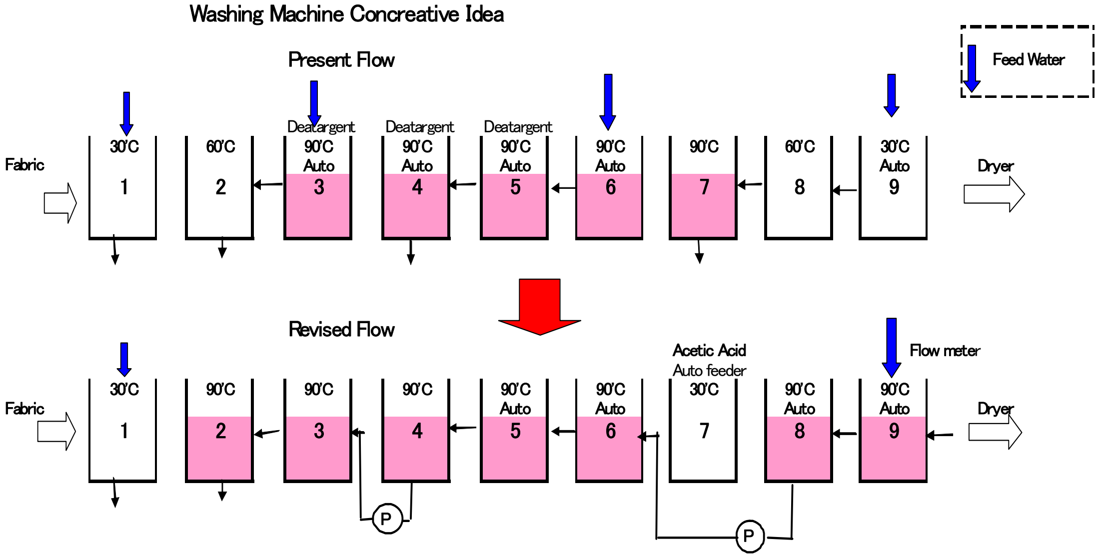


Fig. 2.6.3-14 Proposal for the Washing Equipment in Textile Factory (C)

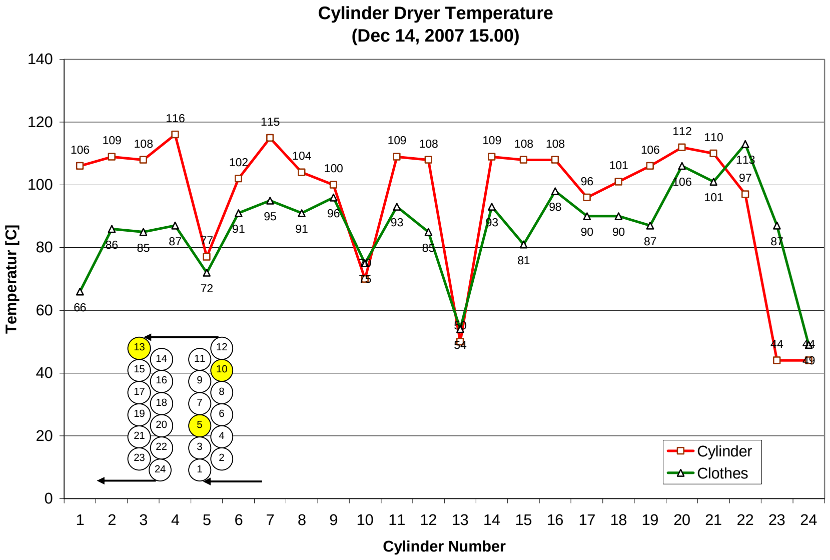


Fig. 2.6.3-15 Temperature of Cylinder and Clothes after Washing in Textile Factory (C)

*The temperature of 3 cylinders (Nos.5,10,12) is quite low. This is caused by interference against steam injection (trouble with rotary joint or bad maintenance).

*The surface temperature of 20th cloth exceeds100ºC. This means it is apparently overheated, so the temperature should be reduced.

2) Valuable speed control (VSD) for stenter machine

It is quite effective to introduce VSD for stenter circulation fans.

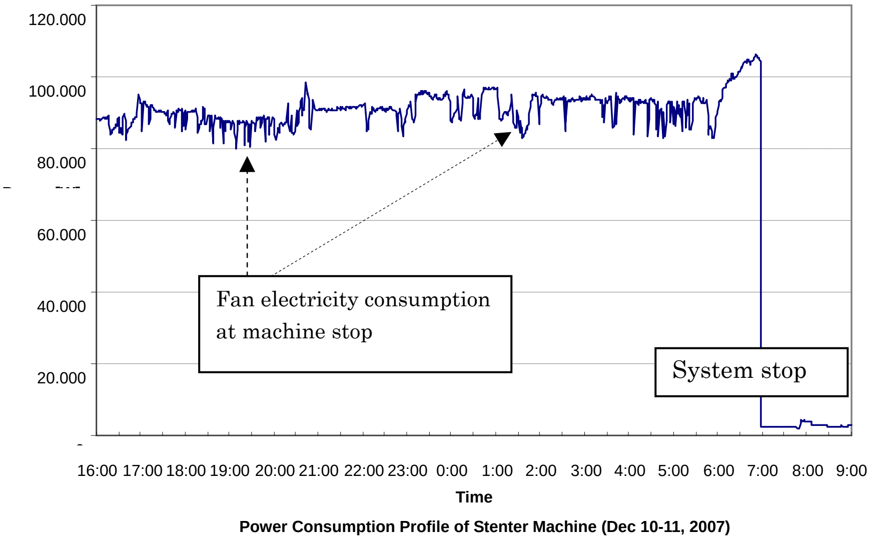
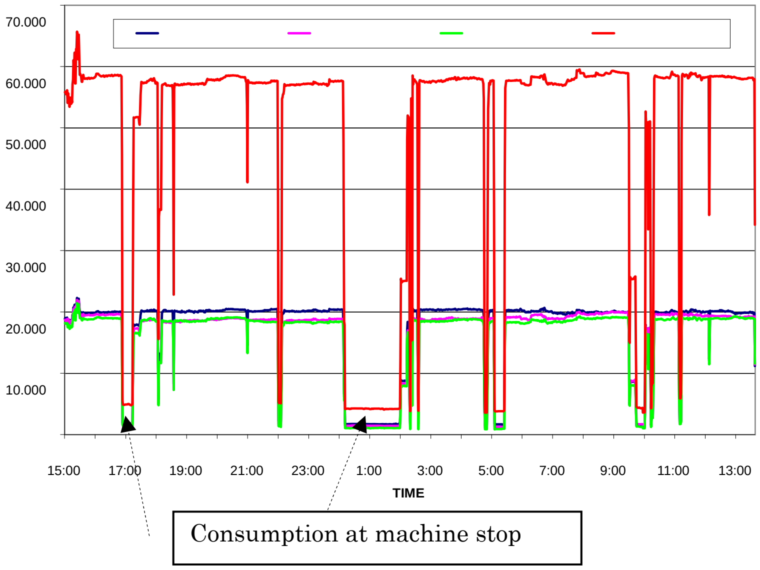


Fig. 2.6.3-16 Electric Power Consumption in Stenter Machine in Textile Factory (B) without Valuable Speed Control (VSD)



Consumption at machine stop

Fig. 2.6.3-17 Electric Power Consumption in Stenter Machine in Textile Factory (C) with Valuable Speed Control (VSD)

Comparing Textile Factory (B) without inverter and Textile Factory (C) with valuable speed control (VSD), the electricity consumption patterns are quite different. By introducing VSD 30%or more EE&C has been achieved.

2.6.4 Energy Management Situation and Potential of EE&C in Buildings

(1) Outline of on-site auditing

The basic information, energy intensity and specific issues on 6 audited buildings are summarized in the Tables from 2.6.4-1 to 2.6.4-3. The audited buildings are a private office, governmental offices, a shopping center, a hospital and a hotel.

Table 2.6.4-1 Basic Information about 5 Audited Buildings

	A bldg	B bldg	C bldg	D bldg	E bldg
Usage	Office	Govt. office	Shopping mall	Hospital	Hotel
2007 Survey dates	Nov. 26-27	Nov. 29-30	Dec. 03-04	Dec. 6-7	Dec.18-19
Age of building	25 years	25 and 12 years	6 years	50 years	15 years
Power demand	2,180 kW	-----		2,250 kW	6,930 kVA
Self-generator	Emergency 1,000 kW×2	None	Regularly 2,700kW×2	Emergency 640 kW×2 +500 kW	Emergency 1400 kW×8
Transformer	2,000kVA×2	1,000kVA×2	2,500kW×3	1200 kVA × 2+800 kVA	2000 kVA
BAS	Yes		Yes		

Table 2.6.4-2 Energy Intensity (MJ/m^{2}year)

	A bldg	B bldg	C bldg	D bldg	E bldg
Energy-Intensity [MJ/m^{2}year]	2091.5	1976.5	2985.6	2898	3702.5
CO_2-Intensity [kg-CO_2/m^{2}year]	137.1	129.5	196.7	190	239.2
Total floor area [m^2]	36000	8500	135,000	［21400］	26384.84
Air-cond. Intensity MJ/m^{2}year]	1000	1080	1488.9	1660	2440
Similar building Energy Intensity [MJ/m^{2}year]	2365.5	1845.7	2662.1	2906.3	2305.1

Note 1: For D Bldg the floor area was presumed from a standard intensity because of inability to calculate the total floor area.

Note 2: Because E Bldg was established with a shopping mall on the same site, and the infrastructure is used by them together, the entire energy consumption was divided in proportion to their floor areas.

E Bldg is presumed to bear responsibility more than its actual consumption when seeing the numerical value of the energy intensity.

Table 2.6.4-3 Specific Issues for Each Building

A(P office)	B(G office)	C(Shopping C)	D(Hospital)	E(Hotel)
Increase in Tenants having 24 hours operations	Lack of human resources in charge of building management	Expansion of gas cogeneration	Ensuring strict environment standards	Hotel utility and shopping utility is common.
Completion of switching to CFLs	Same as on the left	Same as on the left		Due to high cost of crude oil, it has switched from a private generator to power received from PLN.
Installation of power factor capacitor	Installation of power factor capacitor	Reduction of distribution line loss	Installation of power factor capacitor	Reduction of distribution line loss
Audit executed in 2005	Audit executed in 2005		The audit has been based on estimates	

(2) Parameters measured in the auditing

Data in Table 2.6.4-4 were measured by instruments or collected through documents, etc.

Table 2.6.4-4 Parameters Measured

Item	Parameter measured	Purpose
1) Yearly load	Yearly energy consumption trend.	Intensity calculation; trend comparison, comparison with similar buildings, and confirmation of the effect of improvement
2) Monthly load	Energy consumption of every month	Monthly load curve; monthly trend, comparison with the same month in the previous year, confirmation of the effect of improvement
3) Daily load	Energy consumption daily curve	Daily load curve; confirmation of load factor and demand factor, basic data to decide electricity demand
4) Power balance	Energy consumption by each equipment	What equipment should be focused on, confirmation of energy intensity of equipment
5) Value of voltage and current in each phase	Daily fluctuation	Change in higher harmonics, voltage, and current, confirmation of balance of each phase
6) Power factor	Daily fluctuation	Confirmation of fluctuation

(3) Energy audit summary

Building in Indonesia consumes over 70 percent of its entire energy use in air-conditioning and illumination. This should be focused on strongly to promote EE&C in Indonesia.

Table 2.6.4-5 shows the energy conservation potential of the buildings estimated from the audit result. It is expected that all buildings have potential of 20% or more.

Table 2.6.4-5 Energy Conservation Potential

A (P office)	B (G office)	C (Shopping C9)	D (Hospital)	E (Hotel)
Introduction of Energy Management Program (Organizational) :5%				
Improve operation management; 16.5%	Decrease building heat load (heat exchange); 8.2%	Same as on the left; 7.1 %	Improve air-conditioning Improve operation management; 20%	Improve facility management
		Improve illumination equipment		Improve operation and maintenance management
	Introduction of HF fluorescent lamp (dimmer): 9.8%	Review of power distribution system: 3.3%	Improvement of power distribution system: 5%	Introduction of measuring devices
Version up to BEMS; 5%	BEMS and related management; 18.6%	Version up to BEMS; 5%	Introduction of simple BAS; 5%	

1) Audit summary

* Energy Management and Organization Structure

To actualize energy conservation, the enhancement of a concrete organization and the system should be established first. It is necessary to carry out energy management in the PDCA cycle, using the data obtained by the measurements and documents of the energy consumption, etc. The documents, the management standards, and the measuring instruments, etc. should also be maintained. By applying these procedures, the effect of energy conservation can reach the level of several %.

It is common in every building that management for saving energy is not practiced. The current practice is only for maintenance management of equipment. Highly developed maintenance should be introduced for energy conservation management.

It can be said that maintenance has changed from the age of equipment maintenance to the age of equipment management, and it is necessary to establish a concrete organization to promote EE&C.

The energy data collected/ measured periodically should be shared by all employees. Energy conservation is expected to be achieved by the enlightenment and participation of the people/parties concerned.

Neither the drawing nor the materials of the operation equipment are often maintained.

Moreover, even if they are maintained, it is not used for EE&C activity. In addition, measuring instruments have not been installed, less data management.

Therefore, the engineer does not understand the present working condition of equipment, and operates the equipment on only the basis of his experience.

As for energy conservation education, only the energy manager has the opportunity to be educated, but the business manager and the workers do not have the opportunity. The worker is not aware of EE&C, and will not report EE&C activity to top management.

The automation of operations is a first step for EE&C, but the education of employees should also be given strong consideration.

The scale of each building investigated this time was comparatively large, so BAS or some data collection system has been set up.

However, energy conservation management system using the collected data has not been set up. Therefore, it is necessary to set up a management system utilizing collected data.

Also, in the case of current shortage of manpower to conduct a data management system, it is useful to introduce BEMS.

Electronic ballasts for fluorescent lamps have become popular in place of the traditional magnetic type. Lighting devices including this electronic ballast have recently become more efficient.. With an illumination control system, dimmer controllers, high efficiency lamps (T8, Hf, CFL) and reflectors, we can achieve more EE&C.

(4) Energy conservation potential measures of buildings by types

On the basis of on-site energy audit results and experience in Japan, EE&C measures for each types in buildings are described as follows:

1) Office Building

The needs of office buildings are changing. One typical feature is increase in cooling load. In our on-site surveys, cooling load was measured and found to be about 50% of total energy consumption. Lighting load is the second biggest. We should focus on these 2 major loads first. Useful countermeasures are mentioned below:

a) Change the indoor temperature setting level (without additional investment)

In general, the air-conditioning energy consumption decreases by 10% when the indoor air-conditioning setting temperature is raised by 1degree.

b) Illumination near windows in daytime is wasteful.

Unnecessary illumination should be turned off by installation of daylight sensors or change of the electricity distribution line to lighting fixtures.

c) Reduction of intake fresh air intake volume can achieve cooling load reduction.

Cooling load reduction can be achieved by stopping intake during air-conditioning start-up time and intake control with CO_2 sensor etc.

2) Shopping Center

The energy intensity of the shopping center is comparatively high. Especially, energy consumption on air-conditioning and illumination makes up about 70 % of the whole consumption. The useful countermeasures are as follows:

a) Improvement of condition of illumination environment

The tenants’ shops should be highlighted, so it is necessary to increase the difference in illumination between the common areas of the building and the shop areas.

Energy saving in shopping centers can be achieved by switching the common area lighting operation between three patterns during the day.

For instance, in the morning, energy conservation mode can be applied. The common area can be lit by daylight in the afternoon and the shop areas lit a little bit brighter than the common area. At night normal mode can be applied.

b) Decrease of power distribution line loss

In general, the shopping center is huge, so the power distribution system is complex and impossible to measure by equipment. Therefore it is necessary to start from the maintenance of the power distribution system.

c) Installation of BAS

Measurement and control by the BAS are useful to get data for EE&C automatically.

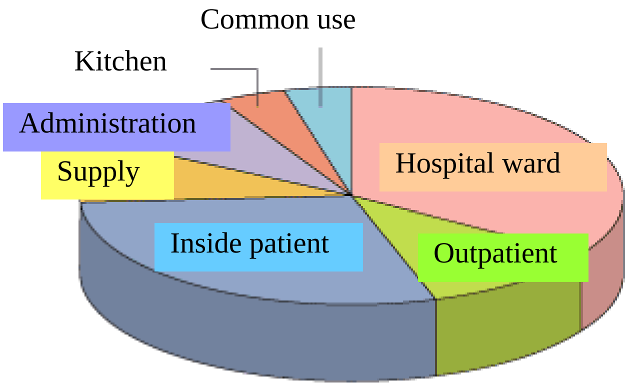
d) Countermeasures to reduce the entrance cooling load and utilizing daylight are useful.

e) The number of customer fluctuates by time zone.

To meet the fluctuation of energy load, an automatic operation device (patterning) should be installed

3) Hospital

In the hospital the energy consumption pattern is different for each department (Fig 2.6.4-1). Moreover, in general buildings and equipment are scattered over a wide area. Reduction of the transportation loss through the piping and wiring should be focused on.



Source; ECCJ “Tips of EE&C for hospitals”

Fig. 2.6.4-1 Energy Consumption in Hospitals

a) The hospital consumes a lot of energy.

A lot of steam and hot water is consumed, so the consumption of heat is large. It is necessary to consider how to secure the efficiency of the combustion equipment (fuel is saved thorough the management of the air ratio of the steam boiler), take measures to reduce steam leakage, and prevent heat loss from the piping system, etc.

b) The energy consumption of the hospital at night is large as in the case of the hotel.

The energy consumption of the central medical care section is large. The standby power consumption is large and the power consumption at night is not small. (The power supply to highly developed medical equipment cannot be stopped at night.)

c) The building is scattered over a large area.

The wire loss increases because of long electric power cables over the scattered area. It is necessary to consider the electric wire size and the arrangement of the power factor capacitor.

4) Hotel

The special feature of the hotel is 24 hours operation.

It has a wide entrance for customers' convenience and a big heat loss through it. The temperature of air-conditioning is set quite low in Indonesia.

Potential energy saving technologies are as follows:

a) Air-conditioning can be stopped in vacant rooms through intelligent turning off. The first step of energy conservation is exclusion of uselessness.

b) The lighting pattern should be changed according to the usage pattern of the room.

c) Turning off the display illumination during preparation for banquet hall

The illumination of a specific place such as a banquet hall is classified into display illuminations such as chandeliers and general illumination to maintain the luminance of the room. For display illumination such as chandeliers, the electric power consumption is large compared with the general illumination.

The point of energy conservation is that only general illumination is turned on at the preparation time and the display illumination should not be turned on then. This measure is popular in Japanese hotels.

d) Use of daylight

e) Stop air-conditioning when guest room is cleaned

When the indoor air-conditioning machine (fan coil etc.) in the guest room stops, centralized air-conditioning still operates. Therefore, the room does not become a bad working environment even if the fan coil stops during cleaning time. Moreover, as regards illumination, opening the curtains and the use of daylight should be recommended. Only light in the bathroom should be turned on. (This should be included in the manual.)

f) Review of air-conditioning operation time

g) Drafting a manual on EE&C management of each department

An energy conservation manual should be drafted and posted on the wall. This will help the employees to be aware of energy conservation.

h) Propriety at operating time of kitchen ventilation fan

The impact of the exhaust fan is large, because the volume of conditioned-air is quite large. The point of this energy conservation measure is to shorten the time of the operation of the fan as much as possible.

i) Raise the temperature setting of fresh air cooling machine properly.

Most hotels drive the fresh air cooling machine for 24 hours a day. The temperature is sometimes set at 20 degrees C. But if it can be changed to 25 degrees C or so, the EE&C impact will be quite large.

j) Replacing incandescent lamps by CFLs

In the hotel, the lighting time of the illumination of common areas is quite long, most often it operates for 24 hours. Energy conservation can be achieved by changing from incandescent lamps to CFLs.

k) Air-conditioning management of banquet hall

The banquet hall is used for various applications, such as marriages, meetings, and conferences. Effective operation pattern of cooling should be examined.

(5) Example of energy consumption analysis and evaluation

Data analysis on these on-site surveys was carried out using the data which was measured and investigated on site. The viewpoint of analysis is depicted in Fig 2.6.4-2 to Fig 2.6.4-8.

1) Annual Data Analysis

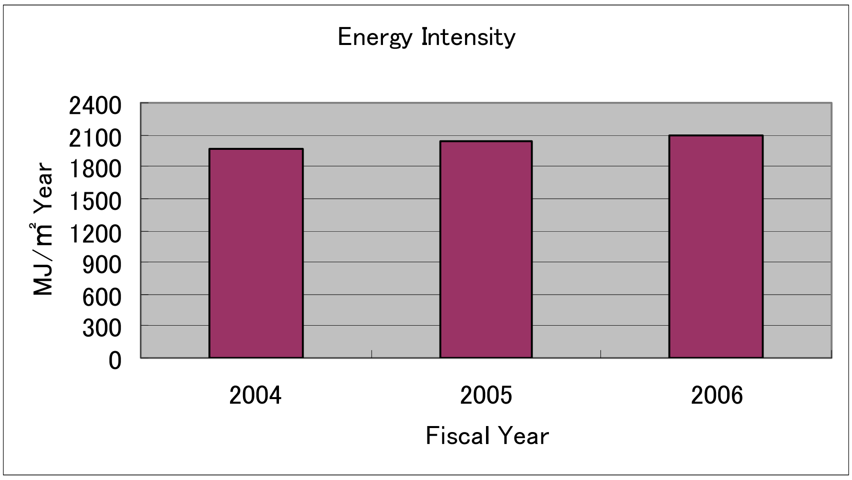


Fig. 2.6.4-2 Annual Data Analysis

Energy intensity is calculated from annual data. Energy intensity is a value which was obtained by dividing the energy consumption during the year by the total floor area, and is used for setting the energy conservation target and comparison with other buildings etc.

Reduction of 1% or more a year in energy intensity is suggested. (As a result, 25% or more reduction within 25 years can be achieved.)

The energy intensity of this sample has on the contrary been increasing year by year. EE&C activities should be implemented.

2) Monthly Data Analysis

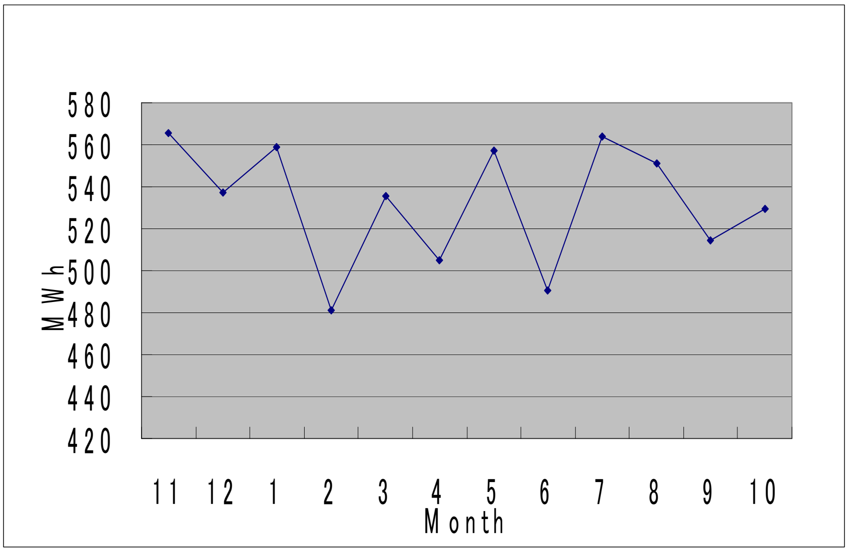


Fig. 2.6.4-3 Monthly Data Analysis

The monthly average temperature of Indonesia does not change much throughout the year. However, in the figure above, there is a fluctuation of power consumption on monthly basis. The energy consumption of the month should be checked and analyzed, reflecting the sensitivity of outdoor monthly average temperature etc.

It is important to level the monthly load in order to achieve effective use of equipment. It is also necessary to review the electricity demand value to reduce monthly expenditure.

3) Daily load curve analysis

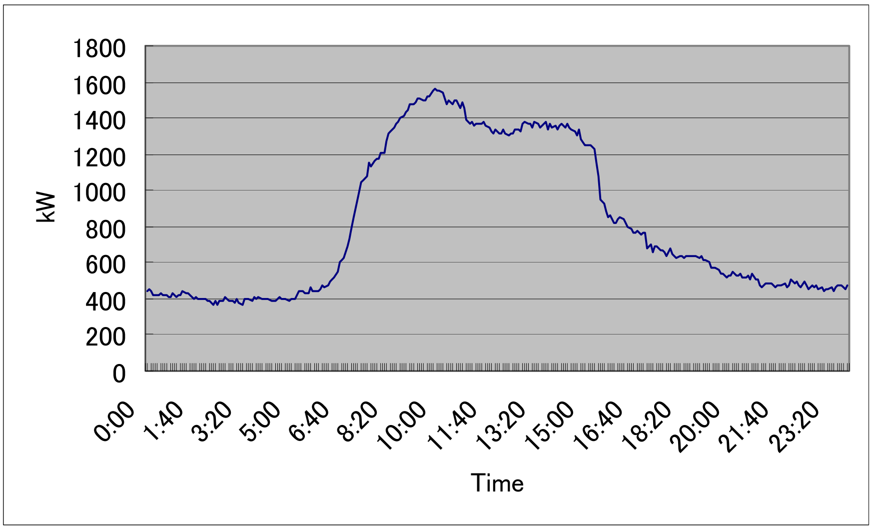


Fig. 2.6.4-4 Daily Load Curve Analysis

In general, consumer's load leveling contributes to the financial benefit of the electric power company greatly. The power company offers TOU tariff system to flatten daily load. Studying the tariff system may offer hints to reduce cost and electricity consumption.

The power consumption in daytime is decided by the pattern of life. Therefore, useless consumption before business hours, during lunchtime and after business hours should be checked. The life pattern should be checked. The daily load curve generally offers the opportunity to review the lifestyle.

Decreasing nighttime electricity consumption should be examined; even if it may be small, the cumulative nighttime consumption can have quite a big value.

It is useful to implement a demand control system which can reduce the daily peak demand. Reduction of contract demand leads to cost reduction.

4) Power factor analysis

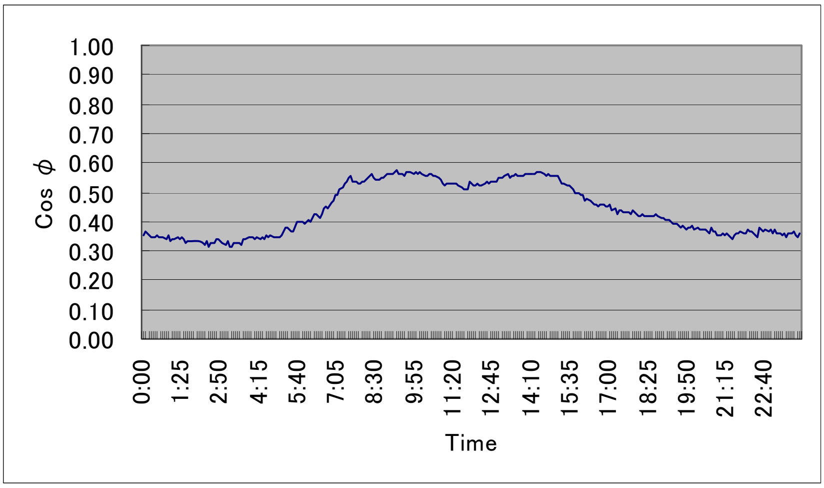


Fig. 2.6.4-5 Power Factor Analysis

There is an incentive scheme for increasing power factor, because power factor greatly influences the power supply loss of the electric power company.

Generally, 0.85 or greater power factor is preferable. If it is lower, it is useful to install or review power factor improvement capacitors.

In the case when electricity consuming equipment is scattered over the large area of the site, the capacitor should be set up on the load side to reduce the electricity distribution loss.

5) Voltage Fluctuation Analysis

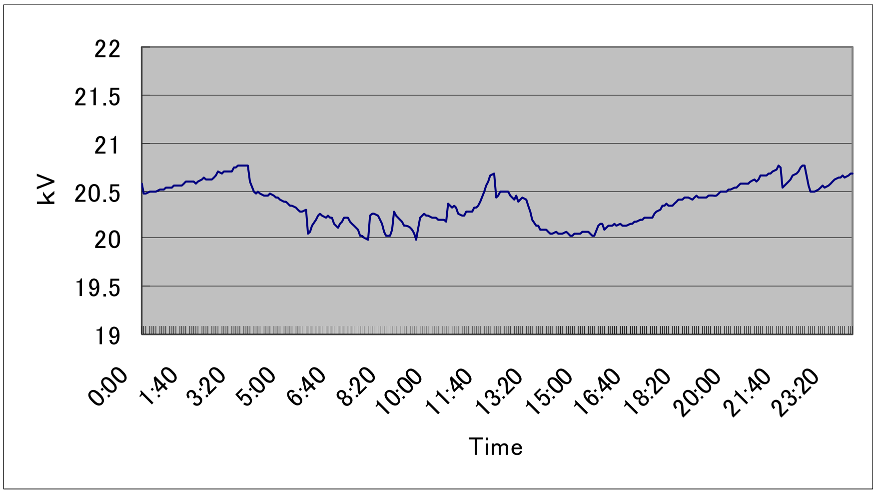


Fig. 2.6.4-6 Voltage Fluctuation Analysis

The demand for electric power changes by time of day and the voltage fluctuates under the influence of the transmission line condition and the voltage at the receiving end. Because the load equipment is operated at 380V rating, in the case when electricity is received at a higher voltage than rating, power consumption would increase and the efficiency would decrease. The power consumption grows in proportion to the square of the voltage. In some cases when the secondary voltage could be reduced by switching the primary tap of the transformer, the excessive power consumption could be reduced. Moreover, to supply power at proper (rating) voltage also helps to prolong the life of the equipment.

6) Current Analysis by phase

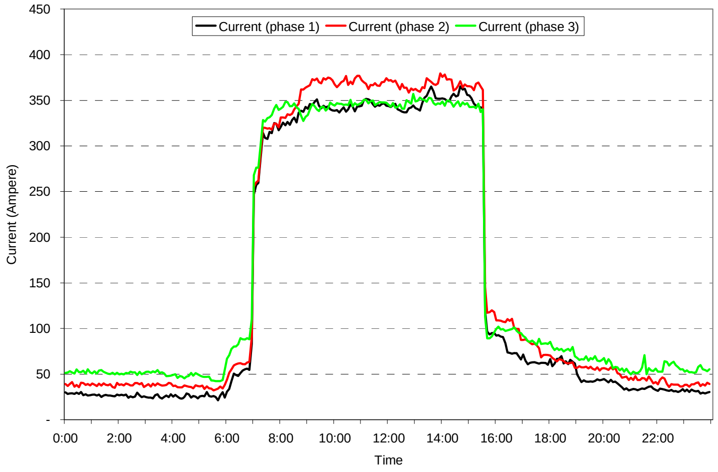


Fig. 2.6.4-7 Current Analysis by Phase

The difference of the electric power load of each phase should be checked. Regular balance check is necessary because the loss increases if there is imbalance between the phases. Whether it is within the regulated fluctuation value (3%) or not should be also checked by measurement of the higher harmonics.

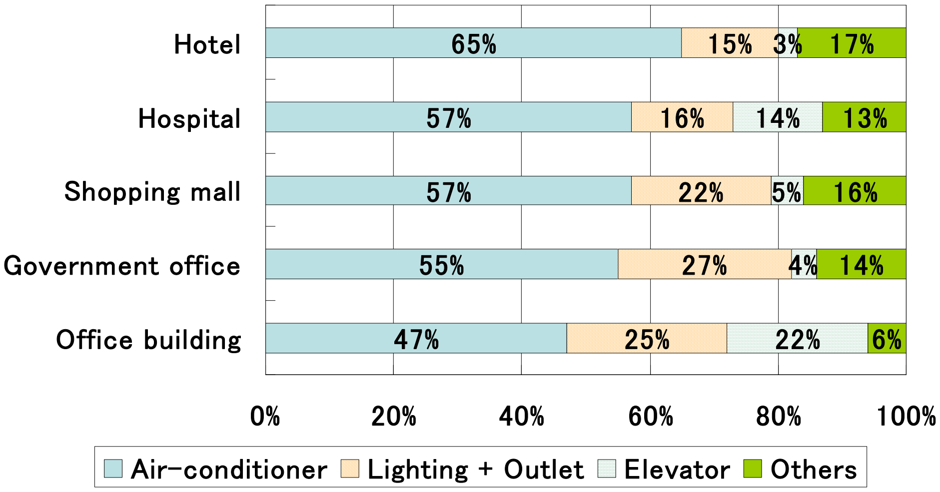


Fig. 2.6.4-8 Power Balance Analysis of Buildings

7) Power Balance Analysis

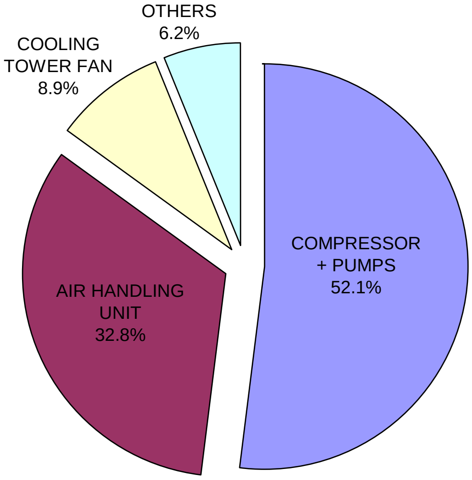


Fig. 2.6.4-9 Analysis of Air-conditioning Power in Office Buildings

The power consumption by each use (equipment) should be checked. Potential energy conservation measures should be examined through this analysis. The power balance of the surveyed buildings is shown in Fig. 2.6.4-8. Air-conditioning power accounts 50 - 60% in total energy consumption. The detailed consumption in air-conditioning unit in an office building is shown in Fig. 2.6.4-9.

Moreover, the value obtained here could be the standard of the energy conservation baseline of buildings in the future.

(6) Energy intensity calculation

The energy intensity is calculated on the basis of the numerical values of measurements as mentioned above (2). These numerical values should be properly revised by the Indonesian government and made public and managed as common data.

Table 2.6.4-6 “Examples of Electric Power Intensity by Usage” was compiled from benchmarking results of the World Bank for 65 buildings of Indonesia.

Table 2.6.4-6 Examples of Electric Power Intensity by Usage

	[kWh/m^{2}y]	Conversion value [MJ/m^{2}y]	Japanese [MJ/m^{2}y]
Hotel	198.2	2305.1	2,810
Office	203.4	2365.5	2,000
Shopping Mall	228.9	2662.1	2,830 (Department Store)
Hospital	249.9	2906.3	3,060
Government office building	(158.7)	(1845.7)	1,560
Computer building	(614.2)	(7,143.1)	5,590
The average for all sectors	216.2	2514.4	

( ); Estimate : It is a value estimated referring to the value of Japan

2.6.5 The State of EE&C Measures Implemented

The state of implementation of EE&C practices in the factories of Indonesia was analyzed and explained in the preceding paragraphs. From an overview, we can find out the constraints to practice EE&C effectively. The results of the analysis are summarized as follows. Interrelations among the constraints analyzed are also shown in Fig. 2.6.5-1.

(1) Lack of (quantitative) evidence-based management

The team found that day-to-day production and various decisions associated with operations lack periodical measuring of the parameters that may support effective operation of the factories and buildings the team visited. Accurate data collected regularly is generally not available because many factories do not utilize the data for operations. Many factories are not equipped with basic measuring devices for collecting necessary data. These factories lack quantitative operation and management based on monitoring data that may be used objectively.

(2) Insufficient standards in operations and procedures

Organizational arrangements and operational procedures are arbitrary in many factories. Though regular procedures and operations are well established, documentation and standardization have not yet been established. Only individuals, not the organization, have knowledge about regular operational procedures. Such knowledge is not transferable and available to others. In addition, procedures to meet with irregularities are not prepared.

(3) Improper maintenance

Many factories still use production lines and machinery as they were built originally. The old machinery has been used without major modifications and renovation. The level and frequency of maintenance is only the bare minimum to operate and survive. Such maintenance is not intended to prevent failure. It was very common to encounter production lines fully equipped with second-hand machinery imported from Japan. They are usually assembled with a variety of used parts and modules. It is very difficult to ensure maximum production.

(4) Insufficient understanding of production processes and facilities

The factories have a long history of retrofitting whenever they have a problem in the production line. Much of the machinery and equipment used has become quite different from what was installed when it was built. Many factories no longer have any documents and plans of the production lines in use. As such, even the managers responsible for energy management do not have sufficient knowledge and understanding about their production lines.

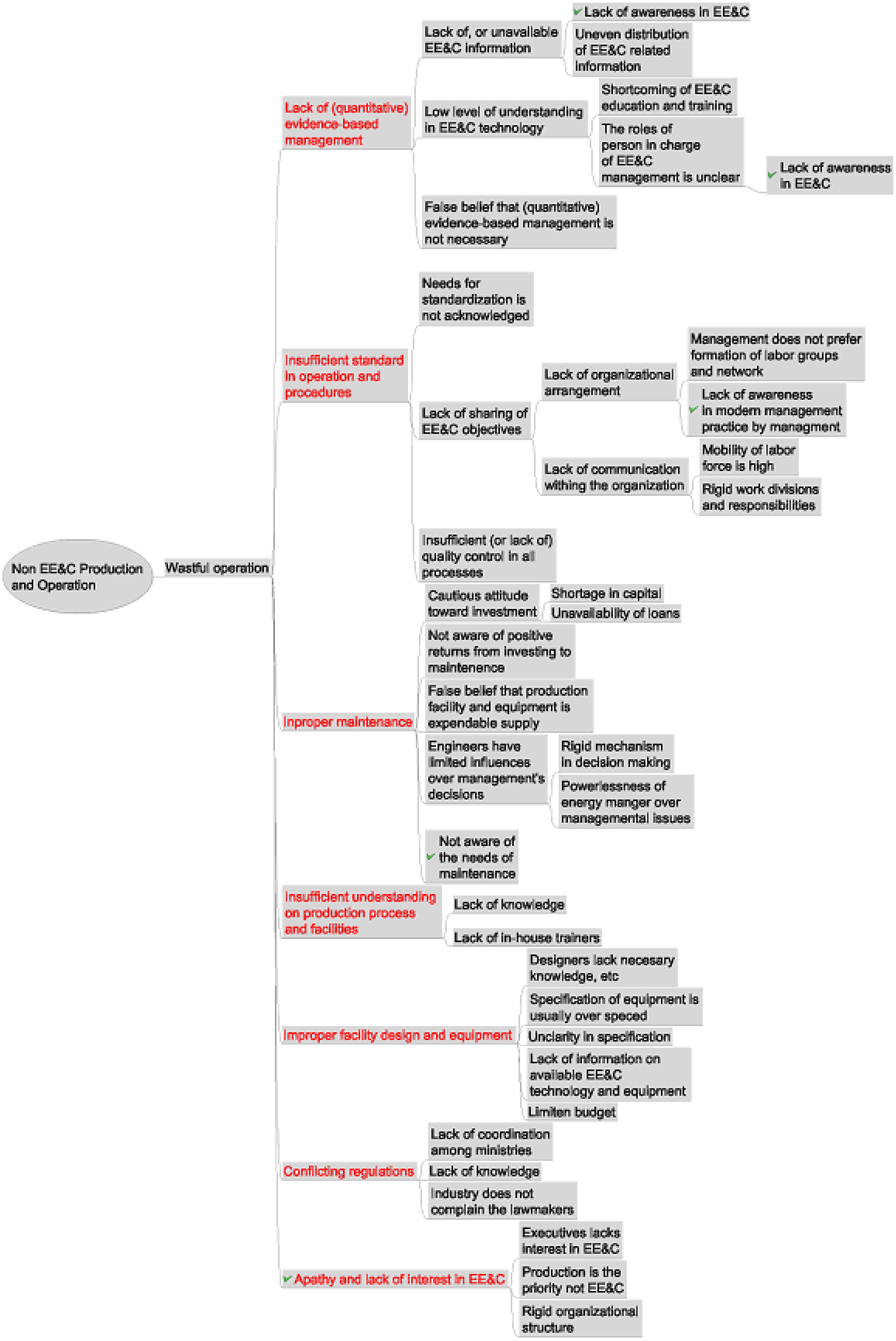


Fig. 2.6.5-1 Problem Tree (Analysis of the Constraints to EE&C Promotion in Indonesia) [1]

Note 1:
Problem analysis in PCM technique is the arrangement of problems in present conditions by the relationship between cause and effect, and work to gather them into a tree diagram (a problem tree) for easy understanding.
A problem tree used for problem analysis places a problem producing a cause below, and a problem as the effect above.
So, one problem shown in a tree is not only a cause of the problem above, but also an effect of the problem below. (In this figure, the tree has been shown sideways, from left to right instead of bottom to top.)

(5) Improper facility design and equipment

The team has found many factories and buildings are not designed to operate efficiently because of their facilities and equipment. For example, many commercial buildings are not equipped with a block-wise control system for air-conditioning and lighting, and hence cannot control temperature and lighting regardless of the occupancy of the floor. When a portion of the floor is used, the entire floor is lit and air-conditioned because of inflexible system design.

(6) Conflicting rules and regulations

The temperature of the rooms in a hospital, for example, should be regulated not exceeding 26 °C degrees by the health law which is heavily regulated by the Ministry of Health. The room temperature may be relatively higher in order to promote EE&C while still keeping a comfortable environment. The room temperature, however, is regulated by another ministry which makes it difficult to implement EE&C.

(7) Apathy and lack of interest in EE&C

Effective EE&C promotion requires especially strong will on the part of the top management in implementing it at both individual and organizational levels. Many companies acknowledge the importance of EE&C, but they lack knowledge, experience, and will in practicing it. There are many who stress the importance of EE&C, but only few have ideas of how to implement it on the ground. Realizing the importance of EE&C does not necessarily lead to actual EE&C practice.

(8) Presenting basic EE&C strategy

The following basic strategy to overcome constraints to EE&C was presented:

1) The goal of EE&C policy

The ultimate goal for the proposed master plan for EE&C and related roadmap are defined as "Realization of Comprehensive Policies for Self-reliant EE&C".

2) Basic strategy

In order to fulfill the goal, the team has proposed the combination of the following three basic strategies: "enhancing awareness and consciousness", "strengthening support from the government" and "enforcing rules and regulations." (See Fig. 3.1.1-2)

The first strategy of "enhancing awareness and consciousness" is a foundation for promoting EE&C. An overview of the analysis shown in Fig. 3.1.1-1 indicates that "lack of awareness in EE&C" is spread across all the branches of the problem tree.

2.7 Market Research on Appliances

In order to collect energy efficiency and sales data of major products which consume energy in large proportions in houses or are commonly used in factories for the study of the labeling program and DSM program, market research on lighting fixtures, TVs, refrigerators, air-conditioners, chillers and industrial motors was carried out in 2008. The following items were surveyed.

- Major manufacturers (brands and suppliers), market share, sales and sales target or prospects
- Energy efficiency
- Strategy for sales expansion of high energy efficiency products and opinion on labeling
- Display of energy efficiency in shops

Besides hearing the opinions of manufacturers and retailers, data issued by the following associations were collected

- GABEL (Gabungan Elektronik Indonesia)
- EMC (Electronic Marketer Club)
- GFK Research Institution

2.7.1 TVs

(1) Market share

There are no nationwide statistical data on the market shares. The market share by quantity is as shown in Table 2.7.1-1 based on information from several manufacturers.

Table 2.7.1-1 Market Share of TVs

TV			
Sharp	25%	Samsung	10%
LG	15%	Sanyo	10%
Panasonic	10%		

(2) Type, specification

The proportions of the sales and prospects by types are as shown in Table 2.7.1-2. The share of CRT will decrease, those of LCD and plasma types will increase.

Table 2.7.1-2 Market Share of TV

Type	2005	2010
Round CRT	66 %	16 %
Flat CRT	33 %	69 %
LCD/Plasma	1 %	15 %

Source : Industrial expert from Ministry of Industry

(3) Number of products and new models

The number of products in the present market is as shown in Table 2.7.1-3. Sharp said that it changes all models every 1.5 years. This means that approximately 100 models in all are put into the market annually by the manufacturers.

Table 2.7.1-3 Number of Products (TV)

Manufacturer	CRT	LCD	Plasma	Total
Sharp	45	15	0	61
Samsung	22	33	9	64
LG	9	4	4	17

(4) Price

Table 2.7.1-4 shows the price of TVs produced by Samsung. LCD and plasma types are more expensive than CRT types.

Table 2.7.1-4 Price of TV (Samsung)

Type	Size								
	21	27	29	32	37	40	42	46	52
CRT									
CRT（Frat）	1,449		3,049						
LCD		4,700		9,749	11,299	13,000		16,000	28,000
Plasma							11,749		

(5) Energy efficiency

“Annual energy consumption” which is used in Japan as an indicator of energy efficiency for TV considering operating time and also stand-by time is not yet being shown on the products in the market. Energy consumption shown in catalogs means rated input (watts), which has a wide variety even for the same manufacturer, type and size since they have different resolutions and may come with or without DVD players.

Fig. 2.7.1-1 shows annual energy consumption of the products sold in Indonesian market. The data is calculated by the rated input (watts) at operating time and stand-by time. Since the measurement method is supposed not same between the products, rigorous comparison cannot be done. But it may be mentioned that plasma type is relatively consuming much energy than LCD type.

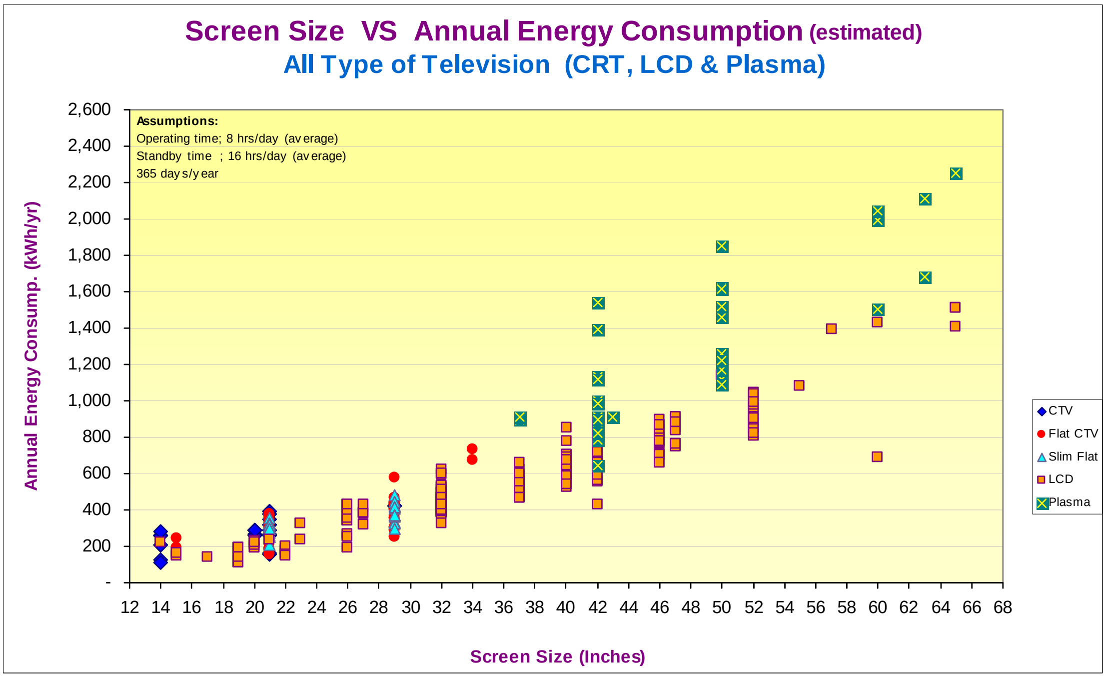


Fig. 2.7.1-1 Annual Energy Consumption of TV

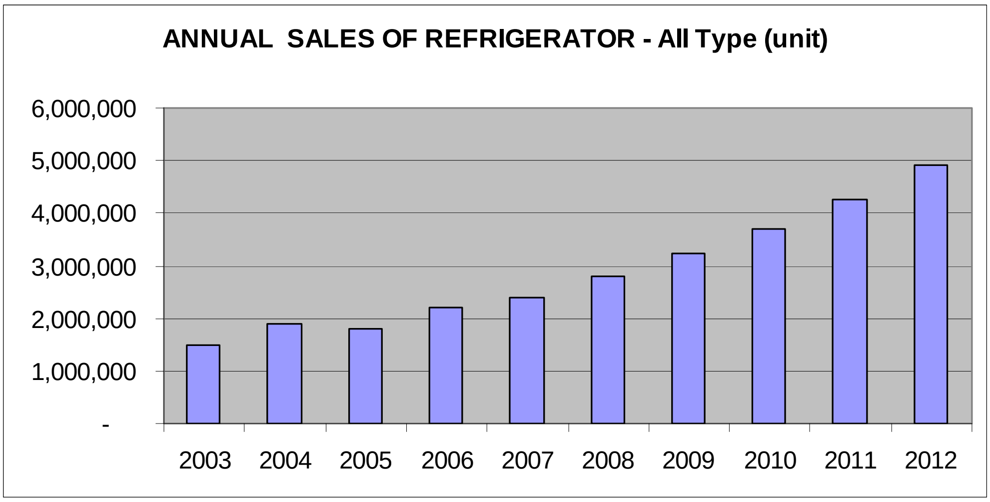
(6) Energy efficiency in marketing

Price and resolution are the two major factors in buying decisions. Energy efficiency is generally ignored.

2.7.2 Refrigerator

(1) Sales, market share

Growth of annual sales and prospects are shown in Fig 2.7.2-1. Figures for after 2006 are prospects.



Source: EMC

Fig. 2.7.2-1 Annual Sales of Refrigerator

There are no nationwide statistical data on the market shares. The market share by quantity is shown in Table 2.7.2-1 based on information from several manufacturers.

Table 2.7.2-1 Market Shares of Refrigerators

Refrigerator			
Sharp	25%	Samsung	10%
LG	24%	Panasonic	9%4%
Sanyo	15%	Others	
Toshiba	13%		

(2) Product, type

Table 2.7.2-2 shows the proportions of refrigerator types sold by LG. 1 door type which means small capacity is still the leading type. This means that houses in rural areas buying refrigerators for the first time.

Table 2.7.2-2 Market Shares of Refrigerators

Type	Proportion of sales
1 door	40%
2 doors	30%
2 doors premium	25%
Side by side double doors	5%

(3) Energy efficiency

“Annual energy consumption” which is used in Japan as an indicator of energy efficiency for refrigerators is not yet being shown on the products in the market. Electrical input (watts) means rated energy consumption, but doesn’t directly indicate energy efficiency because there are wide differences between types such as rapid freezing and ion-deodorant function

(4) Energy efficiency in marketing

Energy efficiency is featured on many products, but it is difficult to evaluate these products relatively according to what is specified since the energy efficiency of the products is according to the manufacturers’s own comparison data.

Energy conservation technology includes inverter drive, multi-compressor, high performance heat insulation, etc. Several products are equipped with inverter drive, but it is not certain that inverter type has high energy efficiency, because inverter drive technology for refrigerators has not yet established.

Till now, price has been the dominant reason for purchase, followed by rapid freezing function, style or low electricity input (watts). However, many marketing personnel think that energy efficiency will be important to consumers.

(5) Energy efficiency labeling

Major manufacturers are positive about the energy efficiency labeling program. They say that standardization of energy efficiency evaluation and education of consumers by the government about energy efficiency are important.

2.7.3 Air-conditioner

(1) Sales, market shares

Nationwide annual sales and prospect from several data sources are shown in Table 2.7.3-1. Data for after 2006 is prospects.

Table 2.7.3-1 Annual Sales of Air-conditioners

	2004	2005	2006	2007	2008	2009	2010
販売台数	510,000	640,000	800,000	1,000,000	1,200,000	1,400,000	1,660,000

Source: GABEL from KADIN Road Map presentation, manufacturers

There are no nationwide statistical data on the market shares. The market shares by quantity are shown in Table 2.7.3-2 based on information from several manufacturers.

Table 2.7.3-2 Market Shares of Air-conditioners

Household Air-conditioner			
Panasonic	25%	Daikin	5%
LG	23%	Other	32%
Sharp	15%		

(2) Product, type

Table 2.7.3-3 shows the proportions of sales by cooling capacity for air-conditioner produced in Indonesia.

Table 2.7.3-3 Sales by Cooling Capacity (1)

Cooling capacity	2005	2010(prospect)	Note
Less than 1HP	39%	34%	1HP means 2.5-2.8kW
1HP	42%	45%	
More than 1HP	19%	21%	

Source: GABEL quoted by KADIN Road Map

On the other hand, Sharp estimates types of air-conditioner as Table 2.7.3-4.

Table 2.7.3-4 Sales by Cooling Capacity (2)

Cooling capacity	Proportion
½ HP	45%
¾ HP	19%
1HP	31%
2 HP & 2 ½ HP	19%

Source; Sharp

(3) Price

Fig. 2.7.3-1 shows the prices by cooling capacity. Inverter type is included. Manufacturers say inverter type has 40% - 150% higher prices than non-inverter type.

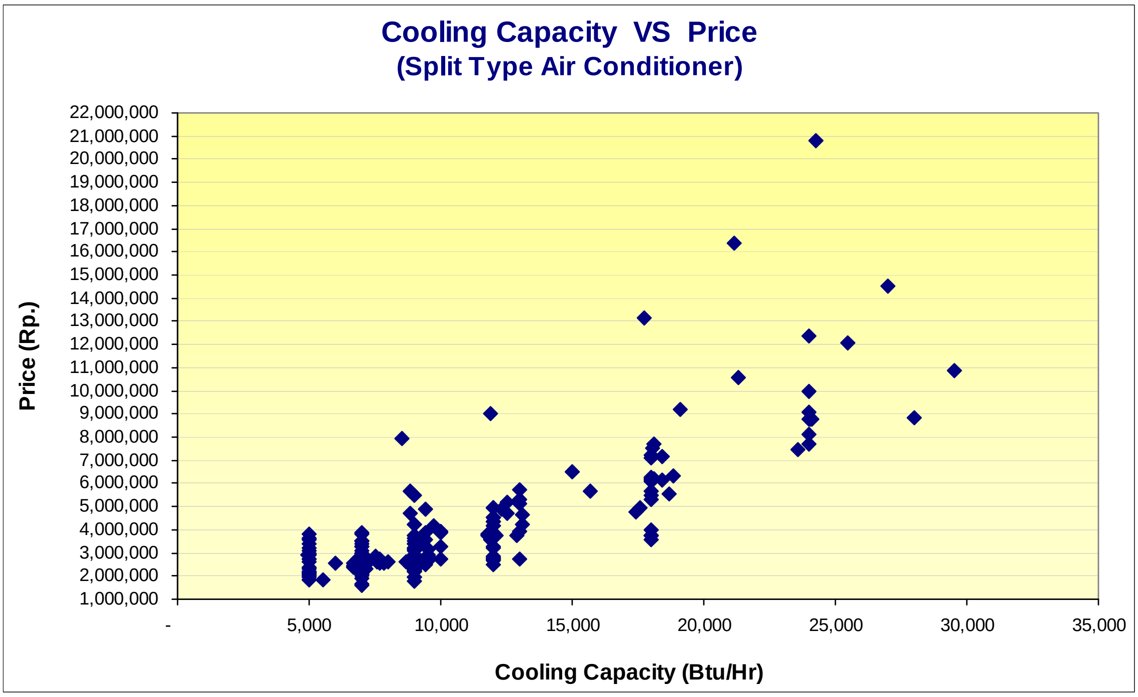


Fig. 2.7.3-1 Price of air-conditioner

(4) Energy efficiency

Energy efficiency is generally indicated by EER or COP. Fig 2.7.3-2 shows EER (COP) by cooling capacity. Small cooling capacity type has relatively higher efficiency. This tendency is the same as in Japan.

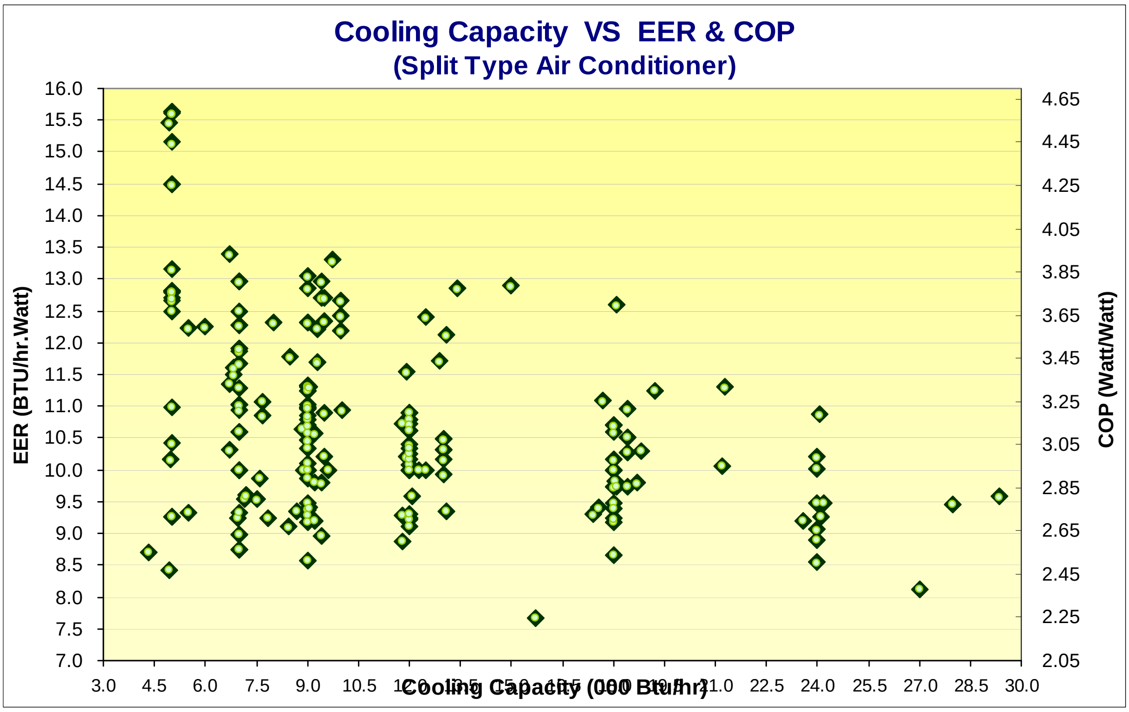


Fig. 2.7.3-2 EER by Cooling Capacity

(5) Energy efficiency in marketing

Major manufacturers indicate EER on the products, but they don't explain the meaning of EER or energy efficiency of the air-conditioner for consumers. The manufacturers feature high energy efficiency especially on the inverter type. Some of them show comparison of running cost. But the cheep price of electricity is an obstacle to persuading consumers that energy saving means cost reduction.

(6) Energy efficiency labeling

Major manufacturers are positive about the energy efficiency labeling program. They say that standardization of energy efficiency evaluation and education of consumers by the government about energy efficiency are important.

2.7.4 Illumination Lamp and Ballast

(1) Sales, market share

Domestic production of fluorescent lamps, ballasts and street lighting is shown in Table 2.7.4-1. figure for after 2007 are prospects.

Table 2.7.4-1 Production of Lighting

	2005	2006	2007	2008	2009	2010
FL	60,000,000	65,000,000	65,000,000	75,000,000	75,000,000	80,000,000
Ballast						
Street lighting	516,000	543,000	571,000	600,000	630,000	661,000

Source: "Peta Industri Lampu Hemat Energi di Indonesia" by Aperlindo and additional interview with the director of association

Domestic production of CFL 2008 is shown in Table 2.7.4-2.

Table 2.7.4-2 Production of Lighting

Manufacturer	Brand name	Annual production
PT Philips Indonesia	Philips	60,000,000
PT Osram Indonesia	Osram	40,000,000
PT Panasonic Lighting Indonesia	Panasonic	7,000,000
PT Sinar Angkasa Rungkut	Chiyoda	60,000,000
PT Hikari	Electra	20,000,000
PT GE Lighting Indonesia	GE	25,000,000
Total		232,000,000

Source: Peta Industri Lampu Hemat Energi Di Indonesia by Aperlindo

There are no nationwide statistical data on the market shares. The market share by quantity is shown in Table 2.7.4-3 and Table 2.7.4-4 based on information from APERLINDO and several manufacturers.

Table 2.7.4-3 Market Share of Lamps

Lamps (all type)		
PHILIPS	40%	
OSRAM	5%	
Panasonic	5%	
Other	50%	

Table 2.7.4-4 Market Share of Fluorescent Lamp and Ballast

Fluorescent lamps and ballasts		
PHILIPS	40%	
OSRAM	10%	
Panasonic	10%	
Other	40%	

(2) Types of ballast

Table 2.7.4-5 shows the production shares of different types of ballast by GE and for all brands as estimated by GE.

Table 2.7.4-5 Type of ballast

Type	Production of GE	Nationwide (GE estimation)
Magnetroelectric	60%	70%
Electronic	40%	30%

(3) Display of energy efficiency

Manufacturers display energy efficiency on CFLs along with a comparison between CFLs and incandescent lamps. CFLs with energy efficiency label which started being applied in 2007 as trial, and having a 4-star mark could not be found in the market.

(4) Energy efficiency in marketing

Manufacturers feature high energy saving performance on brochures, stickers, posters and/or in TV commercials. Table 2.7.4-6 shows the products which the manufacturers focus on.

Table 2.7.4-6 Energy Saving Products

Manufacturer	Product
Panasonic	U-type fluorescent lamp
Philips	Thin tube FL; T5（15.5mm ϕ）
GE	Thin tube FL; T5（15.5mm ϕ） Ceramic metal halide lamp

It is pointed out that the low price of incandescent lamps and mercury lamps is an obstacle to expansion of sales of the energy saving lamps.

(5) Energy efficiency labeling

Major manufacturers are positive about the energy efficiency labeling program. One of the reasons is to eliminate poor quality products which remain in the market because of their low prices. Manufacturers say that standardization of energy efficiency evaluation and education of consumers by the government about energy efficiency are important.

2.7.5 Industrial motor, VSD (Valuable Speed Driver)

(1) Sales, market share

There are no nationwide statistical data on the market shares. The market share by quantity is shown in the Table 2.7.5-1 based on information from several manufacturers.

Table 2.7.5-1 Market shares of Industrial Motors

Industrial motor		VSD	
TECO (made in Taiwan)	35%	Toshiba	40%
EMM	12%	Panasonic	23%
CMG	12%	Hitachi	20%
TATUNG (made in Taiwan)	10%	Schneider	8%
SIEMENS	7%	TECO	5%
Other	24%	Other	4%

2.7.6 Chiller

(1) Sales, market share

There are no nationwide statistical data for the market shares. The market share by quantity is shown in the Table 2.7.6-1 based on information from several manufacturers.

Table 2.7.6-1 Market Share of Chiller

Chiller	
Trane (US)	35%
York	30%
Mc.Quay	15%
Carrier	10%
Hitachi (Japan)	8%
Other	2%

(2) Types of chillers

Hitachi said that proportion of absorption type is only 5%, and compression type is major.

(3) Energy efficiency

Table 2.7.6-2 and 2.7.6-3 show energy efficiency of the chillers which are produced by 3 major manufacturers (Hitachi, Trane and York) in Indonesia.

Table 2.7.6-2 Energy efficiency of water cooled chiller

	COP for Water Cooled Chiller			
	<100 TR	100 - 200 TR	200 - 300 TR	>300 TR
Minimum	2.33	2.40	2.88	2.85
Maximum	4.93	5.54	5.79	5.88
Sample	84	35	24	29

Table 2.7.6-3 Energy efficiency of air cooled chiller

	COP for Air Cooled Chiller		
	<100 TR	100 - 200 TR	200 - 300 TR
Minimum	3.12	2.92	3.05
Maximum	3.53	3.44	3.59
Average	3.33	3.22	3.31
Sample	8	15	12

Table 2.7.6-4 Energy efficiency of Hitachi products

Type	Capacity	Energy efficiency
Reciprocator	1HP～700HP	EER；1.3～1.5 kW/ton
Screw	30HP～750HP	EER；1.1～1.2 kW/ton
Scroll	3HP～250HP	EER；
Packaged unit		EER；1.4～1.6 kW/ton
Ichiban (air-cooled) series		EER；1.05～1.1 kW/ton
Ichiban (water-cooled) series		EER；0.67 kW/ton

Hitachi air cooling chiller with high efficiency technology could only achieve 3.35 COP. while chiller with high efficiency centrifugal compressor type achieved 6.07 COP and screw chiller reaches 5.25 COP.

2.8 Current Condition of and Issues Relating to EE&C Promotion Mechanism in Indonesia

2.8.1 Energy Manager System

(1) Missions of Energy Managers

The energy manager system is intended to ensure that energy managers appointed to ensure proper control of energy consumption are stationed at factories and business establishments with annual energy consumption reaching or exceeding a predetermined threshold level.

Under the energy manager program in Japan, energy managers are mainly in charge of

- maintaining the equipment that consumes energy,
- improving and monitoring the way energy is used, and
- taking part in the process of working out a plan for rationalizing the use of energy.

Energy managers are appointed from among registered energy managers under the energy manager qualification system.

(2) Policy Efforts for the Energy Manager System

While Section 2.3 provided an overall review of the policies and legislation relating to energy conservation, this section takes a look at the action taken in Indonesia with a focus on the policies relating to the energy manager system.

1) Action under RIKEN 2005

a) Position in RIKEN 2005

The current position of the energy manager system in Indonesia is defined in the state-level basic plan for energy conservation under RIKEN.

RIKEN (Rencana Induksi Konservasi Energi 1995 dan 2005) is the Master Plan for National Energy Conservation in Indonesia. It was formulated by MEMR in accordance with presidential decree No. 43/1911 and implemented at the behest of the Minister of Energy and Mineral Resources' decree No. 100.K/48/M.PE/1995. From its 1995 edition to its 2005 edition, RIKEN had been continually revised.

(See http://www.nedo.go.jp/kankobutsu/foreigninfo/html0012/pdf/p15-p28.pdf)

b) Energy manager system under RIKEN 2005

This section reviews the policies introduced for the energy manager system under RIKEN 2005.

In RIKEN, the policy consists of four different instruments: information policy, regulation policy, incentive policy and market transformation. With respect to the energy manager system, the master plan places particular emphasis on the regulation policy. It requires any energy user in the commercial or industrial sector with annual energy consumption of 12,000 tons or more in crude oil equivalent or power receiving capacity of 6,000 kVA or more to comply with the energy manager system. This definition is still being studied by MEMR. An international comparison of the energy manager system has been summarized in the Progress Report. MEMR's initial idea of threshold level of energy consumption is higher than that of Japan or other countries. More consideration should be given to the threshold level of applicability. At first, only a limited number of large energy consumers should be covered by the energy manager system and later the number of target consumers should be enlarged step by step.

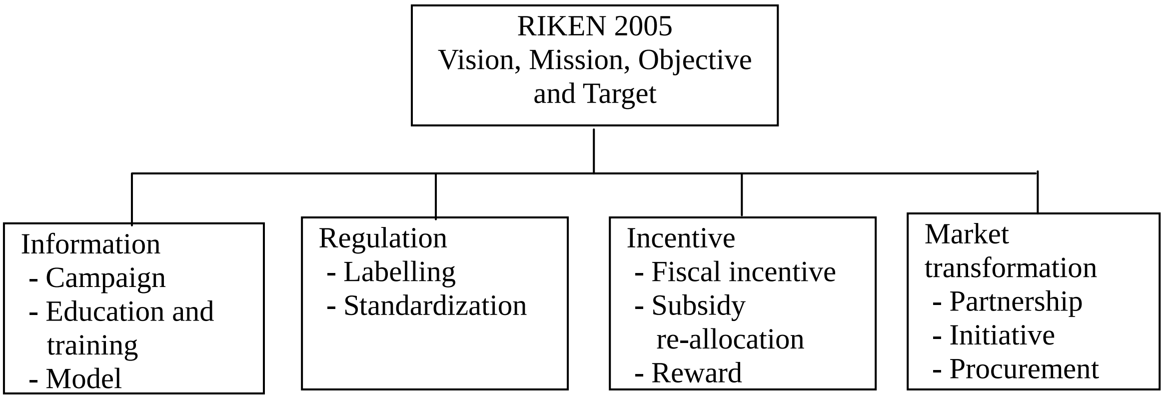


Fig. 2.8.1-1 EE&C Policy Instruments and Purpose in RIKEN 2005

In the category of regulation policies, RIKEN provides for several actions under the energy manager system, including:

- Assigning an energy manager
- Creating and implementing energy conservation programs
- Executing energy audit periodically, and
- Reporting the outcome of implementation of the energy conservation program periodically.

It is thought that Indonesia's energy manager system is designed to be similar to that of Japan.

2) The situation of enactments under the Energy Law

a) Background of establishment of Energy Law

MEMR issued a Ministerial Decree (No.31) in July 2005 based on the Presidential Decree (No. 10) in 2005 to promote energy efficiency and conservation through efficient air temperature control and measures for energy conservation in the public sector. On July 18, 2007, the House of Representatives approved the Energy Law aiming at reform of energy use in Indonesia. The purpose behind the law is to establish a legal framework to enable the Republic to establish the overall energy plan and a long-term energy strategy. Another important purpose of the law is to reduce the dependency on imported refined oil and to promote unexploited energy sources such as biomass and natural gas. In order to implement these policy measures effectively, the National Energy Council headed by the President was established in February to oversee the procurement and distribution of energy in the Republic.

b) EE&C policy actions under the Energy Law.

An important element of the law is mandating local content in procurement of goods and services. All government funded projects including petroleum and gas development projects are required to procure a certain share of local goods and services including recruiting Indonesian personnel except those with specific duties and expertise. As prescribed in the 25th article of the Energy Law, GOI (Government of Indonesia) has provided incentives for end users and manufacturers of energy efficient goods and services to promote sustainable energy supply and utilization. On the other hand, those who neglect energy conservation measures are subject to penalties under the law and regulations.

The law emphasizes measures for energy efficiency and conservation as economic policy, because it has been pointed out that the industrial sector’s energy consumption is rapidly increasing, while its energy efficiency has been low. In order to solve this problem, the law stipulates the implementation of the energy manager system to implement energy audit for factories and commercial buildings and to promote energy conservation and effective energy management. In the light of this, the law affirms the validity of existing legislation in Article 31. It envisions using the policies stipulated in RIKEN 2005, such as introduction of the energy manager system and energy surveys in factories and commercial buildings, as a powerful means of bolstering energy conservation and energy control in the industrial sector.

As shown above, the Energy Law aims at accelerating the development of renewable energy and integrating coherent energy related measures and planning and implementation of national development based on the energy policy.

(3) Existing qualification programs for energy managers

1) Structure of Qualification System

In Indonesia today, the administration of state qualifications for individuals is the responsibility of the National Professional Standard Body (BNSP). With an independent institution status, it licenses any organization capable of organizing examinations on professional skills according to qualification levels as a professional qualification certifying body (LSP) to conduct the certifying operations. Moreover, the LSP secures a facility where professional skill examinations can be held (TUK) from public bodies and enterprises and uses the facility as a venue for qualification tests. The BNSP sets up technical committees consisting of relevant associations and experts suited to different qualification levels. These committees are responsible for preparations for launching LSPs, assessment of LSPs and checks on TUKs.

An institution called KAN is in charge of state qualifications for institutions offering training, education and product performance tests as third-party bodies on behalf of the state authorities. Such institutions are therefore required to have the impartiality and specialist knowledge to act as third-party bodies on behalf of the state authorities. KAN conducts qualification examinations and grants licenses to organizations.

It can be envisaged that the state qualification programs for energy managers, both for individuals and for institutions, are operated on the basis of the existing systems:

- For individuals: LSPs are licensed by the current BNSP to hold examinations for energy manager qualifications, to grant the qualifications and to deal with the renewal and other formalities relating to the qualifications.
- For institutions: Those authorized by the current KAN offer training and education for registered energy managers and carry out skill examination processes requiring specialist knowledge and third-party fairness, including determination of the pass or fail status, as done in Japan by the examination committee under the Energy Conservation Center Japan (ECCJ).

The East Java Local Government is making local-level efforts to develop an energy manager qualification program. Aiming mainly to perform energy surveys of small- and medium-sized factories, the program serves the purpose of skill development for energy survey inspectors, whose functions are part of those to be played by registered energy managers. Included in the initiative to stimulate the local industry under MOI policy, it makes use of the results of JETRO’s JEXSA project, explained later in Section 2.6.1 (1), *Japanese Assistance*. An official of the East Java Local Government confirms that efforts are being made to maintain progress in the establishment of a state-level energy manager system. At state level, MEMR is aiming to increase the efficiency of construction of the system by making occasional use of what has been learned through the experience at the local level.

In addition, full collaboration with MOI is of great importance to MEMR, given that factories are under the supervision of MOI, not MEMR, which is simply to be in charge of energy conservation policies. In view of the consistency with local devolution efforts, it is considered imperative to forge stronger partnerships among MEMR, MOI and local governments.

2) Development of energy manager qualifications today and tomorrow

In Indonesia, MEMR is now making preparations for energy manager qualifications. The activities are now in the phase of developing such standards as:

- Competency Standard,
- Curriculum Standard,
- Testing Standard, and
- Training Standard.

In the course of creating these standards, MEMR set priorities on the sectors subject to the program. It envisions that the program will apply to some commercial buildings before it does to others.

For commercial buildings, the ministry is set to work out the standards for skills required for energy control in 2007 and those for details of the curriculum, qualification testing and educational training in 2008.

A draft competency standard was prepared by MEMR. Consisting largely of nine technical factors, it is merely a list of technical elements. At a meeting with MEMR, the Study Team advised MEMR that it would be necessary to create a more detailed standard covering a guideline for meeting the competency requirements, development of textbooks and other materials for knowledge acquisition and other specific matters. A meeting for consensus building on the standard for qualifications of energy managers for commercial buildings took place on December 7, 2007 to approve the proposed standard more or less as drafted.

With respect to the scheme of energy managers for factories, MEMR will work to establish the competency standard in 2008 and the standards for curriculum, testing and training in 2008. This process will lag one year behind the process for commercial buildings. The ministry intends to set higher requirements for the energy manager qualification for factories than for the qualification for commercial buildings.

(4) Issues to be solved for formulating national energy manager program

To ensure an effective national energy manager program, this section shows some of the problems in the current situation, including the existing legal system, qualification programs and issues revealed in the questionnaires.

1) Issues related to Designated factories for Energy Management System and Its Relevancy and Effectiveness

It is widely known that there are two major policy approaches, enforcement of regulations and support.

The first approach is a compulsory regulation enforced by the government requiring industry sectors and establishments that consume a large volume of energy to implement energy conservation measures based on their energy use. The second approach is to provide incentives such as tax breaks against investment related to EE&C. In many countries these two approaches are adopted together to promote EE&C.

The former approach requires a monitoring mechanism in order to obtain effective enforcement of regulations. It should be noted that strict control and regulation over economic activities of the private sector may hinder the functions of market-based economic growth, therefore the role of the government in EE&C should be carefully reviewed and the most appropriate intervention needs to be identified. While both central and local governments' human resources to administer various elements of environmental monitoring and control in Indonesia have been limited, the effectiveness of enforcing of energy laws is also questionable. Emphasizing strict regulation and control may not be necessarily effective because of such weak administrative capacity in environmental management.

2) Issues related to administrative cost and financial mechanism for EE&C.

The administrative cost for overseeing EE&C cannot be ignored because the number of industrial establishments and factories that use energy in Indonesia is enormous. As discussed in the next section, securing the necessary and sufficient number of able administrators who oversee and supervise EE&C in central and local governments is a prerequisite because Indonesia is an island country encompassing a vast territory. To do so, capacity development through training and education as well as institutional development are essential to achieve fruitful results. In addition, tax reforms providing incentives aiming at accelerating investments for EE&C are necessary. The most effective mix of regulation and incentives should be discussed with stakeholders. The financial mechanism to carry out regulation and incentives should be discussed thoroughly by looking into all available policy options.

3) Issues relating to establishing regulations for energy manager system

The Energy Law was just established in July 2007 and many regulations necessary for the implementation of the Energy Law are still under preparation. On the Certified Energy Manager System, discussions for defining the competency standard under Indonesia National Standard (NSI) are in progress. The finalized competency standard will be promulgating by ministerial decree by MEMR. The administration of the program and the issuing of the certificate will be in accordance with the standard.

Various regulations including the following should be prepared in order to administer the certificate program:

a) Criteria for designated factories (and commercial buildings) by amount of energy used
b) Specific EE&C measures for factories utilizing energy less than the amount specified under item a)
c) Measures, if any, for all existing factories or some existing ones with interim measures for promoting EE&C
d) Criteria for tax breaks for certain investments for EE&C
e) Basis, methodologies and guidelines for calculating energy consumption reduction
f) Whether or not a third party should validate the reduction value
g) Procedures for examination for energy manager certification
h) Criteria and requirements for establishing training institutions for preparation of the exam.

4) Issues relating to disseminating energy management techniques and technology

In order to strengthen institutional arrangements for promoting EE&C at the national level, various measures in addition to establishing legal framework and tax reform are necessary. One of other important measures is the strategy for disseminating energy management techniques and technology. This means that all related ministries, agencies and organizations should be employed to develop, disseminate and implement EE&C techniques and technology. Among the public sector agencies, MEMR and MOI should work closely to disseminate and implement EE&C techniques and technology under their respective jurisdictions.

The current framework provided by the enactment of the Energy Law is geared toward regulating industry. It should be noted, however, that education and training focusing on implementation of EE&C measures in the field should be enhanced.

The training center of MEMR is currently providing a training program on EE&C at the time of writing. The total number of participants is less than 100 trainees annually. The center has a plan to extend the training program to the private sector employees to promote effective measures for EE&C.

More specifically, MEMR should request PLN and IPPs to implement EE&C techniques and technology by using MEMR's authority. The operation and monitoring should be carried out to promote and implement rational use of energy in mining industries. The framework emphasizing regulations complying with the Energy Law has been prepared. Industry establishments should implement education and training programs focusing on both senior management and engineers. Detailed contents of education and training will be developed on the basis of the results derived from the series of energy audit and questionnaire surveys carried out by the Study Team.

5) Education and Training Institutions and Training Curriculum

As discussed in item 4), the current training program at MEMR's training center focuses on EE&C measures in commercial buildings. This is in line with the on-going efforts of discussion and review of the competency standard. All field work under this section emphasizes MEMR's jurisdiction on EE＆C.

The Study Team gave a comment on the competency standard that it should cover not only electricity but also heat management topics.

2.8.2 Energy Efficiency Labeling Program

(1) Present Situation

1) Outlook (Including prospects)

Laws and regulations for the labeling program are going to be established as per the hierarchy shown in the Table 2.8.2-1. Classification of the regulations has not yet been defined completely by MEMR. Up to now (November 2008), the following decree and standards have been issued:

DGEEU Decree (№.238-12/47/600.5/2003) “Procedure of EE Labeling on Electricity User in Indonesia Market”

SNI 04-6958-2003 “Energy Saving Labeling” and,

SNI 04-6711-2002 “Household refrigerator”

Table 2.8.2-1 Classification of Laws and Regulations for the Labeling Program

Existing Under preparation Scheduled

	Laws and regulations
Law	The Energy Law (Issued in August 2007)
Governmental regulation	Energy Conservation (Draft for the forum; Feb. and Sep. 2007)
MEMR Ministerial Decree	Labeling Procedure for Refrigerators (To be issued in 2009) Labeling Procedure for TV set (To be issued in 2009) Labeling Procedure for Air-conditioner (To be issued in 2010)
DGEEU 令	Procedure of EE Labeling on Electricity User in Indonesia Market (№.238-12/47/600.5/2003) Labeling Certification Procedure (To be issued in 2009) CFL Testing Procedure (To be issued in 2009)
Other Standards	SNI(04-6958-2003) Energy Saving Labeling SNI(04-6711-2002) Household refrigerator

2) Energy Conservation (Draft for the forum held 12th Feb. 2007)

This is one of the practical regulations which is required to be enacted to stipulate “Incentive and Disincentive” under the Energy Law. Labeling program is involved in the regulation together with defining “Designated Energy User” products. Following is the stipulation of the labeling program.

Part 3 Labeling Article 10

(1) Individual, corporate, steady business, in implementing energy supply must conduct energy conservation

(2) Energy conservation which mentioned in paragraph (1) conducted through effective energy technology

(3) In order to applying effective energy technology which mentioned in paragraph (2), government must set standard and conduct labeling

(4) Individual, corporate, and steady business in implementing energy equipment supply must attached level efficiency label of energy used to energy user an/ or to the package based on Standard National Indonesia

(5) Following terms about how to attached label which mentioned in paragraph (3) arranged by Ministry Regulation

Explanation
(Paragraph 3)
One who has the obligation to fulfill the applied SNI and must attach the efficiency level label are Producer, Importer and Distributor of energy equipment.

(Paragraph 4)
The term of energy efficiency is a compare between energy output and input in an energy utilization system.
Energy efficiency level label consist of information about energy utilization level by energy user. With the presence of the label, society can get information about level of energy usage.

Though MEMR’s basic policy is that labeling program shall be voluntary, in this regulation there is a possibility that the stipulation may be considered to be a mandatory program because of the wording used in the regulation.

Government regulations are planned to be issued one by one as labeling criteria for the products are specified.

3) DGEEU Decree “Procedure of EE Labeling on Electricity User in Indonesia Market”

This is the stipulation for the manufacturers to follow standard SNI (04-6958-2003) “Energy Saving Labeling”. It covers the procedures to be followed by the labeling certification body, testing laboratory and manufacturers and certification period, inspection by the certification body, nurturing and supervising by DGEEU and others.

4) SNI (National Standard Indonesia) 04-6958-2003 “Energy Saving Labeling”

National Standardizing Agency (BSN Head decision Number: 10/KEP/BSN/03/2003 on 31 March 2003) issued the standard for the design of 4 star marks. This standard specifies the design of the label with 4 stars marks including the shape, size and color.

5) Labeling Certification Procedure

This procedure, lays down the process for the application of various stipulations of the

DGEEU Decree mentioned above. Delegation of responsibilities between KAN (National Accreditation Committee), labeling certification body, testing laboratory and manufacturers is also mentioned in this procedure and periodical inspection is also stipulated. Three companies viz PT. TUV NORD Indonesia、PT. Energy Management Indonesia、PT. Sucofindo are nominated to SLPro (the certification body).

This document does not have any stipulation concerning the charges for the certification and testing. The rule regarding charges is expected to be issued as another decree after discussion about the costs among the stakeholders.

6) Requirements for Performance Test of CFL

The method of testing CFLs and criteria for the star mark rating are stipulated in the document. Three organizations viz P3TKEBT-DESDM、B2TE-BPPT、PT.Scofindo are nominated as the accredited laboratories for conducting the tests.

7) Products to be Labeled

MEMR is attempting to establish labeling procedures for refrigerators, TV sets, air-conditioners, fans, rice cookers, well pumps, personal computers and washing machines. One year after preparing the labeling criteria, the labeling procedures shall be issued one by one either as a government regulation or DGEEU decree.

(2) Organizations for Labeling Program

1) BSN, KAN

KAN grants accreditation to certified institutions (for quality control system, product, personnel, training, environment management system, HACCP system and Forest Management System & testing laboratories/ calibration laboratories). It also inspects and grants accreditation to other standardization organizations as per needs, and is responsible to give advice to the head of BSN for deciding accreditation and certification system. (Certification for individuals is the responsibility of BNSP)

KAN Guideline 402-2001 (same as BSN 401-2000) is a check list for evaluating organizations which apply for accreditation as certification bodies and testing laboratories to KAN. The check list includes evaluation of several parameters including the following:.

- Independence of management from other organizations to ensure that there is no conflict of interest and to maintain the fairness of the certification body or testing laboratory
- Ability to undertake evaluations without any discrimination and in an unbiased manner
- Management system including documentation and recording procedures
- Ability to maintain confidentiality through an appropriate system

2) Accredited Testing Laboratories

Three laboratories viz P3TKEBT-DESDM、B2TE-BPPT and PT.Scofindo have been nominated as accredited testing laboratories. A study for the testing ability for refrigerators, TV sets and air-conditioners was carried out for P3TKEBT-DESDM, B2TE-BPPT and PLN Research Center. PLN Research Center has not yet been accredited as a testing laboratory for CFL, but is recognized as having the requisite ability. EMI has researched PT.Scofindo and B4T-Deprin. The results are shown in Table 2.8.2-2.

Table 2.8.2-2 Testing Ability for Energy Efficiency Performance

	P3 TKEBT	B2TE-BPPT	PLN-LITBANG	B4T- Deprin	PT.Scofindo
CFL FL Ballast	★★★	★★★	★★★	★★★	
	Integrated sphere-photometer; 1,500Φ	Integrated sphere-photometer; 1,500Φ	Integrated sphere-photometer; 2,000Φx 3	Integrated sphere-photometer; 1,500Φ	
Refrigerator	★	★★	★	★	★
	Available if air conditioned room and measurement instrument is provided	Test is being carried out, but testing does not conform to any standard	Available if air conditioned room and measurement instrument is provided	Available if air conditioned room and measurement instrument is provided	Available if air conditioned room and measurement instrument is provided
TV	★	★	★	★	★
	Available if air conditioned room and measurement instrument is provided	Test is being carried out, but testing does not conform to any standard	Available if air conditioned room and measurement instrument is provided	Available if air conditioned room and measurement instrument is provided	Available if air conditioned room and measurement instrument is provided
AC	-	★★	-		
		Climate chamber is under construction. Test under ISO5151 will be implemented.			

★★★；suitable ★★；preparing ★；suitable after proposed changes

(3) Progress of International or Regional Standardization Concerning Labeling Program

1) BRESL (Barrier Removal for Energy Standards and Labeling in Asia)

BRESL is initiated by UNDP and is being funded by Global Environment Facility aiming to extend the market of high efficiency products in developing Asian countries. The project is scheduled to be implemented from 2007 to 2012 for total period of 5 years. Capacity building, marketing and dissemination of information, harmonization of energy efficiency standards and testing methods, promotion of incentives for dealers, technology transfer to the manufacturers, product design are planned to be studied under the programme.

A total of 6 countries viz Indonesia, Thailand, Vietnam, Bangladesh, Pakistan and China are expected to join this program. The budgets are shown in the following tables. Indonesia prepares total 2.9 million USD of in-kind account.

MEMR is expected to be placed in charge as the representative of Indonesian government. Practical action is scheduled to start in 2009. Actual preparation of regulations, testing standards and labeling criteria for establishing the labeling program shall be carried out in close coordination with the activity of BRESL.

Table 2.8.2-3 BRESL Budget for member countries (5 years total USD)

Bangladesh	650,000	Regional Activities	1,755,000
China	1,300,000	Regional PMU	975,000
Indonesia	1,170,000		
Pakistan	650,000		
Thailand	650,000		
Vietnam	650,000	**Total**	**7,800,000**

Table 2.8.2-4 BRESL Budget on Programs (5 years total USD)

Project component	GEF Finance	Co-financing **(Indonesia)**
1. Policy-Making Program	1,611,400	7,245,700 **(1,186,700)**
2. Capacity- Building Program	2,607,500	9,057,900 **(817,300)**
3. Manufacturer Support Program	791,400	5,273,200 **(360,500)**
4. Regional Cooperation Program	710,900	3,240,700 **(213,300)**
5. ES&L Pilot Projects	1,298,800	2,026,600 **(178,600)**
6. Project management	780,000	1,236,800 **(152,500)**
Total	**7,800,000**	28,080,900 **(2,908,900)**

Source; GEF “REQUEST FOR CEO ENDORSEMENT/APPROVAL”
Submission Date: 7 February 2008, Re-submission Date: 4 April 2008

2) International Cooperation on High Efficiency Lighting Including CFL

A workshop for standardization of quality system of CFL initiated by USAID was held in Bangkok in October 2007. Additionally “Phase-out 2008” which was the international stakeholder conference attempting to promote high efficiency lighting was held in May 2008 in Shanghai. The conference was initiated by the Australian Government (Department of Environment, Water, Heritage and the Arts), co-hosted by the Global Environment Facility (GEF), IEA (International Energy Agency) and the China Association of Lighting Industries (CALI). Since international standardization of testing method for lighting fixtures appears to have been discussed in the conference, the progress of such international standardization of testing methods shall be observed.

(4) Issues to be Solved to Formulate Labeling Program

To ensure an effective labeling program, this section highlights some of the current problems including existing legal frame work, market condition etc.

1) Issues Relating to Legal Framework

It is necessary to understand the total structure of the existing legal framework and to clarify the sharing of roles among related organizations, such as government, accredited testing laboratories, labeling certification body and manufacturers. Also it is important to conduct a study to determine ways to introduce the following effective sub-programs:

2) Mandatory display of the information on energy efficiency of the products

3) Monitoring methodology

4) Penalties for illegal actions

5) MEPS (Minimum Energy Performance Standard)

6) Issues Relating to Marketing Research

It is important and urgent to formulate a periodical market research mechanism on penetration level of high efficiency appliance and situation of energy efficiency display on the products.

Using the data so collected, functional and sustainable policy making or amendment to existing systems can be undertaken. (Formulating database on the performance, sales volume and penetration level of EE&C type of electrical appliances of major types)

7) Issues on securing Accredited Testing Laboratories

The testing facilities of the candidates of accredited testing laboratory shown in Table2.8.2-2 are not sufficient. It is necessary to figure out a plan for developing the capacity of these laboratories. Also the feasibility of utilizing manufacturers' existing testing facilities should be studied.

8) Issues Relating to Dissemination and Awareness

Participation of manufacturers and retailers, and strong consumer awareness are necessary to implement a functional labeling program. To enhance awareness at all levels, a suitable supporting program should be formulated.

9) Consensus with manufacturers and importers

The government has applied labeling program on refrigerators in 2003, but the program finished unsuccessfully, because only few manufacturers and importers participated it. No manufacturer and importer would join the program if it is voluntary and the manufacturers estimate no benefit from the join to the program. Thus, it is very important that many manufacturers and importers participate in the stage of establishing program and they understand the merit of the program.

10) Issues Relating to Linkage Among International Organizations(programs)

To reduce the cost of realization of the labeling program and to handle the process more efficiently, it will be very useful to consider ways to harmonize with the supporting program and organization such as BRESL, supported by UNDP/GEF, and CLASP etc.

2.8.3 DSM System in Electricity Business

To put simply, demand side management (DSM) is collaboration between utilities and customers towards establishing optimum supply and demand system of electricity. (Fig 2.8.3-1)

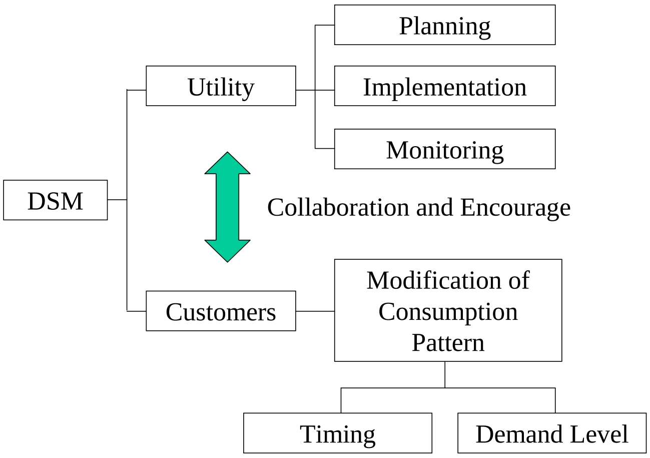


Fig. 2.8.3-1 Demand Side Management

DSM could be categorized into centralized and decentralized approaches shown in Fig 2.8.3-2.

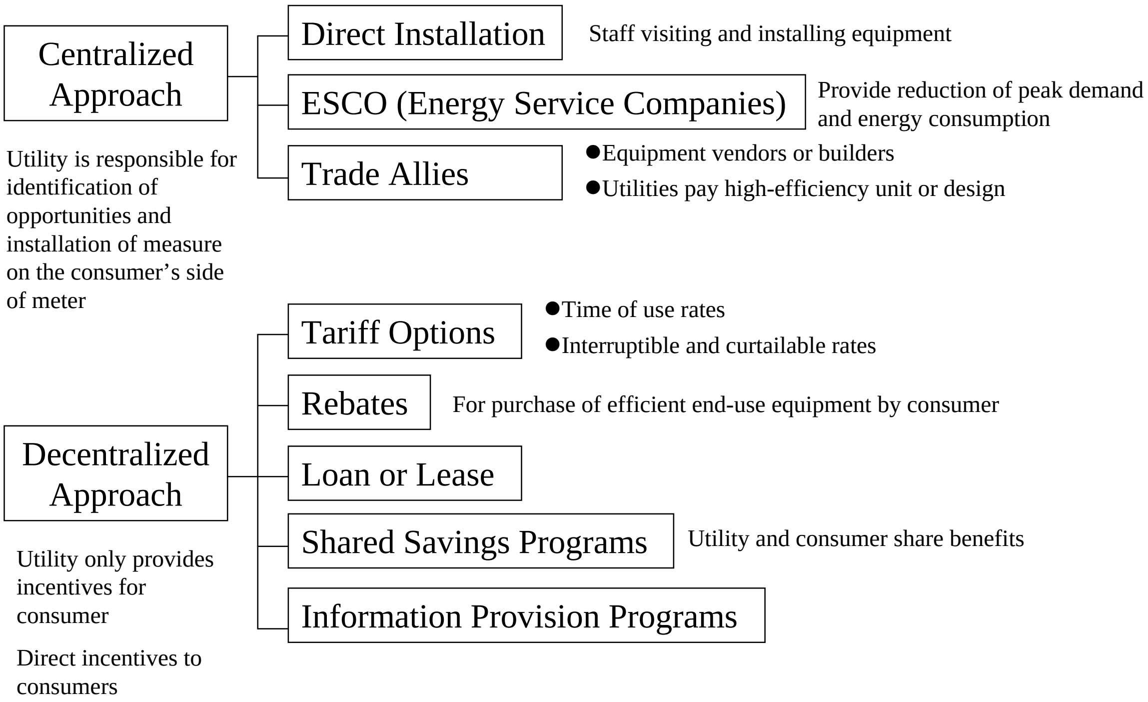


Fig. 2.8.3-2 Delivery Mechanisms for DSM Programs

(1) Target Sectors and Tariff Groups for Promoting Effective EE&C

Following features of Indonesian electricity consumption pattern are highlighted while reviewing the number of customers , installed capacity, electricity consumption and tariff of

PLN in 2005,. To promote EE&C in Indonesia, even contribution from all sectors is required. But, for effective strategy implementation, target sector and tariff group should be clarified. Fig 2.8.3-3 shows electricity consumption by tariff category and sectors.

- Target sectors for effective EC promotion are industry, residential and business sectors.
- The largest consumption group is industrial sector I3 tariff group using over 200kVA, with about 7,600 customers. This industrial group is composed mainly of small and medium size enterprises. The number is not too huge to hinder the implementation of appropriate and timely strategy such as energy manager system, the installation of advanced meter and the promotion of high efficiency electric appliances.
- The next largest consumption groups are the residential sector of 450VA (R1 tariff group) followed by 900VA group, consisting of 15.5 and 9.7million customers respectively. The number of customers is very large to plan an individual strategy. Awareness for EE&C seems to be a key measure.
- The next target group is the industrial group of over 300,000kVA (I4 tariff group). The number of customers in this group is 57. The collaboration between PLN and these large-scale enterprises is expected in areas such as load management and EE&C measures through extensive energy audits as representative DSM models.

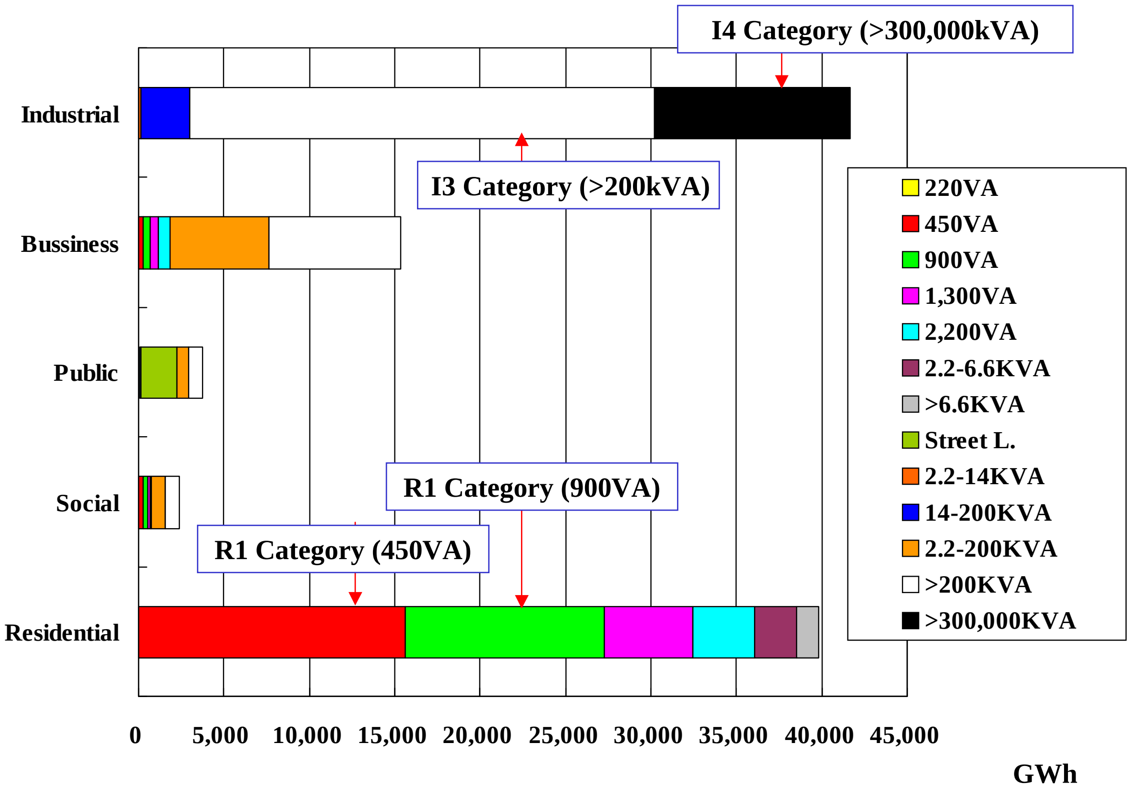


Fig. 2.8.3-3 PLN Electricity Consumption by Tariff Category in 2005

The electricity consumption divided by installed capacity gives the operating hours in a year. Accordingly, further division of this operating hours by 8,760 hours of a year gives the load rate. The higher the value of load rate the higher the facility utilization rate.

Table 2.8.3-1 shows this load rate by PLN tariff category. Load rate for public and industrial sectors are high whereas the value for residential, social and business sector are low. Sectors of low load rate should increase their rate by reducing capacity and increasing operating rate. This will contribute to peak reduction. Fig 2.8.3-4 shows the correlation between load rate and electricity consumption by tariff group. Effective measures should be taken toward residential and business groups.

- The industrial sector shows the highest utilization rate, especially >200KVA and >300,000KVA groups. It's because of continuous operation by many factories. On the other hand, most small-scale factories operate during daytime leading to low load rate.
- The possibility of peak shift and/or peak cut is larger in residential and business sectors than industrial sector.
- Measures in residential sector:

Reduction of excess capacity predicting future increase of electricity consumption.

Adoption of high efficiency electrical appliances

Promotion of EE&C awareness.

- Measures in business sector:

Energy audit and EE&C implementation.

Energy management system

Adoption of high efficiency electrical appliances

Table 2.8.3-1 Load Ratio by Tariff Groups in 2005

Unit: %

	Residential	Social	Public	Business	Industrial
220VA		68.5			
450VA	21.4	19.7	27.1	18.8	22.8
900VA	15.4	14.5	17.1	17.5	2.9
1,300VA	18.4	16.4	19.7	17.6	11.4
2,200VA	20.0	16.6	18.4	16.2	17.2
2.2-6.6KVA	18.5				
>6.6KVA	15.2				
Street L.			44.2		
2.2-14KVA					11.7
14-200KVA					18.1
2.2-200KVA		14.0	15.2	15.2	
>200KVA		21.0	14.0	26.3	36.0
>300,000KVA					57.3
Total	**18.4**	**16.7**	**23.9**	**19.6**	**37.0**

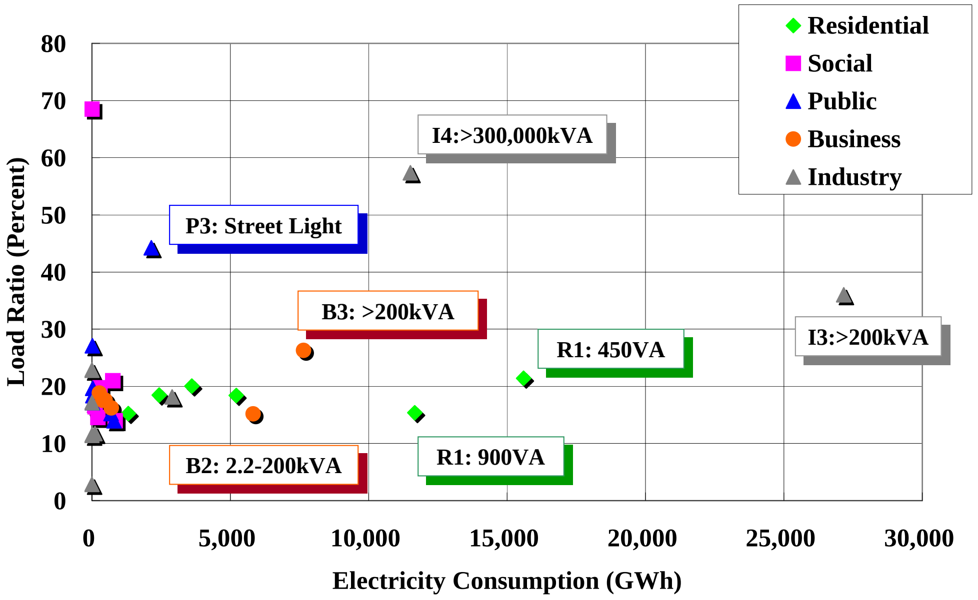


Fig. 2.8.3-4 Correlation between Load Rate and Electricity Consumption by Tariff Group

(2) Demand Side Management (DSM) Program in Power Sector

1) PLN's EE&C Target

Overall EE&C of Indonesia should be followed as per "Decree No.3 31/2005 "Implementation Guideline for Energy Savings" including PLN program, which was issued by MEMR in 2005. PLN programs (DSM) include CFL promotion and energy audits. Government and PLN took short-term actions, issued by the Presidential Instruction No 10 on July 2005. The targets of long-term / medium-term programs and short-term actions are as follows.

Table 2.8.3-2 PLN's DSM Target and Measures

Categories	Contents	Expected EC Effects	Remarks and Comments by PLN
Long-term Target	Energy intensity reduction by 1% yearly		Not total amount target but intensity, taking into account economic growth
Medium-term Target	Electricity conservation for 2005 – 2010	Cumulated 14.3 TWh	Corresponding to yearly2.9% of Total demand ($14.3 \div 98.3^{1} \times 100 \div 5$)
Short-term Actions	Power Reduction as peak load measures	600-900MW	Corresponding to 3.6 – 5.4 % of Peak Load ($600 \div 16{,}600^{2} \times 100$) Reduction by the replacement to CFL at most 200MW in Java

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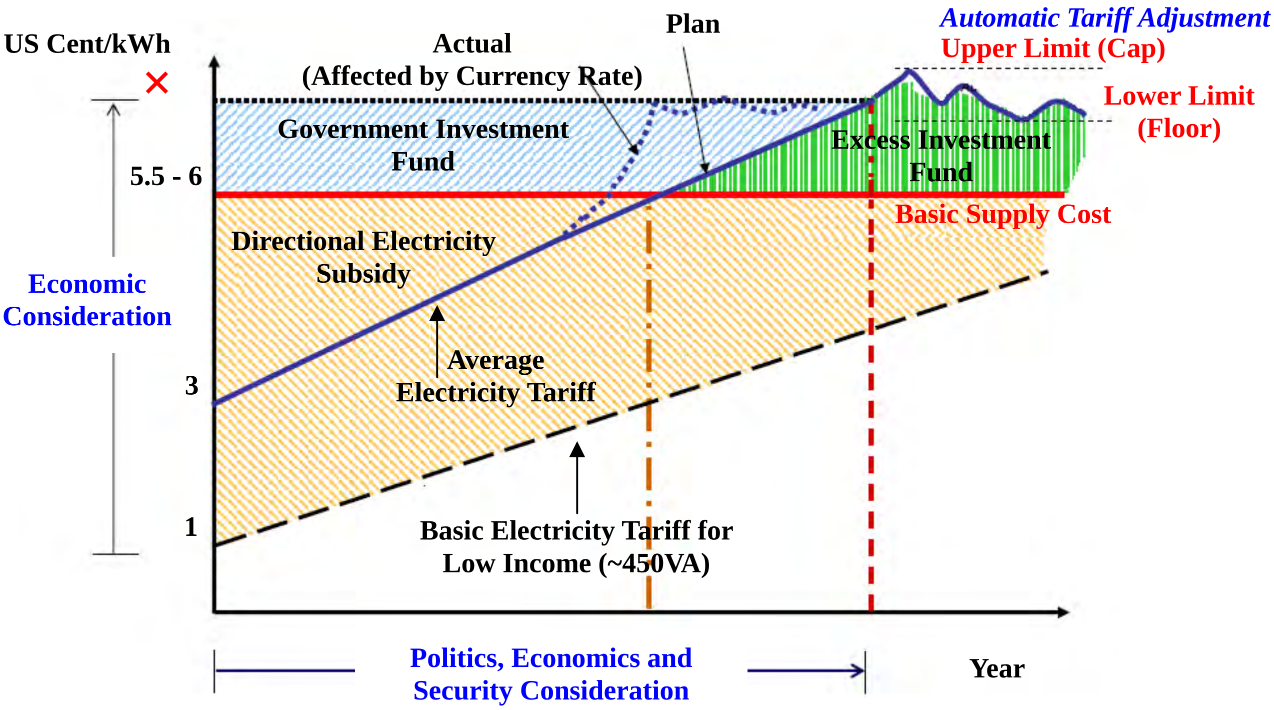
[1] Power Demand in 2004/5, 98.3 TWh
[2] Peak Demand in 2004/5, 16,600MW

2) Introduction of Demand Side Management

- ➢ Primary and Secondary Industry: Introduction of EE&C Technology and Management
- ➢ Household and Commercial: Introduction of EE&C Facilities
- ➢ Transportation: Improvement of Fuel Consumption
- ➢ Power Generation: Introduction of EE&C Technology and Management

3) Electricity Tariff Adjustment Strategy (TDL)

Fig 2.8.3-5 shows electricity tariff adjustment Strategy.



Source: Blueprint Pengelolaan Energi Nasional 2005-2025

Fig. 2.8.3-5 Electricity Tariff Adjustment Strategy (TDL)

4) New incentive and disincentive tariff

In May 2008, PLN had intended to introduce a new incentive and disincentive tariff mechanism, but because of a strong opposition of many consumer groups against this scheme, PLN was obliged to give up and postpone its introduction. The intended mechanism was as follows.

- ➢ Setting a baseline as 80% of national average electricity consumption (kWh/month) in 2007, which is calculated by contract type.
- ➢ When monthly consumption exceeds the baseline (disincentive):

To consumption below the baseline, normal tariff is applied. But to consumption (kWh), which exceeds the baseline, 160% of extra charge is applied. (Base tariff for excess charge is set as the most expensive one).

- When monthly consumption is below the baseline (incentive):

To the consumption below the baseline, 10% discount of normal tariff is applied

But soon after, following extra tariff system (non-subsidy) for middle-income customers was introduced modifying above mechanism in April.

- Setting a baseline as 80% of national average electricity consumption (kWh/month) in 2007, which is calculated by contract type. (kwh/month)
- To the consumption below the baseline, normal tariff is applied.
- To the consumption (kWh), which exceeds the baseline, non-subsidy charge (Rp. 1,380/kWh) is applied.

As current tariff of targeted group R-3 (Large households) is Rp. 621/kW, this program raises over 100%.

5) Government subsidy to PLN

Current tariff system of low-income group could not recover the generation cost, i.e. it creates what is called negative net worth. It was planned to decrease and eliminate the government subsidy in the near future; on the contrary, the government subsidy increased by the hike of heavy oil price in 2008.

In early April, supplementary budget of 61.01 trillion Rp. as PLN subsidy was approved, reflecting the hike of fuel oil price. Initial subsidy was 28.5 trillion Rp.

The trend of PLN subsidy from 2001 is shown in Table 2.8.3-3 together with PLN tariff, generation cost and fuel oil subsidy.

Table 2.8.3-3 Trend of PLN Subsidy

年	Average Tariff	Generation Cost	PLN Subsidy	Fuel Oil Subsidy
	Rp./kWh	Rp./kWh	Billion Rp.	Billion Rp.
2001	334.55	377.89	4,618	61,837
2002	448.03	601.06	4,103	31,594
2003	550.74	617.83	3,759	30,866
2004	581.75	596.53	3,310	72,884
2005	590.91	710.29	12,511	95,518
2006	628.14	954.45	35,510	60,546
2007	612.23	882.98	43,470	87,000
2008	614.43	1,092.92	61,010	126,820

（Note: Tariff and generation cost of 2007-2008 are estimated）

6) CFL Free Delivery Program

PLN is planning a program to deliver CFL (Compact Fluorescent Lamp) to small contract households, aiming to mitigate the evening peak demand of electricity. The program outline is as follows. However, PLN and government are now reviewing the program including pilot scale project.

Delivered lamp;	CFL（8W）swap from 40W incandescent lamp
Target consumer;	Household（R1）: Below 900VA contract
Estimated effect;	Evening electricity peak cut (Within 1 year; cost recovery)

(3) Issues to be Solved for Formulating Functional DSM program

The major issues to ensure functional DSM program, which were clarified through current and future prospect on electricity tariff mechanism, market research on electric appliances, current situation for promoting DSM and referential foreign experiences, are described below;

1) Issues on Electricity Tariff Mechanism

To formulate a New or amended electricity tariff mechanism that can afford such benefit to PLN（daily load flattening、improvement of power factor）, to consumers（cost down）and to the government（reduction of subsidy for PLN）should be an urgent issue.

2) Issues on promoting functional and promising Energy auditing

For large consumers, energy auditing should be conducted continuously. Parallel development of technical auditing level should be done, and functional tariff mechanism should be studied and prepared.

3) Issues on Awareness

To expand DSM activity, Awareness for people and education for children about the importance of DSM should be stipulated. And success examples of EE&C implementation should be shared in the same sub-sector. In order to enhance these activities, supporting program should be formulated.

CHAPTER 3

PROGRESS OF STUDY ON OPTIMAL PROGRAM FOR PROMOTION OF EE&C

Chapter 3 Progress of Study on Optimal Program for Promotion of EE&C

3.1 Major Contents of Discussion with C/P and Technology Transfer

The major contents of discussion with C/P and technology transfer list during the Study are shown in Table 3.1-1.

Table 3.1-1 Major Contents of Discussion with C/P and Technology Transfer

Theme	Transfer to	Timing	C/P apply
Common			
Economic Analysis			
Intensity/elasticity	MEMR	3rd mission	Shared
Procedure of economic analysis	MEMR/EMI	1st, 2nd	PPT
EE&C,CO2 potential	MEMR/EMI	3rd, 4th ,5th,7th,8th	EXCEL table
Economic analysis	MEMR/EMI	4th ,5th	EXCEL table
Future Direction	MEMR	5th	
Training in Japan	MEMR/ETC/BPPT/EM	2008.Novem.	
Energy Management			
Legal Framework	MEMR/ETCERE		
Japanese Periodecal report		3rd, 4th	WORD
Middle & long term plan		3rd, 4th	WORD
EM training curriculum		2nd, 3rd	WORD
Outline of EM training		2nd, 3rd	WORD
Example of test paper		between 2nd and 3rd	WORD
Punisshument		2nd, 3rd	WORD
EM program	MEMR/ETCERE		
Outline of surrounding countries		2nd, 3rd	WORD
Number of candidate factories		2nd, 3rd	Applied
Competency for Industrial		4th	
EA program	MEMR/ETCERE		
Competency fot EA		4th	WORD
Guideline	MEMR/ETCERE/EMI/ BPPT	4th, 5th	To be discussed
Energy Management			WORD
Audit, measurement			WORD
Guideline			
Auditing（8 spots）	MEMR/BPPT	2nd, 3rd	Introduction of EMS
Potential Next project	MEMR/ETCERE	4th,5th,6th,7th,8th	To be discussed
Labeling program	MEMR		
Japanese labeling system		1st, 2nd, 3rd	WORD
Comparison & proposal		3rd, 4th	PPT
（Lamp、Ref.、AC、TV）			
Japanese testing Meth.		3rd, 4th	WORD
Outline of surrounding countries		3rd, 4th	WORD
EE&C potential estimation		3rd	EXEL
DSM program			
Japanese DSM、electricity tariff	PLN/MEMR	3rd, 4th	PPT
EPP/CDM	MEMR/PLN	2nd, 3rd	PPT
Proposal of CFL programatic CDM	PLN	between 2nd and 3rd	Applied
Potential estimation	PLN	3rd, 4th	EXEL
Energy auditing support system	PLN/MEMR	3rd, 4th	PPT
Proposal of EPP	PLN/MEMR	4th, 5th	PPT
Potential Next project	MEMR/PLN	4th,5th,6th,7th,8th	To be discussed
Roadmap & Actionplan	MEMR/ETCERE/PLN	4th, 5th,6th,7th	

3.2 Energy Manager Program

3.2.1 Basic Strategy for Promoting EE&C in Indonesia

It was found that strengthening awareness and consciousness is critical for removing constraints for EE&C. More specific measures include: (i) extending education and training on EE&C to all levels of stakeholders, (ii) promoting high efficiency electric appliances, and (iii) establishing award programs for significant EE&C initiatives.

The second strategy, "strengthening support from the government" is to offer incentives for EE&C. Specific measures may include: (i) capacity development for energy audit by diverse measures, (ii) introduction of high efficiency machinery and equipment, (iii) introduction of electricity demand side management, etc.

The third strategy is defined as "enforcing rules and regulations". This may include (i) introduction of energy manger program and target setting agreement program for designated factories, (ii) creation the legal framework to ensure the long-lasting implementation of effective EE&C policies and programs, (iii) introduction of a sustainable electricity tariff development mechanism.

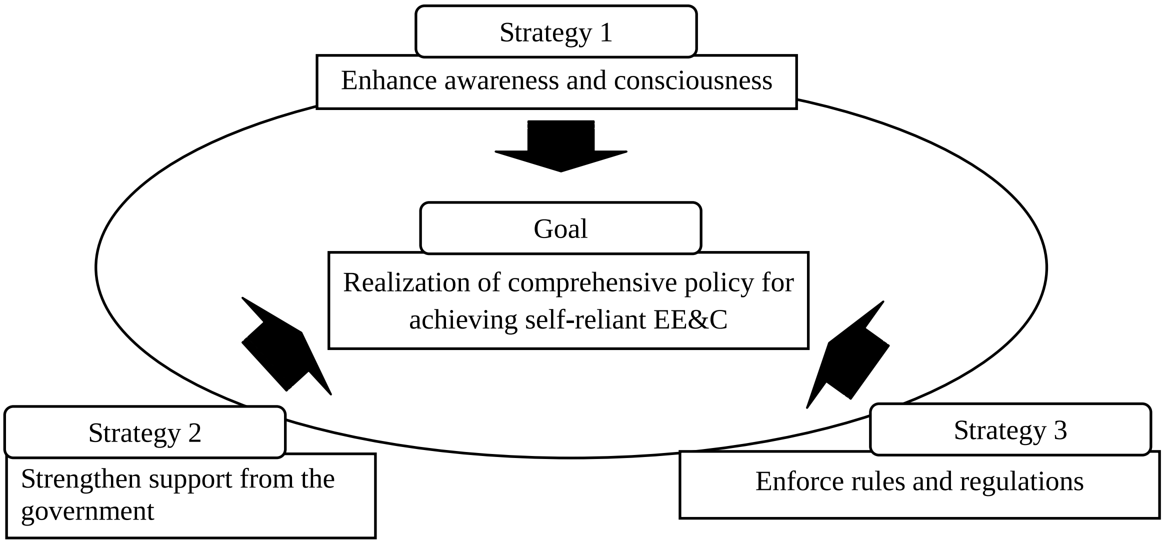


Fig. 3.2.1-1 Basic Strategy for Promoting EE&C in Indonesia

3.2.2 Need of Dialogue with Stakeholders

In order for Indonesia to pursue decisive EE&C policies based on the strategies described above, MEMR should play a focal role to collaborate with various stakeholders such as MOI and industries through dialogue. Support to the EE&C policies by these stakeholders should be carefully monitored as they have a significant role in ensuring successful implementation of the policies. The team has recommended the following approaches[1] to create a favorable environment to support the EE&C

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[1] Currently, Indonesia has set a policy goal of energy elasticity less than 1.0 by 2025. The goal, however, is not fully attainable because it has many parameters and single energy policy cannot control the results. The team has recommended Indonesian side that more attainable and

policies.

- Establishment of a committee for enforcing energy management policy mainly carried out by MEMR (or establishment of a sub-committee under the National Energy Committee. These options for organizational structures and mission are discussed in the course of the study),
- Creation of thematic working groups under the committee to discuss substantive issues necessary for promotion and realization of EE&C measures. (Proposed areas for the working group may include (i) energy management program, (ii) monitoring and evaluation mechanism, (iii) Energy Manager Certification Program (iv) incentives and taxation, (v) education and training, and (vi) publicity.
- Identification of felt needs from related industry and dialogue with the industry through the use of industry associations overseen by MOI, and
- Publicizing energy management program through mass media including newspapers and broadcasting.

The team has emphasized that the tree major approaches for EE&C, namely (1) Target-setting Agreement, (2) Energy Manger Certificate Program combined with (3) energy audit mechanism, should be implemented as defined in the Energy Law. These regulations should be effectively enforced to encourage voluntary EE&C efforts carried out by the private sector through legal and institutional provision and other incentives.

3.2.3 Ensuring Financial Mechanisms to Cover Administrative Cost for Promoting EE&C

The Study Team suggested that there is a need to know the exact number of industrial establishments, their distribution and the quantity of energy usage for the government to be able to control and administer rational use of energy with optimal administrative costs. Through this Study, the approximate number has been estimated. Such information will help the government to estimate the exact number of officers necessary to administer and oversee the energy consumption of the industrial sector.

For presenting a basis for further discussion, the estimation of the number of possible designated factories and energy mangers is presented in the following discussion based on those of Japan (Table 3.2.2-1). It should be noted that total energy consumption of Class 1 and Class 2 designated factory under Japanese Energy Law accounts 87% of the energy consumed by whole industrial sector. The assumption for the estimation is that it should be divided into two categories of Class 1 and Class 2 designated factories based on energy consumption as was done in Japan. In Japan, only the single category of Class 1 was designated until 1999. The second category was established in 1999 to manage factories whose energy consumption is 50% smaller than the first category. Table 3.2.3-2 shows the number of enterprises by the category of energy consumption and each category's contribution. Considering of the effectiveness of regulation and the available number of suitable officers, Indonesia may want to establish the proposed energy manager program incrementally,

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effective objectives need to be identified and shared among stakeholders. Examples include (1) establishment of more specific milestones, (2) sector-wise numerical objectives, etc.

regulating larger factories initially and extending to the smaller ones thereafter.

Table 3.2.3-1 Number of Designated Factory for Energy Management

Classification	Number of Factories	Energy Consumption	Qualifications of Energy Managers
Class 1 Designated Factory	7,640	≥3,000 TOE	Energy Manager with Certification
Class 2 Designated Factory	6,476	≥1,500 TOE	Designated Energy Manager
Total	14,116	As of March 2008	

Source; METI, Japan

There are a couple of prerequisites for establishing energy management thorough designating factories with large energy consumption over 6,000TOE/year. For example, MEMR should ensure sufficient number of suitable officers who can oversee the factory and make training available. It should be noted that the number of officers who oversee the energy use in industry depend on how strict the regulation and reporting requirements would be. Therefore procedures and requirements (such as nomination of energy manger in a factory, and reporting requirements) associated with the proposed regulation need to be specifically defined. This may clarify actual needs of training as well as number of officers, or recruitment, if any at the local level. The summation of energy consumption of factories whose energy consumption is over 6,000TOE /year makes 81 % of industry-wide consumption.

In addition, taxation reform to accelerate investment in EE&C is very important. Regulation and support are not a choice between two things. Those two, however, are complementary and of great help to each other. To realize effective EE&C measures in Indonesia, a ground level discussion by looking into the balance between administrative cost and effectiveness of the proposed EE&C measures is essential.

Table 3.2.3-2 Number of Company by Consumption of Fuel Oil in Indonesia

	Energy consumption (ton of oil equivalent (toe))						
	<6,000	6,000-12,000	12,000-16,000	16,000-20,000	20,000-40,000	40,000-100,000	>100,000
Industry	19,568	305	96	60	141	55	53
Power plant	3	1	0	1	3	3	7
Building	3,366	35					
Total	22,937	341	96	61	144	58	60
Accumulated numbers of energy user	23,697	760	419	323	262	118	60
Energy consumption							
Industry (%)	19	5	4	3	11	7	51
Power plant (%)	0.1	0.1	0	0.2	1.1	2.8	95.7
Building (%)	78	22					
Industry	36,068,387 toe/y						
Power plant	7,599,307 toe/y						
Building	1,779,910 toe/y						

Note: Energy consumption of commercial buildings consists of only electric power consumption in Jakarta City

3.2.4 Formulating Regulations for Energy Manager Program

Currently, MEMR leads in formulating regulations of Energy Law related to EE&C. In particular, the discussion regarding defining the competency standard for energy management and listing it into Indonesia National Standard (SNI) is in progress. The team has provided MEMR information regarding the Energy Management Program in Japan. The team has identified that there is a need for other rules and regulations governing energy manager program. The negotiation on the rules and the regulations are still in progress with various ministries and agencies concerned and such regulations should be enacted as soon as possible. The team has supported MEMR for drafting out these items. The items and issues listed below are still under discussion:

- Clarification of designated factories,
- Requirement of mandatory energy consumption reporting,
- Interim measures for existing factories and buildings,
- Taxation and subsidies,
- Standardization and its procedures,
- Validation by third party,
- Testing procedures,
- Training needs,
- Accreditation and validation,
- Competency standard for Energy Managers, and
- Competency standard for Auditors.

3.2.5 Dissemination of Energy Management Techniques and Technology

In order to strengthen institutional arrangements for promoting EE&C in the national level, various measures in addition to establishing legal framework and tax reforms are necessary. One of the other important measures is disseminating strategy of energy management techniques and technology. This means that all related ministries, agencies and organizations should be employed to develop, disseminate and implement EE&C techniques and technology. Among the public sector agencies, MEMR and MOI should work closely to disseminate and implement EE&C techniques and technology under their respective jurisdictions.

More specifically, MEMR needs to employ all available administrative power to guide the private sector including PLN and IPPs to practice and promote EE&C technology. For the industrial sector, especially the private sector including Pretamina may be a core technological resource to disseminate EE&C knowledge to industries such as iron, steel, textile, oil refineries that consume a large amount of energy. It should also strengthen its monitoring and management capacity.

3.2.6 Education and Training Institutions and Training Curriculum

As indicated in item 3.2.5, the education and training program currently undertaken at ETCERE focuses on EE&C measures for commercial buildings and the participants are mainly government officers. It complies with the proposed competency standard and focuses on MEMR’s jurisdiction of EE&C of commercial buildings. According to MEMR, the initial phase of the regulation is applied to commercial buildings. The development of certification program and other institutional arrangement will be for commercial buildings. Additional measures may be included for provision of training programs for beginners. Extending the EE&C measures to the industrial sector will be implemented once the regulations for commercial buildings are introduced and administered. Before its start MEMR needs to coordinate with MOI which has a jurisdiction over the industrial sector to effectively impose the regulation.

MOI aims at promoting EE&C in the industrial sector by collaborating with local governments. MOI intends to employ 21 of its own education and training facilities (most of them are research institutes) located throughout Indonesia. When the local governments would like to implement their own training programs, MOI may allow the governments to use MOI’s training facilities whenever possible.

While some local universities are to establish a department specialized in energy management, utilizing these university resources should be considered as a prospective training institution.

The Study Team has highlighted the importance of integrating effective EE&C measures applying to three sectors, namely commercial buildings, the industrial sector, and public buildings. For effectively introducing EE&C measures to the industrial sector, a platform to collaborate with MOI and MEMR may be necessary. To realize such initiative, the Japanese side would like to identify the needs of the Indonesian side.

The analysis of proposed direction on future education and training segment of possible technical cooperation is shown in Table 3.2.6-1 as a basis for discussions, particularly at the proposed PCM Workshop scheduled in June 2008. The team will continue the dialogue with Indonesian side to finalize the detail of prospective training activities for promoting EE&C.

Table 3.2.6-1 Prospective Participants of the Proposed Training Institutions

Name of Institution	Officer from Government		The Private Sector Employees (Commercial Building)	Private Sector (Industry)
	MEMR	MOI		
ETCERE (Training Center of MEMR)	○	△	○	△ Mainly energy management and utilities.
MOI Research Centers	△ Mainly production process in industry	○	×	○ Mainly production process
Local Government (e.g. Eastern Java)	×	×	○	○ Specific areas of technology need to be defined
Accredited Training Institutions (Universities, private training facilities (PLN etc.))	×	×	○	○ University’s main focus is academic research. Private sector facilities focus on preparation for EM examination

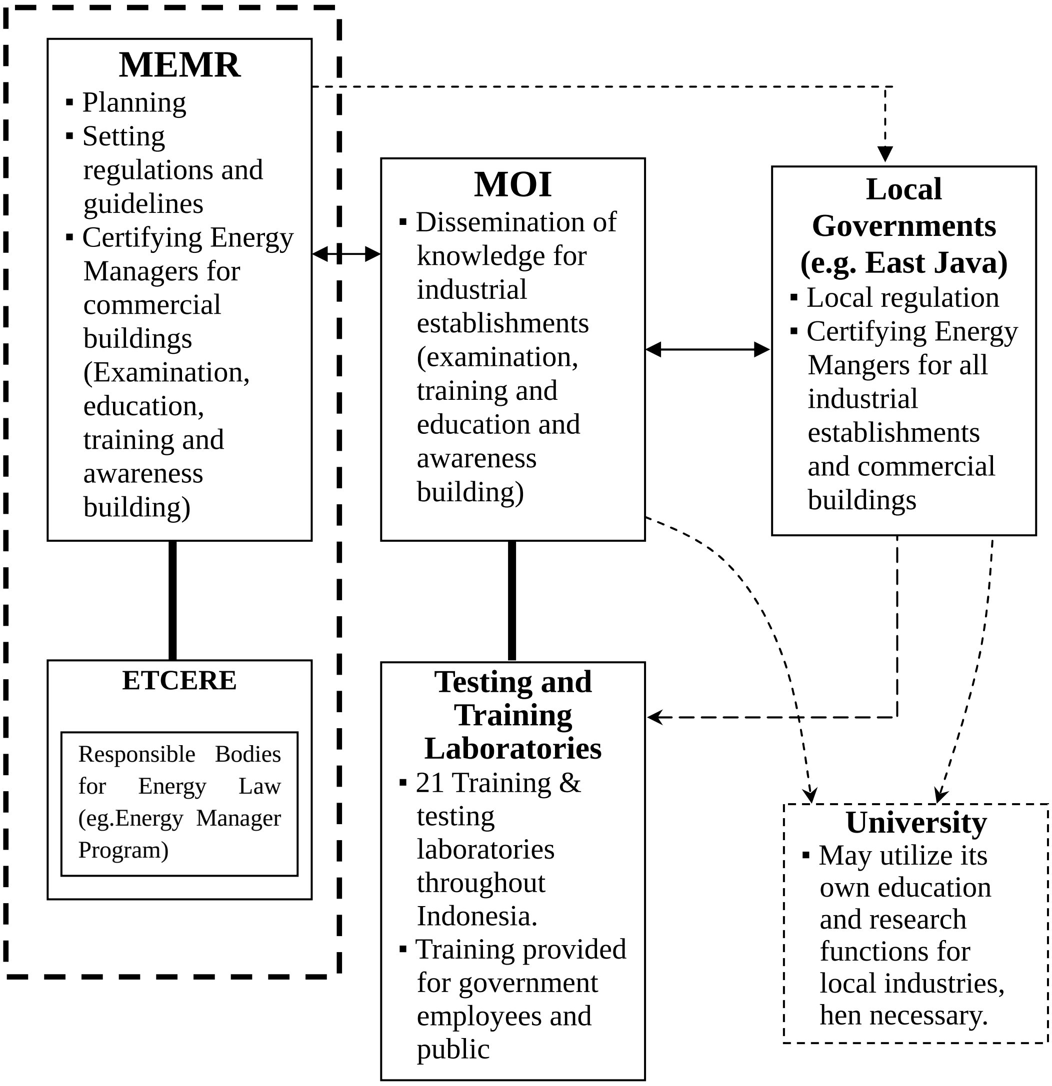


Fig. 3.2.6-1 The Relationship among Ministries and Local Governments for Promoting EE&C Technologies

3.2.7 Accreditation and Certification for Energy Mangers

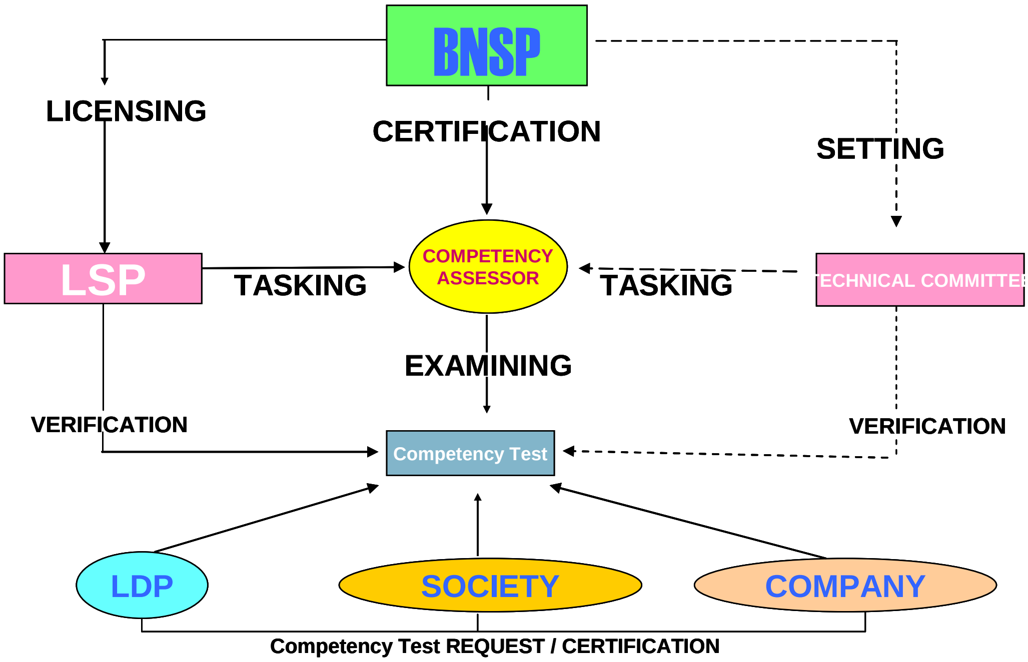
As discussed in 2.5.1, the proposed Energy Manger Certification process has been under review within the framework of the national professional certification program defined by the Ministry of Labor and Transmigration and BNSP. The Study Team has reconfirmed the procedures and framework with MEMR. The team requested MEMR to negotiate with BNSP to clarify the overall schedule for finalizing the professional qualification. MEMR has explained that the procedure has been completed except for the ministerial approval. It should be noted that the energy issue is one of politically sensitive issues in Indonesia which requires exercising of additional caution to proceed.

Currently, the Indonesian side is discussing the certification for energy managers within the framework of national qualification standard procedures. The procedures for accreditation, therefore, are administered by BNSP under Ministry of Labor and Transmigration. The procedures for accreditation are overseen by BNSP as are other qualification certifications in Indonesia. The study

Team has requested the Indonesian side to clarify the overall schedule and procedures for developing and institutionalizing the certification program.

MEMR has explained that there will be an examination for energy manger certification aimed towards people with relatively higher educational background and training. In addition, there will also be a training program aimed towards those without experience and training. MEMR is considering that the qualifications standard of proposed energy managers for commercial building and those in industry would be different.

On-going discussion for developing certification program is focusing on the development of examination procedures only. As a training institution of MEMR, ETCERE is in charge of developing and defining the competency standards. According to MEMR, the discussion for the standard is different from the proposed training program by ETCERE. A newly established organization HAKE will act as an examiner within the framework set forth by the Ministry of Labor and Transmigration. The role of ETCERE will be to provide training for preparing for the exam aiming at both pubic and private sector employees. They needs to clarify and identify an organization that will be responsible to administer the examination, as soon as possible. To do so, coordination with the Ministry of Labor and Transmigration is necessary. In addition, the team has suggested that there may be other possible training institutions namely; university and private institutions owned by the private sector companies.



Source: BNSP

Fig. 3.2.7-1 Conceptual Accreditation Procedures by BNSP

3.2.8 Trend of the Standardization of Energy Management Technology

A new and significant initiative for EE&C is the establishment of ISO 50001 Series standards which aim at establishing global standards for energy management. ISO 50001 Series is under preparation based on US ANSI MSE 2000/2005 which originated in 2000. The study team has provided the related information to the Indonesian side. Furthermore, the team has provided the Indonesian side a textbook for the training for ANSI MSE/200/2005 developed by EPA.

The background of the current move for standardization of Energy Management is that ISO has found the importance and effectiveness of adopting some common techniques and procedures practiced in Total Quality Management (TQM). Practitioners of EE&C have found that PDCA (Plan-Do - Check - Action) Cycle can be the basis for implementing effective EE&C activities in the field. EE&C can be implemented effectively when it is carried out within the framework of various quality control activities. Standardization of procedures and reporting as stressed in modern quality control standards such as ISO 9001 and ISO 14001 series. Establishment of ISO 50001 series will bring about not only disseminating energy management technology, but also organizational development, decision-making procedures and reporting, and monitoring may be enhanced.

The Table (Table 3.2.8-1) shows the current state and up-coming schedule of preparing ISO 50001 series.

Table 3.2.8-1 Schedule for Establishment of ISO 50001 Series

Date	Location and (Region)	Purpose	Participants
March, 2007	Vienna（World）	Discussion with ISO on the existing standards on energy managements	Countries already furnish energy management standard, ISO, experts on standardization of energy management
September, 2007	Thailand（Asia）	Introduction of energy management standard, raising awareness on energy management technology, feedback from the industry	ASEAN Standardization Committee members, GEF
April 2008	China（World）	Framework and TOR of ISO/PC242 (Project Committee）, Discussion on PC242 tasks	Participants of ISO/PC242[2], Chinese Standardization Committee
August 2008	Brazil（World）	Introduction of energy management standard, raising awareness on energy management technology	Standardization Committees of Latin American countries, industrial representatives form Brazil , GEF
October 2008	Washington DC（World）	ISO PC242 Meeting	PC242 member countries
December 2008	South Africa（Southern Africa）	Introduction of energy management standard, raising awareness on energy management technology	SADAC member countries, RSA industry, GEF
The second quarter of 2009	Egypt (Northern Africa）	Introduction of energy management standard, raising awareness on energy management technology	Northern African countries, industries, GEF
The second quarter of 2009	Turkey (Middle East）	Introduction of energy management standard, raising awareness on energy management technology	Middle eastern countries, industries, GEF
End of 2010		Launch of ISO 50001	

Source: ISO, UNIDO and Virginia Institute of Technology

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[2] The membership of ISO/PC242 includes the following 19 countries and another 4 observers. They are Argentina, Australia, Brazil, Canada, China, Denmark, Finland, France, Germany, Japan, Korea, Netherlands, Poland, Portugal Singapore, South Africa, Spain, Sweden, United Kingdom, United States of America. Observers include: Czech Republic, Italy, Morocco, Switzerland, Thailand

Table 3.2.8-2 Energy Management Standards in Selected Countries

Current State	Country
Energy Management Standards established	Denmark DS 2403:2001 Energy Management-Specification and DS/INF 136:2001 Energy Management - Guidance on Energy Management Ireland IS 393:2005 Energy Management Systems-Specification with Guidance for Use and IS 393:2005 Technical Guideline (December 2006) Sweden SS 627750:2003 Energy Management Systems - Specification United States ANSI/MSE 2000:2005 A Management System for Energy
Standards under consideration	China Management System for Energy - in development, China Standard Certification Center, China National Institute of Standardization EU European Committee for Standardization (CEN) harmonized EU standard - in development
Existing energy management standards	Australia AS3595-1990 Energy Management programs - Guidelines for financial evaluation of a project and AS 3596-1992 Energy Management programs - Guidelines for definition and analysis of energy and cost savings Canada PLUS 1140:1995 A Voluntary Energy Management Guideline China GB/T 15587:1995 Guides for energy management in industrial enterprise Germany VDI 4602 Blatt 1:2006-04 Energy Management - Terms, definitions Japan JIS Z 9211 (1982-02-01) titled Technical terms used in energy management an JIS Z 9212 (1983-01-01) Technical terms used in energy management (2003-05-20) Korea B 0071 (1985) Technical terms used in energy management (No. 2) Netherlands Energy Management System Specification with Guidance for Use, June 2004 publication of Senter Novem United Kingdom BIP 2011:2003 Continual Improvement through auditing (Integrated Management Systems Series) United Kingdom HB 10190:2001 The Framework (Integrated Management System Series)and HB 1091:2002 Implementing and operating (Integrated Management System Series) United Kingdom PASS 55-1:2003 Specification for the optimized management of physical infrastructure assets and PASS 55-2:2003 Guidelines for the application of PASS 55-1. United States ANSI 739:1995 IEEE Recommended practice for energy management in industrial and commercial facilities
Other important documents	United Nations Industrial Development Organization (UNIDO) issues paper on energy management and outcomes of 21-22 March 2007 Experts Group Meeting http://www.unido.org/doc/64561

Source: US Department of Energy

3.3 Energy Efficiency Labeling Program

3.3.1 Progress of Research and Support

The progress of research and support aiming to establish a labeling program through the Study is shown in Table 3.3.1-1

Table 3.3.1-1 Progress of Research and Supports

Stage	Contents
1st mission	• Confirmation of MEMR's basic policy • Outline of labeling system and introduction of Japanese program ➢ Purpose of labeling system ➢ Types of energy efficiency labels ➢ Labeling program in the Japanese Energy Conservation Law ➢ Top runner standard ➢ Retailer assessment program ➢ Legislation procedure and standardization • Discussion with the Advisor of the president ➢ Introduction of overseas labeling program
2nd mission	• Recommendations regarding "Labeling certification procedure" and "Requirements for CFL labeling & testing procedure" ➢ Absence of stipulation about charge ➢ Comparison to other CFL labeling criteria • Interpretation of the labeling program in the Japanese Energy Conservation Law ➢ Construction of the regulations such as law, governmental ordinance, ministerial ordinance and public announcements ➢ Distinction between standards and regulations ➢ Operation and maintenance method for labeling program
3rd mission	• Introduction of the actual labeling criteria in Japan ➢ Criteria for lighting fixtures, refrigerators, TV sets & air-conditioners, ➢ Testing and calculation method for EE performance and relevant industrial standards • Site research for several laboratories on testing equipment • Suggestions on draft roadmap
4th mission	• Suggestions on draft roadmap and action plan • Suggestions on labeling criteria for personal computers and rice cookers • Joining to TV and refrigerator labeling committee
5th mission	• Suggestions on labeling criteria for AC • Presentation of the result of the Study on Labeling program at the Workshop • Information exchange between appliances industry
Other works	• Hearing to METI • Hearing to ECCJ • Collection of relevant industrial standards • Market research of products including manufacturers, specification, sales and market share (carried out by EMI) • Hearing to UNDP on BRESL project

3.3.2 Recommendation Regarding “Requirement for Performance Test of CFL (Draft)”

Energy efficiency is calculated in Lumen/Watt. Labeling criteria (star ranking criteria) is also involved. Compared with the rating criteria of Japan and other countries, Indonesian criteria seem to be average criteria.

Labeling criteria should be reviewed at periodic intervals along with the improvement of energy efficiency of the product. Therefore a reviewing procedure which includes official processes and organizations should be stipulated when the labeling program is established as a governmental regulation.

Generally the products to which energy efficiency labels are expected to be applied should already be following quality standards for aspects such as safety or durability. Therefore labeling criteria normally don’t include the specification besides energy performance. Since quality standards for CFL have not been defined as yet, the requirement includes some quality criteria such as function test, lighting test and excess voltage test. In future the contents of the requirement should be coordinated again between MEMR and MOI which is responsible for providing quality standards.

3.3.3 Comparison between Japanese and Indonesian Labeling Programs

Based on discussions it appears that the Indonesian labeling program which is ongoing now is different from Japanese program. Table 3.3.3-1 shows the outline of differences between the two programs.

Table 3.3.3-1 Comparison of Labeling Program between Japan and Indonesia

	Japan	Indonesia
Subject of labeling	Specified in governmental ordinance as follows; Air-conditioners, Lighting fixtures, TV sets, Computers, Magnetic discs, Video recorders, Refrigerators, Freezers, Stoves, Gas cookers, Gas water heaters, Oil water heaters, Electric toilet seats, Rice cookers, Electronic ranges, DVD recorders	Not yet specified officially CFLs: under construction Refrigerators: within 2009 TV sets: within 2009 Air-conditioners: within 2010
Label	“e” mark and target achievement ratio	“4 star” mark
	“5 star” mark For Air-conditioners, Refrigerators, TV sets	
Mandatory or Voluntary	Voluntary	Voluntary
Issue of labeling criteria	Ministerial public announcement	DGEEU decree (CFL)
Energy efficiency measurement	Manufacturers and importers (Inspected by METI)	Accredited testing laboratory
Certification of label	Automatically published by data base in ECCJ uploaded by manufacturers	Accredited certification body
Who puts the label	Retailers	Manufacturers and importers

	Japan	Indonesia
Place of label	Shop (on or near the products)	Products or package
Term of validity	No	6 years
Target of EE performance	Targeted under “Top runner method”	No
Review of program	Not specified One by one for the products	Not specified
Display of EE performance	Manufacturers obligation	No

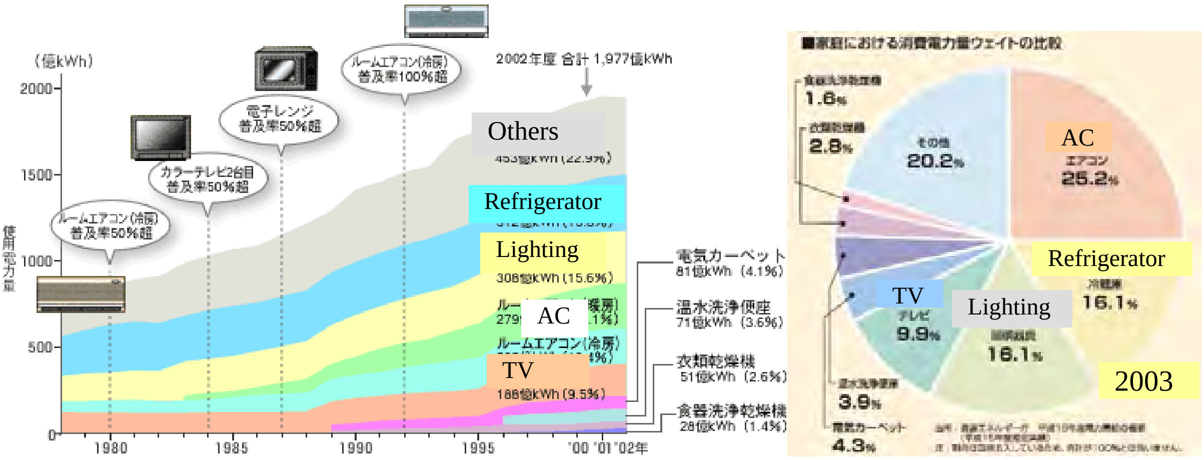
3.3.4 Products for the Application of the Labeling Program

Table 3.3.4-1 shows electricity consumption proportion of household electric appliances. The data was given from the research conducted by EMI (PT. Energy Management Indonesia) as a part of the Study. The proportion of power consumed by refrigerators and TVs is greater in the houses which have small demand contracts and do not have air-conditioners. The proportion of power consumption by air-conditioners is overwhelmingly high in the houses which are air- conditioned.

Table 3.3.4-1 Energy Consumption Proportion of Household Electric Appliances

Appliance	Electricity contract				
	R1 - 450VA	R1 - 900VA	R1 - 1.300VA	RI - 2.200VA	R2
Lighting	11%	13%	6%	11%	10%
Air-conditioners	0%	0%	39%	40%	43%
TVs	16%	20%	11%	9%	7%
Refrigerators	30%	25%	16%	12%	10%
Water pumps	5%	4%	3%	4%	5%
Fans	12%	6%	5%	3%	2%
Irons	7%	6%	6%	3%	3%
Others	19%	26%	14%	18%	18%
Total	100%	100%	100%	100%	100%

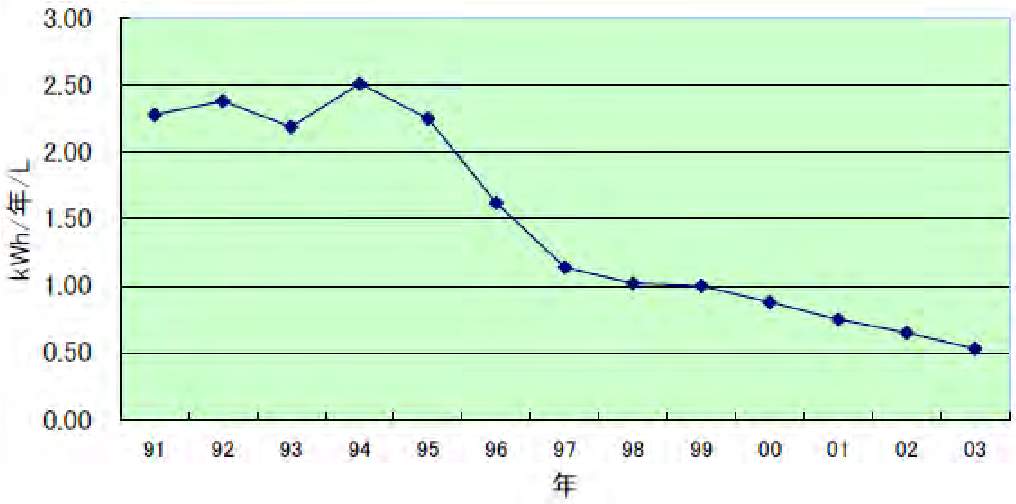
Fig 3.3.4-1 is static data for appliances in Japan, which shows the proportion of electricity consumption by appliance type. As the portion of air-conditioners, refrigerators and TV sets is large, multi stage ranking energy efficiency label is applied to these appliances in Japan. Almost the same tendency can be foreseen or anticipated in Indonesia, and MEMR are planning to introduce a labeling program to refrigerators and TV sets as the next stage after CFL within 2009, followed by air-conditioners within 2010.



Source; the Agency of Natural Resources and Energy "Outline of Electricity supply and demand"

Fig. 3.3.4-1 Energy Consumption Transition of Household Electric Appliances

Fig 3.3.4-2 shows the transition of electricity consumption of refrigerator. Electricity consumption has been getting reduced by technical developments for energy saving by manufacturers. Temporary rise in power consumption in 1993 and 1994 was attributed to effects of changes in refrigerant and heat insulator foaming agent responding to abolition of specified CFC.



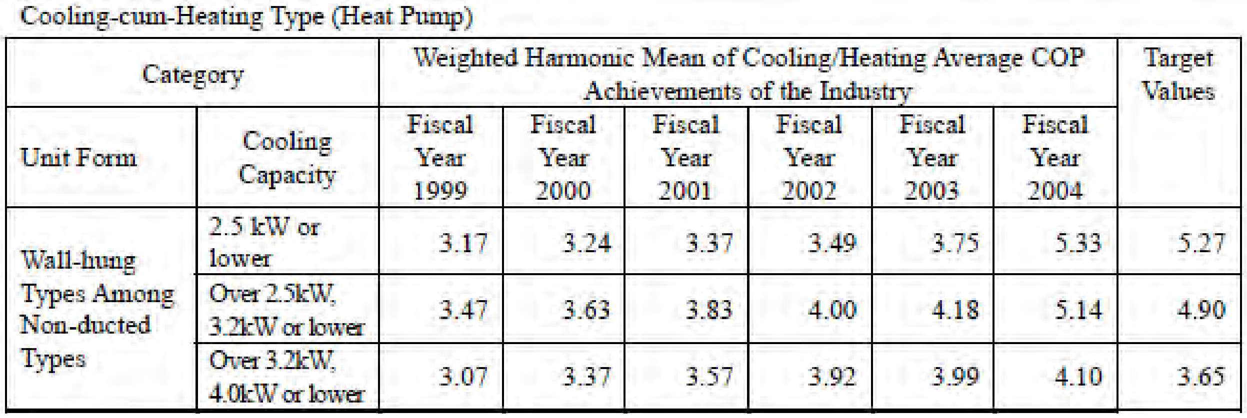
Source: Source: Japan Electrical Manufacturers' Association

Note: Although the method of measuring energy consumption was changed in 1993 and 1999 (because JIS was revised), correction was made with a coefficient which is a difference in data caused by difference in measurement method.

Fig. 3.3.4-2 Annual Electric Consumption of Refrigerator (kWh/L)

Table 3.3.4-2 shows the transition of average COP for cooling and heating in Japan. At the end of March, 1998, new target values were set according to the Top Runner Program, and the year 2004 was frozen to be the target year for residential air-conditioners. Although they were high target values requiring considerable improvement, all the Japanese manufacturers have achieved the targets.

Table 3.3.4-2 Transition of Cooling/Heating Average COP



Cooling-cum-Heating Type (Heat Pump)

Category		Weighted Harmonic Mean of Cooling/Heating Average COP Achievements of the Industry						Target Values
Unit Form	Cooling Capacity	Fiscal Year 1999	Fiscal Year 2000	Fiscal Year 2001	Fiscal Year 2002	Fiscal Year 2003	Fiscal Year 2004	
Wall-hung Types Among Non-ducted Types	2.5 kW or lower	3.17	3.24	3.37	3.49	3.75	5.33	5.27
	Over 2.5kW, 3.2kW or lower	3.47	3.63	3.83	4.00	4.18	5.14	4.90
	Over 3.2kW, 4.0kW or lower	3.07	3.37	3.57	3.92	3.99	4.10	3.65

Source: Final Summary Report by Air Conditioner Evaluation Standard Subcommittee, Energy Efficiency Standards Subcommittee of the Advisory Committee for Natural Resources and Energy

Table 3.3.4-3 shows the situation of labeling programs introduced in countries in Asia on household appliances.

Table 3.3.4-3 Situation of Labeling Program in Asia

Country	Lighting	AC	TV	Refrigerator
Japan	Voluntary	, Voluntary	Voluntary	Voluntary
China	Mandatory	, Mandatory		Mandatory
Korea	Mandatory	, Mandatory		Mandatory
Singapore		, Mandatory		Mandatory
Thailand		Voluntary		Mandatory
India	Mandatory	, Mandatory	Mandatory	Mandatory
Australia	Mandatory	, Mandatory		Mandatory

Table 3.3.4-4 shows the labeling criteria for air conditioners in India. The level of criteria is lower than Japan, but it is a similar idea as Japanese “Top Runner Standard” to set targets a few years later. On the other hand it introduces MEPS to prohibit selling of low energy efficiency products.

Table 3.3.4-4 Labeling Criteria for Air Conditioners in India

COP (Cooling)	**2008**	**2009**	**2010-2011**
3.5 <			**5 Star**
3.3 <		**5 Star**	**4 Star**
3.1 <	**5 Star**	**4 Star**	**3 Star**
2.9 <	**4 Star**	**3 Star**	**2 Star**
2.7 <	**3 Star**	**2 Star**	**1 Star** **Prohibited**
2.5 <	**2 Star**	**1 Star** **Prohibited**	**Prohibited**
2.3 <	**1 Star** **Prohibited**	**Prohibited**	**Prohibited**
< 2.3	**Prohibited**	**Prohibited**	**Prohibited**

In Singapore labeling criteria, maximum rank of non-inverter type air conditioner is 3 stars, but inverter type product can be ranked 4 stars. Since the almost all products sold in Japan are inverter type, this method is not applied in Japan. Although this labeling method can be adopted in Indonesia or other countries in which inverter type product is being expected to spread widely.

Thus, introduction of labeling program for refrigerators, TV sets and air-conditioners should be immediately implemented, from the view point of the large proportion of energy consumption of these appliances in households, expectation of promotion to higher energy efficiency by means of technical development and the situation that the surrounding countries are introducing the program.

3.3.5 Preparation of Labeling Criteria

Based on the existing Labeling program established and implemented in Japan and other countries, following methodology and points can be recommended for preparation of Indonesian labeling criteria.

Distinction between industrial standards for the measurement method on energy efficiency and labeling criteria; Standardization of testing or calculation methods for energy efficiency is done aiming to make them relatively lasting. On the other hand, labeling criteria should be reviewed at periodic intervals aiming to reflect improvement of energy efficiency, evaluation in the market and political intention. Therefore, standardizing labeling criteria together with measurement method for energy efficiency should be avoided.

Unifying measurement method for energy efficiency; Tests and calculation method for energy efficiency shall be specified definitely or one testing standard shall be designated in order to rightly compare the energy efficiency of the products which are produced by the different manufacturers. For example, testing methods for refrigerators are different between JIS and ISO at the condition of ambient temperature and door open/close .

Data collection and analysis on the energy efficiency of the products sold in the present market; In order to grasp the actual energy efficiency level of the products for preparing labeling criteria of comparison label, many products shall be tested by accredited testing laboratories, or manufactures data of energy efficiency shall be collected. The data shall be categorized by type of function, capacity (output), etc. and be used as the basic data for the preparation of labeling criteria.

Level setting of label; The level of the star marks which means high, medium or low energy efficiency is subject to the actual condition of the products sold in the market or the value of energy efficiency targeted in the future. If low levels are being set, then, almost every product would be put with the same rank label, which makes it hard to distinguish between products.

Air-conditioners; At the beginning, labeling criteria shall be made basing on COP, and in future it shall be made basing on the indicator such as “Annual Performance Factor (APF)” by which inverter type air conditioner can be evaluated properly. Fig 3.3.5-1 shows the draft of labeling criteria for AC. The data of COP mapped on the chart are from catalogs.

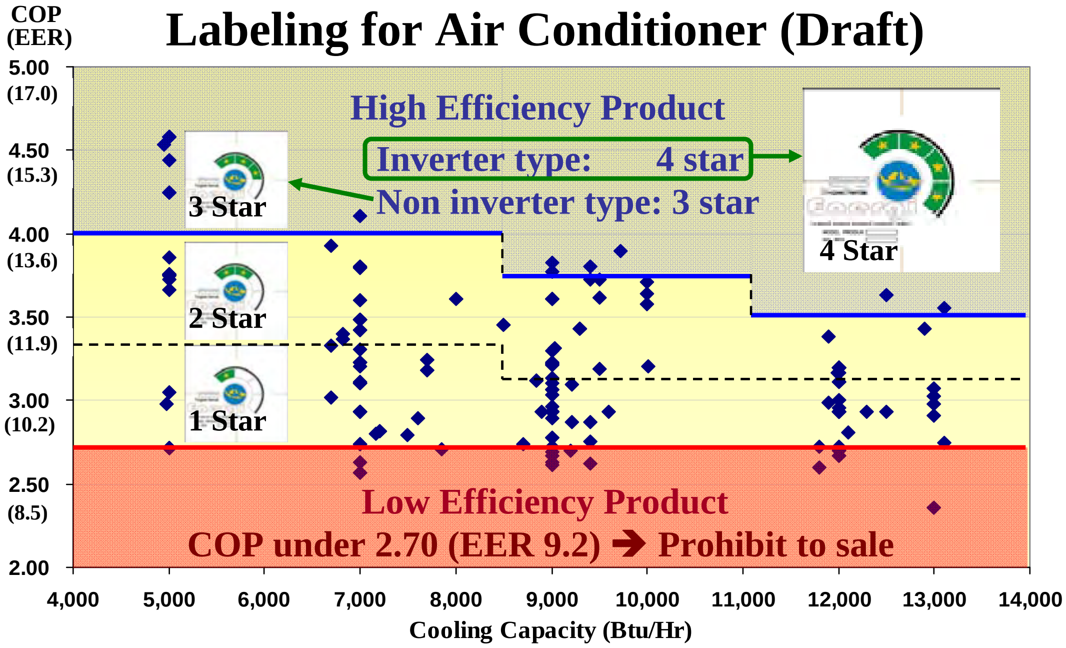


Fig. 3.3.5-1 Labeling Criteria for AC (Draft)

3.3.6 Basic Direction of Labeling Program

Basic direction of the labeling program can be summarized as shown in Table 3.3.6-1, considering the present situation of the program.

Table 3.3.6-1 Basic Direction of Labeling Program

Category	Item/New Idea	Content/Problem	Countermeasure	Priority	Counterpart	Schedule
Legal framework	Roles	• Roles of stakeholders shall be defined.	• Name, definition and roles of stakeholders shall be stipulated.	A	MEMR /Stakeholders	Short term
	Measurement method of energy efficiency	• Measurement method of energy efficiency shall be specified.	• Measurement method of energy efficiency shall be specified in the regulation, or cited from specified industrial standard.	A	MEMR /Stakeholders	Short term
	Labeling criteria	• Numbering criteria for star mark shall be specified.	• High efficiency products shall be properly distinguished.	A	MEMR /Stakeholders	Short term
	Mandatory display of energy efficiency	• Energy efficiency has not yet completely indicated on the product.	• Indication of product name, energy efficiency, measurement method (Standard No.), manufacturer name and address shall be obligated.	A	MEMR /Stakeholders	Short term
	Maintenance of the program	• Monitoring and administrative direction	• Monitoring of actual energy efficiency, display and administrative direction shall be stipulated in order to prevent illegal activity.	A	MEMR /Stakeholders	Short term
	Incentive Disincentive	• Penalty	• Penalty for illegal activity shall be stipulated.	A	MEMR /Stakeholders	Short term
	MEPS	• Introduction of MEPS (Minimum Efficiency Performance Standard)	• Stipulate MEPS and eliminate the low energy efficiency products from the market.	A	MEMR /Stakeholders	Short term
Market research;	Energy efficiency	• Present situation of energy efficiency shall be evaluated in order to prepare targeting and labeling criteria.	• Market research shall be carried out before the application of the program on the product.	A	MEMR/PLN	Short Term

Category	Item/New Idea	Content/Problem	Countermeasure	Priority	Counterpart	Schedule
	Monitoring of the program	• Sales transfer of the high efficiency products shall be evaluated.	• Market research shall be carried out in every target year of the products, in order to review the program.	A	MEMR/PLN	Short Term
	Information	• Information of energy efficiency to consumers	• Database shall be built, and energy efficiency of products shall be informed widely.	C	MEMR /Clearinghouse	Long term
Standardization	Measurement method of energy efficiency	• Measurement method of energy efficiency for CFL and refrigerator have been already issued as SNI • Measurement method of energy efficiency for the remaining products shall be standardized.	• In order to arrive at a consensus between manufacturers, the committee which is lead by manufacturers shall be organized and shall prepare the measurement method.	A	MEMR /Manufacturer	Short term
	Standardization among multi countries	• Join the BRESL project	• Standardization of energy efficiency measurement method among several countries shall be aimed at.	B	MEMR /UNDP/China and 5 countries	Medium term
Targeting	Target value	• Target year and target value shall be fixed considering policy on energy saving, price transfer and technical development	• The committee which is lead by manufacturers shall be organized and shall fix the target year and target value	A	MEMR /Manufacturers	Short term
	Labeling criteria	• Labeling criteria (Star mark rating) shall be fixed based on the target value and present situation of energy efficiency of the product.	• The committee which is lead by manufacturers shall be organized and shall fix the labeling criteria.	A	MEMR /Manufacturers	Short term
Testing	Test conducted by manufacturers	• Labeling shall be carried out based on the test data submitted by manufacturers own test	• The government shall conduct monitoring test (Sample test) in order to prevent illegal activity. • Penalty for the illegal activity shall be provided in the regulation	B	Manufacturer	Short term

Category	Item/New Idea	Content/Problem	Countermeasure	Priority	Counterpart	Schedule
	Test conducted by the accredited testing laboratories	• The accredited testing laboratory can be free to test from the manufacturers. • The accredited testing laboratory shall be free to test from the government for verification of test result submitted by the manufacturers.	• Testing laboratories shall be accredited by KAN	B	Accredited testing laboratory	Medium term
Promotion, Dissemination and Awareness	Target to manufacturers	• To promote manufacturers to join the program	• Pamphlet explaining the program shall be prepared • Seminars shall be organized by the government or manufacturers association.	A	MEMR	Short term
	Target to retailers	• To educate sales person who can explain the program to consumers.	• Pamphlet explaining the program shall be prepared • Seminars shall be organized by the government or retailers association.	A	MEMR	Short term
	Target to consumers	• To make consumers to use and buy high efficiency product	• Posters and pamphlet shall be applied in electrical shops. • TV commercial shall be on air	A	MEMR	Short term

3.4 DSM System in Electricity Business

In 2nd mission, PLN requested that the major targets of DSM study should include market survey, potential estimation and load curve analysis.

Based on the information related to electricity and data described in Chapter 2: Basic Survey, the Study Team provided the candidate items for DSM study during the 3rd mission. PLN and MEMR requested the provision of Japanese information and data regarding the tariff system and energy audit supporting system.

In the 4th and 5th mission the Study Team analyzed the effect of the on-going CFL project , and proposed and discussed ideas about successive EE&C national project, EPP (Efficient Power Plant; explained in detail later) In this context, the Study Team invited DAIKIN Co., world top runner of high efficiency ACs, to Jakarta and DAIKIN conducted a seminar for C/P and PLN about efficient AC technologies.

3.4.1 Basic Direction of DSM Study

Including the above items, lists of study items are shown in Table 3.4.1-1.

Table 3.4.1-1 Basic Direction of DSM Study

Category	Item/New Idea	Content/Problem	Countermeasure	Priority	Counterpart	Schedule
Tariff	Establishment of Data Collection System for Large Customers	Communication and Cooperation	Meter Installation for Load Management (MW, kWh, Power Factor, Load Curve)	A	MEMR/PLN /Industry/ Business/ Municipal Corporations	Short Term
	Power Factor Consideration	Promotion of PF Improvement	Demand Charge × $\frac{185\text{-PF}}{100}$	B	MEMR/PLN /Industry/ Business/ Municipal Corporations /Government Buildings	Medium Term
		Not Attractive Tariff System (Penalty Type) Threshold of 85%				
	TOU (Time of Use()ystem	Main issue is that measurement, is too complicated	PP Tariff: Raise OPP Tariff: Cut	B	MEMR/PLN	Medium Term
Auditing	Energy Analysis Support System (EASS)	Simple Auditing	Making Report for Trend and Load Curve	A	PLN/Industry/Business/ Municipal Corporations	Short Term
			Macro Analysis (co-relation, comparison, histogram) among Samples			
			Making Database of Large Customers			

Category	Item/New Idea	Content/Problem	Countermeasure	Priority	Counterpart	Schedule
Advertisement	TV Program		Promotion of Energy Conservation Method Introduction of Energy Conservation for Kids	A	MEMR/PLN	Short Term
	Education		Primary School Education	A		
	Booklet for Energy Conservation and Good Practice		Energy Saving Practice in Factory Manual for Design and O&M	A		
Transmission and Distribution Loss	High Voltage		Out of scope of this Study	C	PLN	Long Term
Load Management	Daily Load Curve	Prediction of Daily Load Curve	Survey Japanese Utilities	A	MEMR/PLN	Short Term
	Improvement of SAIDI and SAIFI	Improving Steadily	Out of Scope of this Study	C	PLN	Long Term
Power Plant Construction	Power Generation with Pumped-up Water (Supply side)	Off Peak: Pumping Water Peak: Power Generation	Feasibility Study is on-going (Out of Scope of this Study)	B	MEMR/PLN	Long Term
Street Lighting	DSM PJU	Economic analysis	Study of Promotion Methodology	A	MEMR/PLN /MCs	Short Term
Electrification	-	-	Out of Scope of this Study	C	PLN	Long Term
EPP	Efficiency Power Plant		Implementation plan Research of foreign success Examples	A	MEMR/EMI /PLN/Ministry of Finance	Short Term
CDM Bundling	Replacement of CFL/AC/Chiller		Implementation plan	A	MEMR/PLN /DOE	Short Term
	Bundling whole Nation		Research of foreign success Examples			

3.4.2 High Efficiency Electric Appliances

(1) Target High Efficiency Electric Appliances

Selection of high efficiency electric appliances is very important to contribute towards national energy conservation. Current target electric appliances of top runner programs in Japan are as follows.

- Air Conditioners
- Electric Rice Cookers
- Electric Toilet Seats
- DVD Recorders
- Electric Refrigerators
- Microwave Ovens
- TV Sets
- Computers
- Electric Freezers
- Fluorescent Lights
- Video Tape Recorders
- Magnetic Disk Units
- Copying Machines
- Vending Machines
- Transformers

These are selected mainly for energy conservation in household, commercial and business sectors.

Referring to the above and current Indonesian market condition, starting target of high efficiency electric appliances for this Study in Indonesia are given below:.

- Energy Saving Lamps(CFL)
- Variable Speed Drives(VSD)
- Refrigerators
- Electronic Ballasts
- Room Air Conditioners(AC)
- Motors
- Street Lighting
- Chillers
- TVs

(2) Life Cycle Costs

Savings due to energy conservation by introducing high efficiency electric appliances should pay off for the higher price of efficient appliances as compared with the lower cost of low efficiency ones. Life Cycle Cost (LCC) minimum should be achieved .(Fig 3.4.2-1)

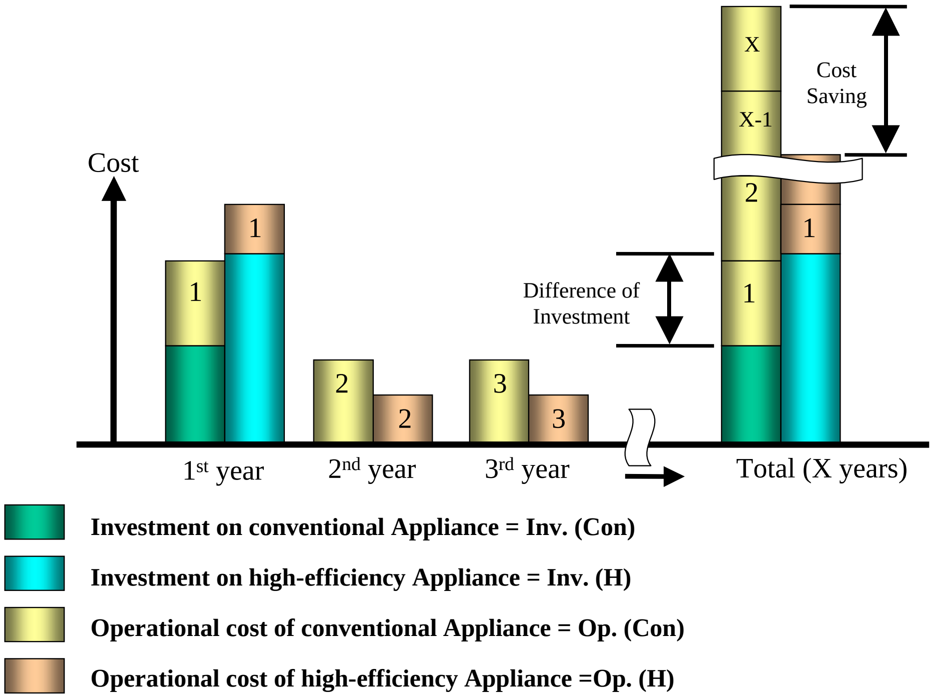


Fig. 3.4.2-1 Simple Calculation Method of Life Cycle Cost

To calculate the economics of high efficiency electric appliances, information such as price, electricity consumption, life time, electricity tariff etc. is required. However, in developing countries, purchasers of electric appliances tend to buy only on the basis of price. Awareness of high efficiency electric appliances including consciousness of economical operating costs during life time is necessary.

(3) Economics calculation result by high efficiency electric appliances

In this study, economic aspects of buying high efficiency electric appliances are evaluated by payout time. As electricity tariffs are different by sector and tariff groups, following results of economic calculation (replacement and new purchase) are conducted for each tariff group.

Categorization by payout time

Within one year: Highly feasible to be implemented as soon as possible
Within three years: Feasible to be considered for implementation
Within five years: Feasible but efficiency should be improved further
Over five years: Difficult to implement. Technology, price and performance should be reviewed.

1) Result of Economics calculation of replacement by high efficiency electric appliances

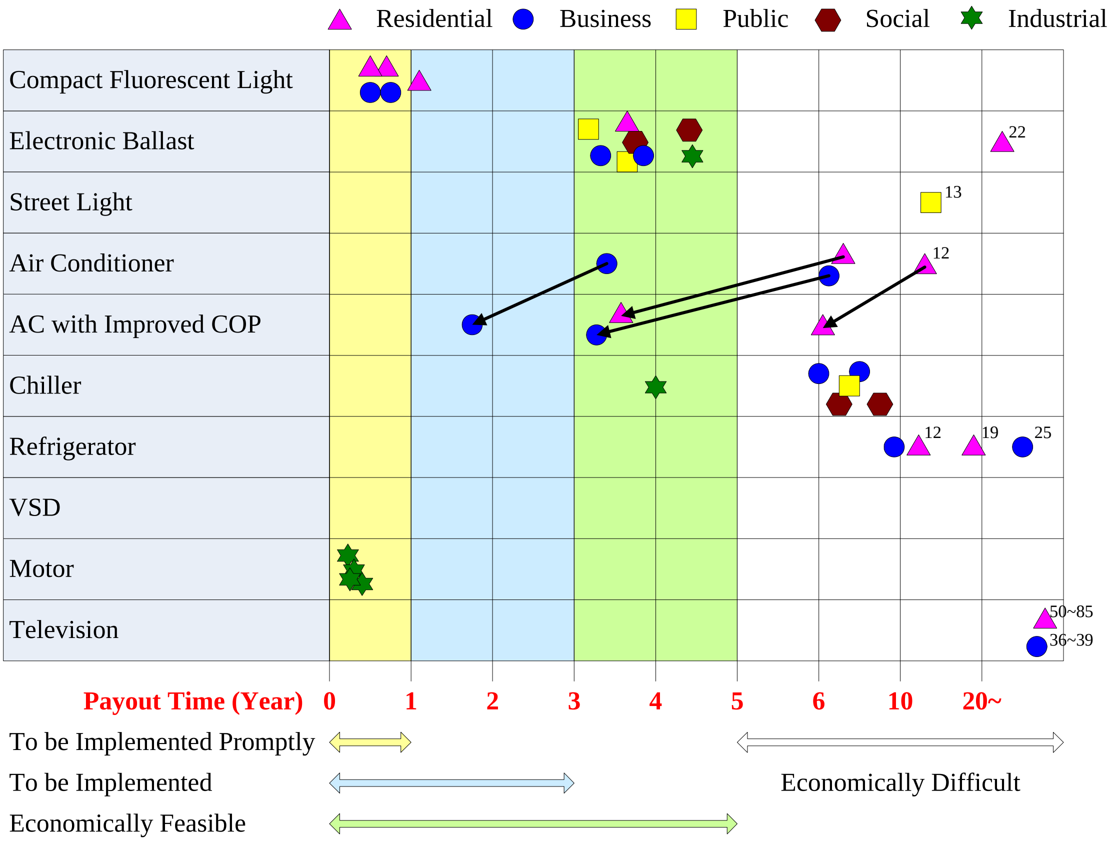


Fig. 3.4.2-2 Economics Calculation Result of High Efficiency Electric Appliances (Replacement)

Payout time

- Within one year: CFLs, high efficiency motors
- Within three years: improved efficiency ACs
- Within five years: improved efficiency ACs and electronic ballasts
- Over five years: street light, ACs, chillers, refrigerators and TVs

2) Results of Economics calculation of new purchase of high efficiency electric appliances

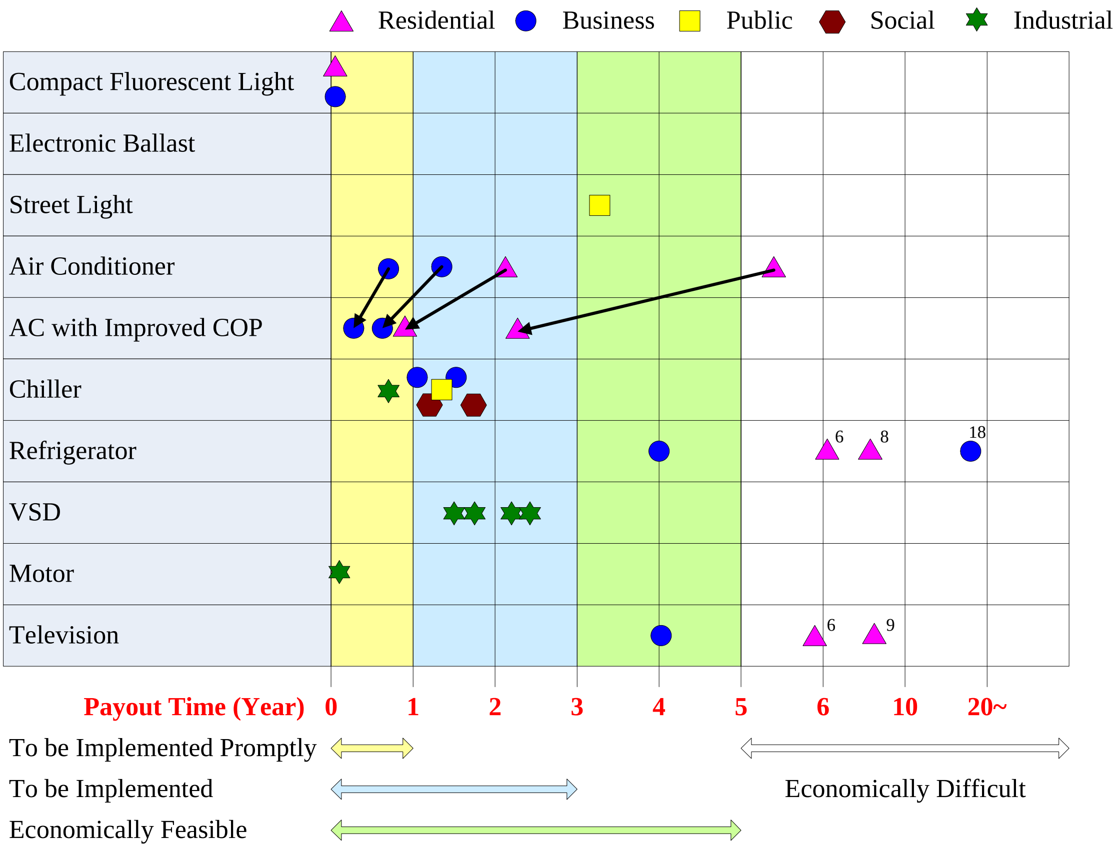
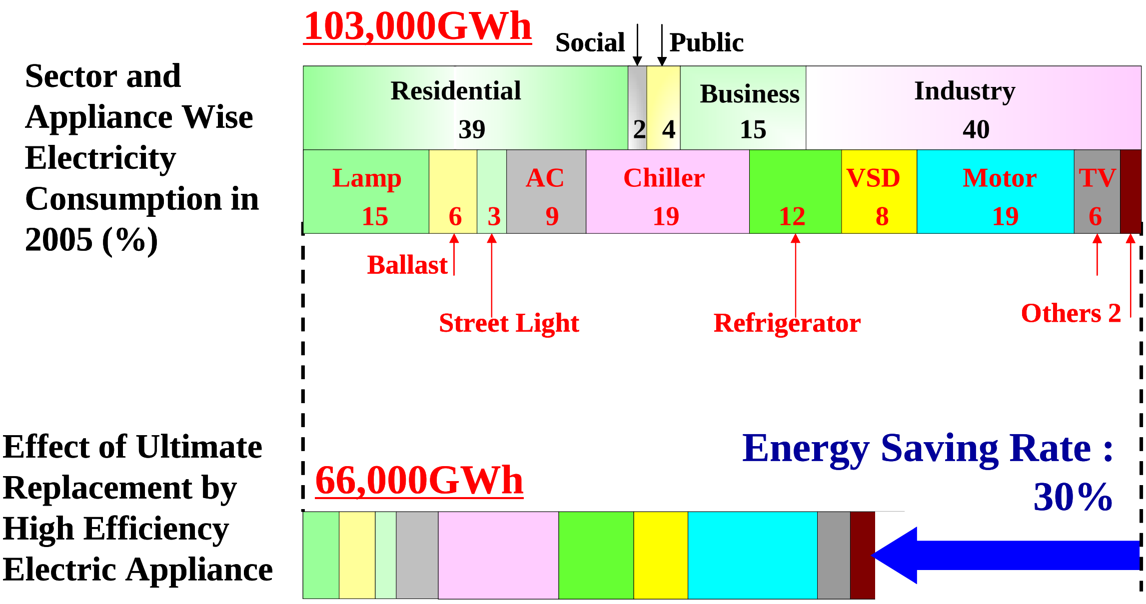


Fig. 3.4.2-3 Economics Calculation Result of High Efficiency Electric Appliances (New Purchase)

Payout time

- Within one year: CFLs, high efficiency motors and improved efficiency ACs
- Within three years: improved efficiency ACs, chillers and VSDs
- Within five years: street lights
- Over five years: refrigerators and TVs



(Base Case, In high case EE&C potential increases to 36%)

Fig. 3.4.2-4 Contribution to Electricity Conservation in Indonesia

The above result is based on a preliminary survey by EMI; hence further information and data should be collected to make it reliable and precise. But a rough picture of economics of high efficiency electric appliances can be understood. Following are important points from the study.

- CFsL: Highly economical. CFL promotion by PLN and government is quite appropriate.
- ACs and chillers: Prior Target. With inverter dissemination EE&C potential increases about twice
- High efficiency motors: Attractive as effective measures in all the sectors
- Refrigerators and TVs: Further improvement of efficiency should be realized.

(4) Contribution to National Energy Conservation by High Efficiency Electric Appliance

Based on above study, the method of estimating future electricity consumption by high efficiency electric appliances is divided into two parts. The first part is the replacement calculation of currently existing electric appliances by high efficiency ones. There are three courses for achieving electricity conservation target by 2025, depending on the implementation of policy and strategies. (Fig. 3.4.2-4)

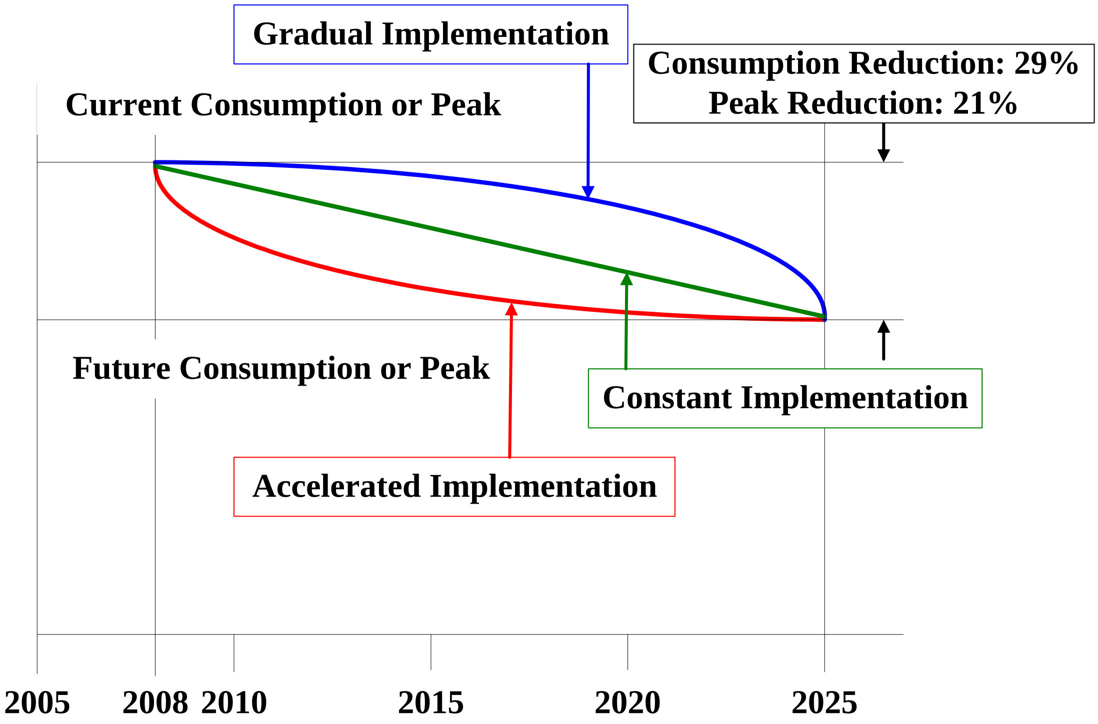


Fig. 3.4.2-5 Courses of High Efficiency Replacement for Existing Appliances

The second part is newly purchased electric appliances. Growth rate of electricity consumption is assumed as 6.0% yearly. The high efficiency electric appliances are expected to reduce the electricity consumption by 29% in the whole sector l. The promotion of awareness for high efficiency electric appliances including economics could reduce growth rate from 6.0 to 4.3 (=6 ×0.71).

Considering the above two parts together, the following scenarios are illustrated.

1) Electricity Consumption

Fig 3.4.2-6 shows future estimate of electricity consumption of BAU (Business As Usual) and high efficiency electric appliances selection and replacement. Energy conservation effect by high efficiency electric appliance is very huge. Without any measures of energy conservation, the electricity consumption will reach to about three times of current one in 2025. However, by promoting selection and replacement of high efficiency electric appliances, it will be brought down to about double of current one.

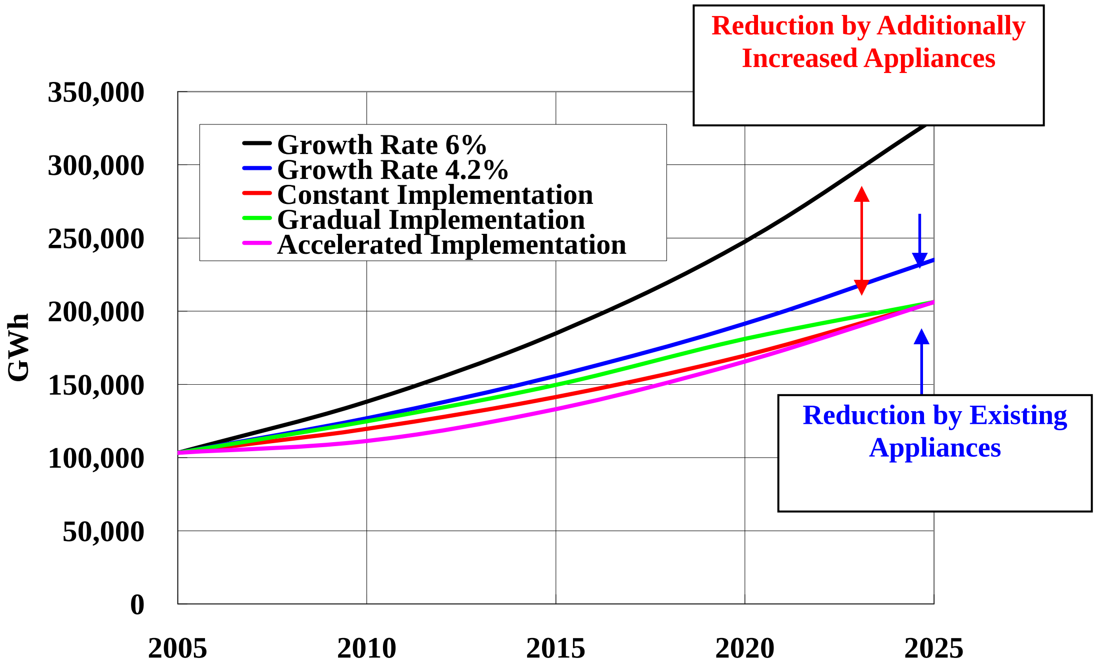


Fig. 3.4.2-6 Future Estimate of Electricity Consumption in Indonesia

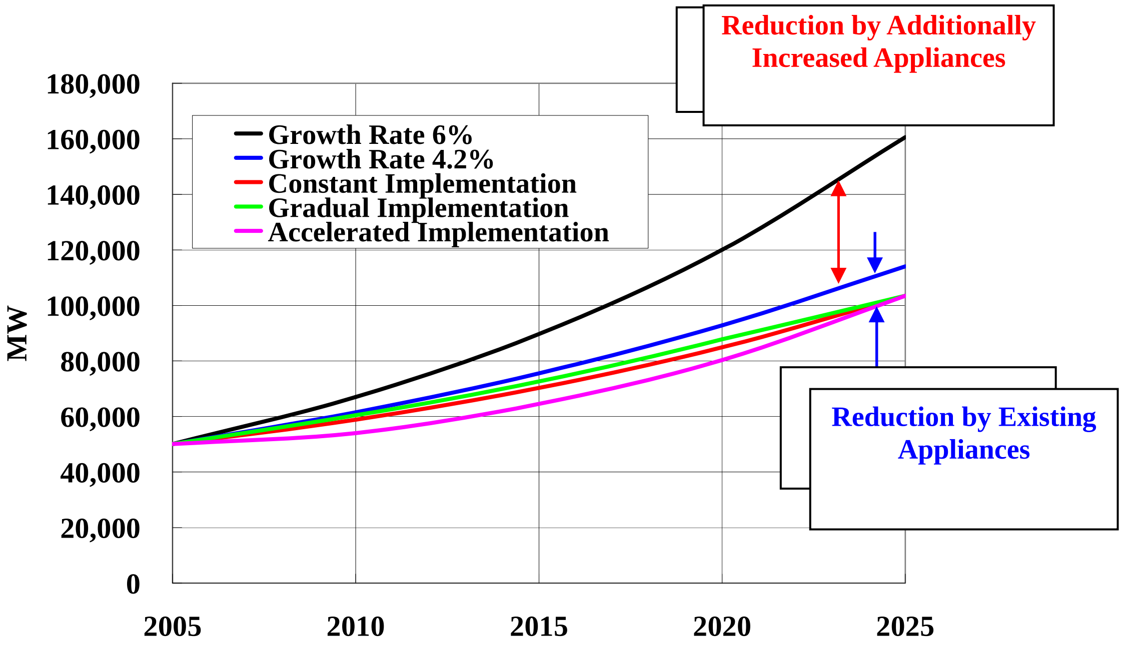


Fig. 3.4.2-7 Future Estimate of Peak Reduction in Indonesia

2) Peak Reduction

Fig 3.4.2-7 also shows future estimates of peak reduction of BAU (Business As Usual) and high efficiency electric appliances selection and replacement. Without any measures of energy conservation, the electricity peak will reach about three times of current levels in 2025. However, by promoting selection and replacement of high efficiency electric appliances, it will be brought down to about double of current levels.

3.4.3 EPP (Efficient Power Plant)

An Efficient Power Plant (EPP) is a virtual power plant consisting of a bundle of energy efficiency investments that provides predictable load carrying capacity in almost the same way as provided by a generating unit. Since conventional power plants (CPP) are developed ordered by the relatively cheep investment cost, electricity price must become higher as the demand increase. On the other hand EPP has possibility to bring more economical merit rather than CPP. Investment for EE&C in EPP scheme shall be done by electricity supply companies. That is the reason why the EE&C investment is called EPP.

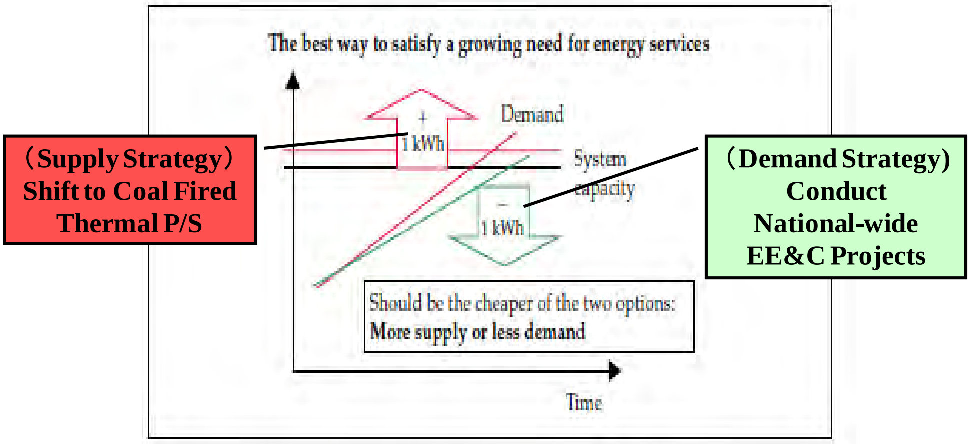


Fig. 3.4.3-1 Image of EPP

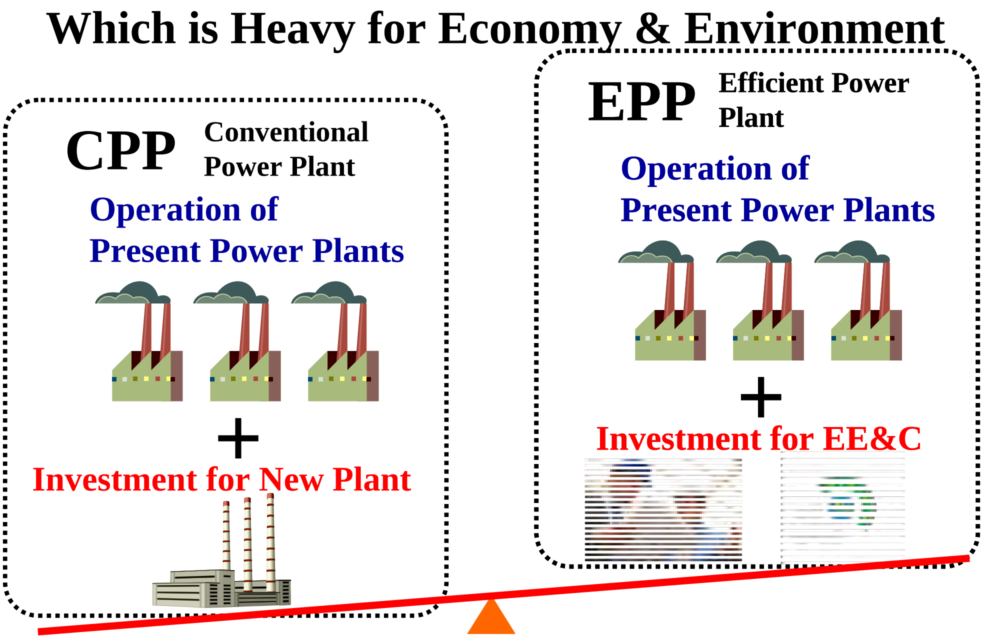


Fig. 3.4.3-2 CPP and EPP

In Indonesian electricity supply and demand condition, the skyrocketing subsidy from Government to PLN, mainly caused by 1) deficit of evening electricity supply, 2) excess of electricity cost over price (tariff), becomes the biggest issue to be solved.

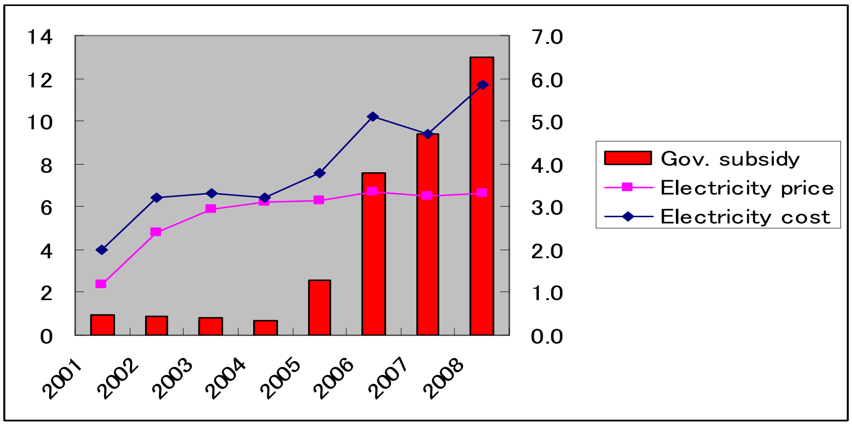
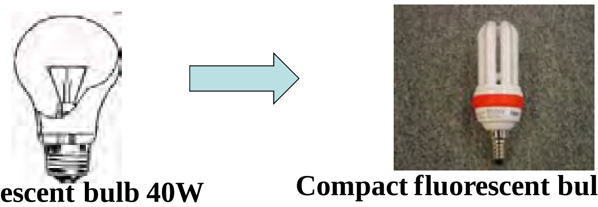


Fig. 3.4.3-3 Trend of Electricity Average Tariff, Cost and Gov Subsidy to PLN

PLN are carrying out a pilot project to deliver CFL bulbs, and this is one of typical EPP models. The Study Team explained the situation based on references to foreign experiences and had discussions with C/P and PLN on how to conduct Indonesian EPP. And Indonesian Gov. finally requested JICA to formulate a successive TA program to enhance the activity to implement EPP and amend the electricity tariff mechanism.

CFL Distribution Free Project



Incandescent bulb 40W

Compact fluorescent bulb 8 W
(80 % electricity reduction)

Estimated effect; Evening electricity Peak Cut
Electricity saving
CO2 Reduction
Economically Feasible

Fig. 3.4.3-4 Image of CFL EPP Model in Indonesia

Table 3.4.3-1 Effect of CFL EPP

	CPP	EPP
Content	Power Plant Construction	Energy Conservation project bundling in Demand Side (ex; CFL)
Fuel Consumption	Burns 0.26TOE/MWh (JICA Team Cal.)	No fuel
Emission	SOx and Nox	No Pollution
Cost	700Rp/kWh (PLN 2006ave)	150Rp/kWh(CFL case)

3.4.4 Electric Tariff Comparison between Japan and Indonesia

Table 3.4.4-1 shows the comparison of tariff system between Japan and Indonesia. (Refer Appendix) Compared to the Japanese tariff system, the Indonesian system is rather simple and may have some possibility to improve it using the Japanese system as a reference.

Table 3.4.4-1 Comparison of Tariff System between Japan and Indonesia

Items		Indonesia	Japan
Basic Condition	Climate	Year Round Tropical	Temperate, 4 seasons
	Yearly Load	Constant	Summer and Winter Peak
	Daily Load	Rural: Evening Peak Urban: Afternoon Peak	Summer/Afternoon Peak
Tariff Calculation Formula		Basic Fee + Power Volume Fee	
Fuel Price Change Correction		None	Yes
Collection Cost Saving Discount		None	Bank Account Discount
Donation for Environment Protection		None	Green Electricity Donation
TOU (Time of Use) Tariff		None	Seasonal and Time of Day Tariff
Power Factor Consideration		Power Volume Fee Below 85%: Penalty	Basic Fee Over 85%: Discount Below 85%: Price Increase
Optional Contract		None	TOU for Households
			Load Management Contract
			Emergency Contract

3.4.5 Utilizing Clean Development Mechanism (CDM)

In 2007 2new methodologies in EE&C CDM were approved by UNFCCC. From now on increase of implementation of EE&C CDM projects are expected. 2 new methodologies are as follows;

(1) Programmatic CDM methodology approved in June 2007

Generally EE&C projects are said to be too small for CDM. But applying “programmatic CDM” methodology, after declaration of “Program of activities”, multiple small projects could be bundled and accumulated as one programmatic CDM and small scale CDM methodologies on EE&C can be applied. This methodology is desired to be applied to EE&C CDM project.

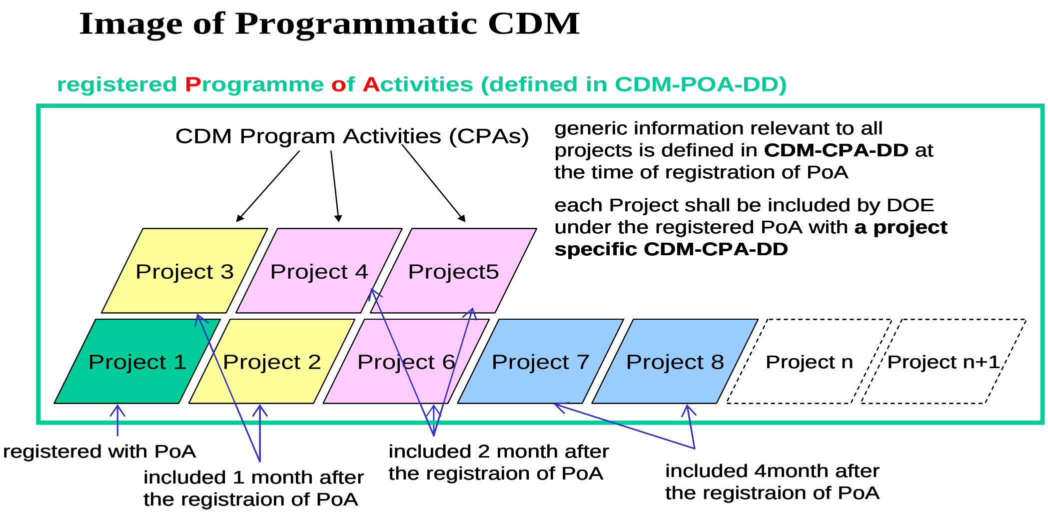


Fig. 3.4.5-1 Programmatic CDM/Bundling

(2) CDM Methodology of AM0060 Approved by the Executive Board at Bali, November 2007[1]

The outline of CDM methodology of AM 0060 "Chiller Replacement is shown in Table 3.4.5-1

Multiple EE&C projects (531 chillers replacement in India nation-wide) were approved as one CDM project (Bundling). This methodology can be a leading model of multiple EE&C (chillers, air-conditioners, etc.) replacement, and the project size Rp.900billion also serves as a useful reference for us.

The feasibility and ways of applying it in Indonesia should be studied.

Table 3.4.5-1 Outline of CDM Methodology AM0060 of Chiller Replacement

AM0060 (UNFCCC)

Applicability	**Replacement of Existing Chiller by Energy Efficient New One**		
	Rated Capacity	**Single**	Not More than +5%
		Several	Each Chiller ±5%
	Refrigerant		Water / Antifreeze
	Utilization		Process Cooling or Air Conditioning
	Existing Chiller		Functioning and Fully Operational
	Driving Force		Electricity
Project Boundary	**Physical and Geographical Location of Site** **Electricity System (Grid)** **Captive Power Plants, if Applicable** **CO_2 Emission from Power Generation**		
Gas / Sources	**Baseline**		CO_2 from Power Plant
	Project Activity		**GHGs Refrigerants**

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[1] Approved Baseline and Monitoring Methodology (AM0060) and Project Design Document of Accelerated Chiller Replacement Program Proposed by India

3.5 Trial Cost Estimation for the Program

The budget for the implementation of the programs which have been selected as the result of discussion between C/P was estimated as shown in Table 3.5-1. In this table, total period until 2025 was divided 3. Annual budget of US$ 5 to 6 million including donation from international cooperative agencies must be needed in order to realize sufficient EE&C. This is equal to the 7 or 8 times of the present budget which C/P is managing.

Table 3.5-1 Expected Governmental Budget to achieve functional EE&C (US$)

No	Category (Strategy)	Item／New Idea	I (2009-2015)	II (2016-2020)	III (2021-2025)	Total
1	Energy Manager Program	Education and Training (on EE&C for senior executives, etc)	3,240,000	3,670,000	3,670,000	10,500,000
2		Development of the Network of Designated Factories and Energy Mangers	126,400	171,500	467,500	765,400
3		Energy Audit Partnership Program (Continuation and Expansion of the Existing Program)	4,740,000	4,060,000	4,880,000	13,600,000
4		Implementation of Seminars, Education and Training on EE&C	2,539,300	2,569,900	639,900	5,747,100
5		Implementation of Seminars, Education and Training on EE&C	3,970,000	2,972,000	2,972,000	9,914,000
6	Labeling Program	Introduction of EE&C Labeling system	1,520,000	850,000	850,000	3,220,000
7	DSM Program	Promotion of Electricity Demand Side Management (DSM)	13,000,000	10,000,000	10,000,000	33,000,000
8	Common Program	Establishment and expansion of award program for achievement of EE&C activities	420,000	300,000	300,000	1,020,000
9		Promoting EE&C design and use of EE&C goods and materials	1,930,000	2,040,000	113,000	4,080,000
10		Energy Conservation Technology Center (ECTC)	3,930,000	1,430,000	1,700,000	7,060,000
11		Establishment of financial mechanisms to support EE&C promotion and dissemination	180,000,000	0	0	180,000,000
12		Promotion and acceleration of research and development	874,000	2,010,000	1,828,000	4,710,000
13		Development of database and formulation of master-plan	350,000	350,000	350,000	1,050,000
14		Preparation of Laws, Regulations and Standards for Promotion and Dissemination of EE&C	0	0	0	0
Total			36,639,700	30,423,400	27,770,400	94,666,500
Annual Budget（Total÷ years of each stage）			**5,636,877**	**6,084,680**	**5,554,080**	**5,737,364**

CHAPTER 4

ROADMAP AND ACTION PLAN (SUGGESTIONS FOR THE MULTIPLE EE&C PROMOTION PROGRAM)

Chapter 4 Roadmap and Action Plan (Suggestions for the Multiple EE&C Promotion Program)

4.1 Overview

Based on section 3.1.1 “Basic Strategy for Promoting EE&C”, the measures to be taken for introducing functional energy management utilizing the Target-setting Agreement Program was explained in Chapter 3. These are listed in the 14 programs based on three basic strategies, namely “Enhancement of Awareness and Consciousness for EE&C”, “Strengthening Support from the Government”, and “Enforcing Rules and Regulations”. The summary of these programs and projects is listed in Table 4.1-1, and also programs and action plans are shown in APPENDIX. A brief explanation of the programs is discussed in the following sections.

Basic grounds for proposed programs and projects are as follows.

Compared with Japan and surrounding countries, national budget & resources for EE&C activity per capita and GDP in Indonesia is quite small. In order to achieve national target of EE&C level, it is necessary to invest at least about 3 times larger financial resources. And to achieve the target, firstly the road map and total figure for EE&C promotion should be arrived at. Then to secure the budget needed, functional linkage among eligible international supporting programs (organizations) should be formulated and tied up.

Until 2015, utilizing support of international organizations, the government should concentrate on 1) formulating national energy manager certification program and introducing the concept of energy management in factories and buildings 2) disseminate knowledge about labeling program of selected electric appliances and 3) accelerate DSM measures in electricity field. These programs are not very costly, and with these prioritized measures, 10％EE&C will be achievable.

Based on Japanese experience, by introducing an energy management system and steadily operating it (PDCA cycle), at least 5 % EE&C can be achieved. The Indonesian government should continue and accelerate the preparation and enactment for legal frame work of the national energy management program. The Government should also strongly focus on awareness programs for governmental organizations and private companies about the merit of introducing energy management systems.

Following the labeling program on CFL, it would be quite effective to formulate the next labeling programs on ACs, TVs and refrigerators etc. and go into steady operation, which will surely spread in the near future in Indonesia, before these become popular. There are several failures in other countries in implementing such programs without controlling the energy efficiency criteria relating to these electric appliances.

DSM in electricity becomes quite effective and a speedy measure when applied with a functional electricity tariff mechanism. The expected benefit is not only achieving EE&C and mitigating peak demand but also reducing the increasing governmental subsidy to PLN.

Priority main programs and the Study approach to reach them are shown in Fig. 4.1-1.

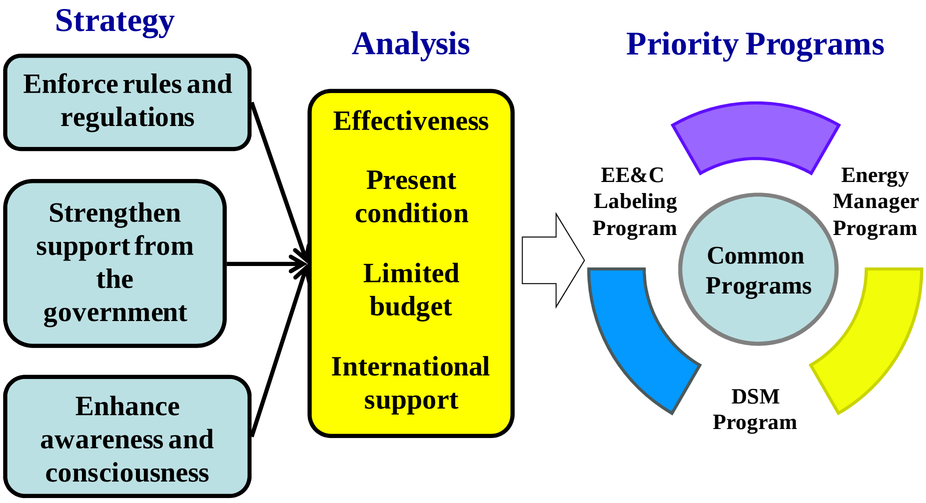


Fig. 4.1-1 Approach to the Priority Programs

There is a trend for decentralization in Indonesia, but up to 2015 central government should play a leading role to show the national direction for EE&C, prepare guidelines and formulate the national framework.

In this context more resources should be allocated in central government than in provincial government. Also reflecting national direction, related ministries, provinces and private sector organizations will be able to formulate their respective plans. Thereafter, they can prepare their own budget for EE&C and go to the implementation stage.

Up to 2015, it is also necessary to clarify eligible EE&C technologies, which are effective but costly, and conduct demonstrative projects of these specified technologies and formulate supporting programs to induce investment by private companies in such technologies.

After 2015 the dissemination of such specified technologies should be accelerated, mainly by the private sectors. The governmental role should be limited to creating awareness and providing support.

Table 4.1-1 Summary of the Road Map for EE&C C Dissemination and Promotion

No	Main program	Program	Description/ Issues	Measures	Priority	C/P （Implementing Agencies）	Schedule
1	Energy Manager Program	Education and Training (on EE&C for senior executives, etc)	Relevance and feasibility of EE&C investment are not fully understood by the management. Adopting proposed ISO 50001 (Energy Management System) through participating EE&C promotion programs proposed by UNIDO	Various seminars and training events for senior managers conducted to teach the feasibility of EE&C investment. EE&C should become a major indicator for good management. Creating a positive corporate image of eco-friendly company.	A	MEMR (ETCERE）	Highest priority among all programs/projects. Complete in the Stage 1
2		Development of the Network of Designated Factories and Energy Mangers	Absence of forum aiming at technology exchange and transfer across industry. Technical information on EE&C and its advancement is not easily distributed in Indonesia. Absence of technology exchange and transfer across industry. Technological advancement is not transparent No connection with other energy managers. Lack of information on good practices and effective measures, etc.	Seminars for Energy Managers Preparation for examination for the certification Technology transfer.	A	MEMR, ECTC	Implement ASAP HAKE has established as a professional association for Energy Managers

No	Main program	Program	Description/ Issues	Measures	Priority	C/P（Implementing Agencies）	Schedule
3		Energy Audit Partnership Program (Continuation and Expansion of the Existing Program)	Weak capacity in auditing There is no professional certification for energy mangers	Training for Auditors Compilation and publication of the analysis and audit results	A	MEMR	Stage 1
4		Implementation of Seminars, Education and Training on EE&C	Access to the technical information is very limited. The knowledge of the regulation is limited.	A variety of technical seminars and training targeting to various levels.	A	ETCERE、 local government, conglomerate	Introductory levels in the Stage 1 (2009-15) Technologically advanced contents may be introduced in the succeeding stages
5		Target-Setting Agreement with Designated Factory	There is no regulatory framework for overseeing energy use of industry and building, etc. There is no functional incentive for adopting EE&C because of low energy prices driven by politics. Adopting proposed ISO 50001 (Energy Management System) through participating EE&C promotion programs proposed by UNIDO	Introduction of the target-setting agreement program Mandatory reporting on energy use Nomination of an energy manger	A	MEMR	Stage 1. (Implementation of Energy Manger Program is one of the highest priority)

No	Main program	Program	Description/ Issues	Measures	Priority	C/P（Implementing Agencies）	Schedule
6	Labeling Program	Promotion of Energy Labeling Program	Functional Labeling Program has not been implemented, Lack of information on useful EE&C technology, Lack of awareness program	Establishment of testing methodology and testing organizations, Specified technologies	A	MEMR, Accredited testing laboratory, Label Certification Body, ECTC, Clearinghouse	Stage 1. (Mainly focus on AC, refrigerator and TV etc. which are effective in a short term)
7	DSM Program	Promotion of Electricity Demand Side Management (DSM) Program	Absence of incentives and disincentives based on the electricity usage	Introduction of sustainable electricity tariff schedule Provision of incentives to adopt measures for DSM	A	PLN, (MEMR)	Should be implemented in Stage 1
8	Common Program	Establishment and expansion of award program for achievement of EE&C activities (targeting to industry, commercial buildings, machinery and equipment, schools and children)	Lack of incentives for adapting EE&C. Weak attitude to carry out EE&C	Stronger publicity for EE&C. Incentives through one’s good name	A	MEMR（ACE, MOI and MOE）, ECTC	The current award program may be carried out soon. Develop a new award program in the separate areas in the mid and long term activities
9		Promoting EE&C design and use of EE&C goods and materials	There is no one stop access to technical information, etc on EE&C	Provision of so-called “one-stop service”(Establishment of the clearing house)	A	MEMR	Stage 1

No	Main program	Program	Description/ Issues	Measures	Priority	C/P（Implementing Agencies）	Schedule
10		Energy Conservation Technology Center (ECTC)	There is no central department/organization to promote EE&C (Is this what you mean????)	Present and promote EE&C technology	B	MEMR	Stage 2 and the following (after the institutional arrangement is completed) Support from industry is indispensable
11		Establishment of financial mechanisms to support EE&C promotion and dissemination	Financial support for implementing EE&C is lacking Weak incentives for promoting EE&C measures	Provision of subsidies (e.g. low-interest loan, etc.) Tax easement for EE&C investment Lower import tax	A	MEMR（MOF）	Launch any supports that can start earlier Realizing the tax reform in the early stage is the highest priority.
12		Promotion and Acceleration of Research and Development	Dependency on EE&C technology abroad No room for fostering technology originated in Indonesia	Presenting EE&C policy direction suitable for socio-economic system of Indonesia Collaboration among universities and industries Development of technology unique to tropical cremate	B	MEMR、Ministry of Education	Initial emphasis will be on the behavioral science (laws, organizational development, policy areas) in the Stage 1. Engineering development may be on the Stage 2 and 3.
13		Preparation of Laws, Regulations and Standards for Promotion and Dissemination of EE&C	Various ministries prepare laws and regulations without close coordination and consultation	Coherent and coordinated implementation of EE&C laws and regulations	A	MEMR、MOI,	Should be implemented in the Stage 1

No	Main program	Program	Description/ Issues	Measures	Priority	C/P（Implementing Agencies）	Schedule
14		Common database of EE&C has not been established		Establishment of national basic data base, Formulation of functional data collection and analyzing mechanism, Implementation of master plan based on the data base above	A	MEMR、MOI ECTC	Should be implemented in the Stage 1

Table 4.1-2 Main Schedule of the Programs

No.	Main program	Program	2009	2010	2011	2012	2013	2014	2015	2020	2025
1	Energy Manager Program	Education and Training for senior executives, etc	Development		Implementation and maintenance						
2		Network of Designated Factories and Energy Mangers	Development		Networking					Extension of the Network	
3		Energy Audit Partnership Program	Implementation and maintenance								
4		Seminars, Education and Training	Development		Implementation						
5		Target-Setting	Development		Practical use of Energy Manager					Practical use of Energy Auditor	
6	Labeling Program	Energy Labeling Program	Standardization		Implementation and maintenance					Internationalization	
7	DSM Program	DSM Program	Development & Trial projects							Implementation and maintenance	
8	Common program	Award program	Development							Improvement and maintenance	
9		EE&C design and use of EE&C goods and material	Development							Implementation and maintenance	
10		Energy Conservation Technology Center (ECTC)	Development						Establishment of ECTC▼	Improvement and maintenance	
11		Financial mechanisms	Development		Implementation					Improvement and maintenance	
12		Research and Development	Development of management methodology							Technology development	
13		Laws, Regulations and Standards	Legislation							Review	
14		Common database	Development of the Database							Master Plan for EE&C	

4.2 Energy Efficiency Improvement and Conservation Promotion Program

4.2.1 Energy Manager Certification Program

Based on the strategies indicated in section 3.1.1. “Basic Strategy for Implementing Energy Manager Program and promoting EE&C”, the following measures should be taken by the government of Indonesia. These are also discussed further in the Program Outline and Action Plan (APPENDIX):

（Regarding the measures for 3 major issues, there are several common approaches. Here the Study Team has included these in Energy Manager Certification program）

(1) Education and Training (on EE&C for senior executives, etc)

JICA has implemented a variety of EE&C related projects overseas in the past few years. Experience has shown that the root cause of obstacles in promoting EE&C is lack of awareness about EE&C at higher management levels of public and private enterprises. It has found that a top-down approach for managerial decisions on EE&C related investment is the most effective approach in accelerating EE&C. In reality, however, very few executives understand effectiveness and feasibility of EE&C related investments. Many enterprises put priority on short-term growth through increased production and underestimate the long-term effects of new approaches to investing aiming to achieve EE&C through improved productivity. To overcome such situations, education and training for executives are very important in order to change their mindset. The ideal topics may include: how EE&C investment will affect long-term prosperity of the company (e.g. contribution to the profit and corporate social responsibility, etc.) The seminar will aim at making EE&C one of main operational indicators to promote their company as a green business in the market.

(2) Development of the Network of Designated Factories and Energy Managers

The problems that engineers in the Indonesian industry have identified are lack of access to technical information on EE&C and to information regarding best practices on EE&C at other factories, etc. Information exchange as well as information sharing on EE&C technology is rarely happening. Many factory engineers are in need of information on how and what others are doing in order to review objectively their own EE&C practices. In particular, EE&C should be built upon others’ experiences and lesson learnt in the past. Ongoing discussions on the certification program for Energy Managers and technical seminars, as well as the preparation for the certification examination are among the topics that need a higher level of information sharing. Such networking among engineers and Managers is one of the effective approaches to promote and disseminate technology in EE&C and to strengthen awareness in EE&C. Such program needs to be carried out as soon as possible because they have a higher priority. Currently, MEMR is establishing HAKE (EE&C Engineers Association) to serve such a role and responsibility.

(3) Energy Audit Partnership Program (Continuation and Expansion of the Existing Program)

The existing partnership program for energy audit has been effective for promoting EE&C. The program should be extended and strengthened. It should be carried out in the first stage.

Because the existing program has paid specific attention to EE&C mainly for electricity use in commercial buildings, the future plan should be extended to include EE&C for heating applications and industrial sector to diversify the beneficiaries. To extend the program, organizations such as EMI and BPPT who contract with MEMR for providing audit services should be provided audit training on electricity and heat usage in the factory. The audit results under the partnership program should be systematically collected and compiled to be published in the form of a best practices guide in Indonesia.

Audit support to the industrial sector has been identified as one of the most prosperous ODA projects by donor community including JICA, NEDO, JETRO, ECCJ, UN, World Bank, etc. Aid coordination may be another area to strengthen because many such agencies are interested in supporting EE&C in Indonesia.

Improvement of data collection may be necessary because the data compiled may be best used when they are published as best practices and used as a bench mark for EE&C in Indonesian industry. To do so, the partnership should be significantly extended to reach out to more factories and industries. Audit should be limited to preliminary audit.（Number of audit reports received are 200 in 2007, 32 in 2006）Audit under the partnership program may be at a preliminary-level which aims at energy reduction through a good house keeping. Additional audit training may be provided to BPPT and EMI. Another important task is to monitor actual implementation of EE&C activities which were recommended by the partnership program.

Detailed energy audit may be carried out on a commercial basis followed by the preliminary audit. Audit results such as energy use, EE&C activities, potential energy saving, etc. should be compiled anonymously and be disclosed publicly to promote EE&C. (Audit results obtained on a commercial basis should be kept confidential.) Information on best practices in Indonesia should be collected to the maximum extent possible.

(4) Implementation of Seminars, Education and Training on EE&C

It is identified that provision of EE&C training and seminar throughout the country will be significantly important for promotion of EE&C. Though this activity, both “promotion and dissemination of EE&C” and “capacity development through enhanced knowledge and skills of EE&C engineers” will be materialized.

In the initial phase, particularly, sector-specific (e.g. textile, food, cement & ceramics, steel, etc) and industrial machinery-specific (e.g. air conditioners, electric power, pumps, compressed air, lighting, converters, rotating fans, etc.) seminars, training and education, and publications for promoting EE&C should be undertaken. Publications should be in Bahasa Indonesia. The highest priority should be placed on basic topics covered in the proposed examination for Energy Manager Certification. The training should be carried out by combing on the job (OJT) training and class room training. Combination of on-the-job training and classroom teaching should be considered effectively depending on the contents and type of the training.

(5) Target-Setting Agreement with Designated Factory

The ground work for introducing the Target-setting Agreement Program will be carried out in Stage I (2009～2015). The target setting agreement program consist of (a) designating factories and commercial buildings whose energy consumption exceeds a certain amount (6,000TOE/year at the moment), (b) nominating a qualified energy Manager (or managers) who is responsible for overseeing effective energy use at respective factories and commercial buildings, (c) mandatory and periodical reporting of annual energy use, (d) voluntary or mandatory agreement for annual energy use reduction, and other necessary measures and support to those who comply with the program. Currently, the government of Indonesia is preparing various prerequisites and preconditions for introducing the program

The preconditions for the program include: (a) establishment of examination for qualification certificate of energy manager, and (b) appropriate number of qualified energy Managers are nominated and assigned to the designated factories. Other preconditions may include: (c) "heat conversion table" for calculating energy usage is published annually, (d) external consultants who provide energy audit services to designated factories are trained and available, (e) sufficient number of energy engineers who can perform internal energy-related basic diagnosis for large companies (in-house auditors) are trained and available, (f) various supporting mechanism to request external auditor for seeking energy audit services, and (g) in addition to the mandatory energy usage reporting, designated factories shall mandatorily pledge annual energy usage reduction (energy usage reduction with legal binding). Combining all the measures listed above, EE&C may be promoted in Indonesia.

Currently MEMR is undertaking to prepare for the preconditions listed above. In the meantime, technical and financial support for MEMR's initiatives is necessary.

Actions to be taken to promote the programs

Items (1) to (5) listed above are a list of priority programs targeting the EE&C policy goals in 2025 in Indonesia. In order to materialize the plan, a separate list of immediate actions which should be carried out within 5 years is developed. The following section discusses these actions as an action plan.

1) Enhancement of skills and knowledge of engineers of EE&C

Table 4.2.1-1 indicates the number of factories in Indonesia by amount of energy consumed. According to the statistics, there are 882 companies whose energy consumption exceeds 3,000 kL/year. Assuming each company has 1.5 factories, total number of factories will be 1,323. Assuming many factories also use natural gas and electricity, the number of factories whose energy consumption exceeds oil equivalent of 3,000kL may be estimated to be about 2,000. (Note that the number of commercial buildings and their energy consumption is not yet available at the time of the report.) When the number of designated factories is estimated to be 2,000 and each factory nominates one energy

Manager, number of qualified energy managers (with certification) required is three times the number of factories i.e.about 6,000 energy managers with certification.

Table 4.2.1-1 Number of Companies by Consumption of Fuel Oil in Indonesia

	Energy consumption (ton of oil equivalent (toe))						
	<6,000	6,000-12,000	12,000-16,000	16,000-20,000	20,000-40,000	40,000-100,000	>100,000
Industry	19,568	305	96	60	141	55	53
Power plant	3	1	0	1	3	3	7
Building	3,366	35					
Total	22,937	341	96	61	144	58	60
Accumulated numbers of energy user	23,697	760	419	323	262	118	60

Source：EMI Report

There are a couple of prerequisites for establishing energy management through designating factories with large energy consumption. For example, MEMR should ensure sufficient number of able officers who can oversee the factory and make training available. It should be noted that the number of officers who oversee the energy use in industry depend on how strict the regulations and reporting requirements would be. Therefore procedures and requirements (such as nomination of energy managers in factory, and reporting requirements) associated with the proposed regulation needs to be defined specifically. This may clarify actual needs of training as well as number of officers required, or recruitment required, if necessary, at the local level.

In addition, a reform in taxation to accelerate investment in EE&C is very important. Regulation and support are not alternative choices but complementary. To realize effective EE&C measures in Indonesia, a down to earth discussion by looking into the balance between administrative cost and effectiveness of the measures is essential.

2) Furnishing Regulations for Energy Manager Program

The government of Indonesia is preparing to introduce its energy manager program. It realizes that various bylaws need to be defined when the program is fully introduced in Indonesia. The following items may need to be completed prior to implementation of the program:

a) Defining details of the designated factory program

In order to introduce designated factory with mandatory reporting of energy consumption to the government, exemptions form the program need to be clarified. Based on the statistical data of energy consumption in Indonesia, such thresholds are still under review. The Study Team has recommended that 3,000 TOE/year may be an appropriate number for further discussion. Such number should be thoroughly reviewed by taking administrative cost and benefit into consideration. The team will continue providing MEMR necessary information and recommendation during the course of the Study.

b) Details of the reporting requirement

According to the ongoing discussion between MEMR and the Study Team, the designated factory may be subjected to reporting annual energy consumption and obliged to reduce a certain percentage of total energy consumption every year. The data submitted by the factories should be compiled and may be utilized for the macro energy policy of Indonesia such as accurate energy supply and demand statistics, industrial input and output, etc. The procedure for the reporting requirements, however, is still under review. Therefore no announcement for the regulation and requirements has been made to the public. It is highly necessary for the government of Indonesia to finalize the procedures and to announce them to public as early as possible because such reporting requirement is linked to availability of EE&C technology in industries. The capacity to deal with such requirements is also associated with availability of audit services and EE&C related information in market. These elements should be considered when the program is realized. Apart from periodical reporting on energy consumption, it needs an enormous effort from designated factories, local government and central government in data handling, checking, feedback and analysis. Sufficient human resources and budget should be prepared for this. Fig. 4.2.1-1 shows the flow of periodical energy consumption reporting system in Japan and Vietnam (draft). In Japan, the central government takes a lot of measures and data base is managed by ECCJ. Besides Vietnam has once failed to manage periodical reporting system (started in 2004). Reviewing this failure Vietnam is now considering utilizing its national statistics organization to collect periodical energy consumption data. In Indonesia, the draft idea of periodical reporting should be communicated as early as possible to local government and targeted factories.

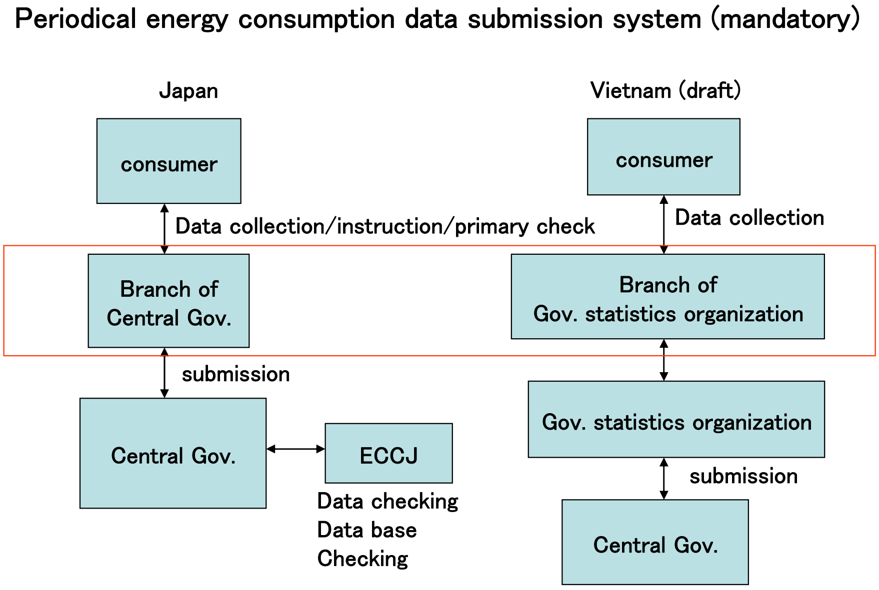


Fig. 4.2.1-1 Flow of Periodical Reporting on Energy Consumption Data (Example of Japan and Vietnamese Draft)

c) Transitional relief for existing facilities

The regulations (i.e. Energy Manager Program, designated factory program for mandatory reporting and energy reduction, etc.) require technological and financial support for existing factories and buildings. The institutional and organizational arrangements are prerequisites for realizing visible improvement of EE&C among factories and buildings. In order to achieve such objectives, transitional reliefs to existing establishments are necessary. Strict enforcement of the regulations is only effective when financial and technological support is provided simultaneously. Examples may include exemption from the mandatory energy reduction when the company meets certain pre-arranged conditions.

d) Taxation and subsidies reform

Proper EE&C related investments to factories and buildings is one of the important elements of promoting EE&C. Tax exemption to certain EE&C investment for both factories and buildings are the most effective approaches for realizing EE&C. Other relief may include energy audit, and dissemination of energy manager program. Other approach may be provision of soft loans by subsidizing the banks and municipal offices. These reforms on taxation are very effective for accelerating energy manager program in industries in Indonesia.

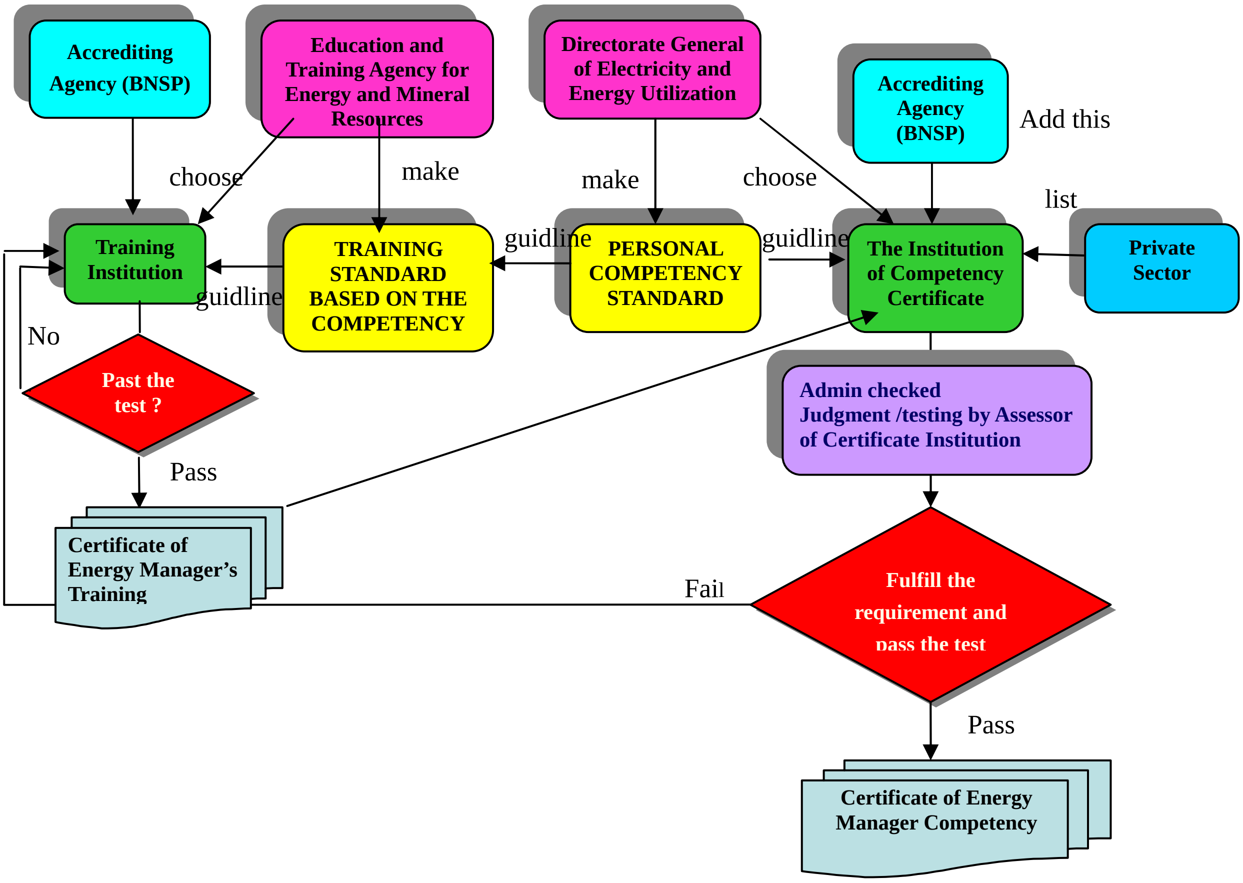


Fig. 4.2.1-2 Organizations and Procedures of Energy Manager Certificate Examination

e) Procedures for implementing energy manager program

Formulation of procedures for examining the energy manager qualification certificates is undertaken by MEMR. Training necessary for the examination will be conducted at ETCERE under the guidance of MEMR. A separate agency will be established to oversee and implement the examination. (Fig. 4.2.1-2) Though the competency standard for the proposed energy Manager has been listed in NSI, regulations to administer the examination are yet to be published. The procedures that may be defined in the regulations are critical for ensuring fairness in the proposed examination. The regulations for carrying out the examination are necessary while the qualification standard has been already defined and clarified in the standard.

f) Identifying the Training Needs

The certificate for the proposed Energy Manager will be issued based on the educational qualifications and the results of examination. Those who fail the examination will be granted the same certificate upon the completion of a training program. According to the plan prepared by MEMR and ETCERE, the eligibility criteria for the examination will be engineers who have sufficient field experiences in industry. The requirements, however, will be relatively challenging for those who lack practical experience and/or for those who lack professional-level education and training (Fig. 4.2.1-2).

It may be necessary for MEMR and ETCERE to provide education and training programs, to establish the training institutions, and to train trainers complying with the proposed qualification standard. The tasks MEMR and ETCERE need to accomplish are to furnish the institutional arrangement for the examination, to identify the training needs to fulfill the competency standards and to achieve actual EE&C in the factory. To achieve these multiple objectives, the Study Team may have to communicate with MEMR to identify their needs.

g) Competency Standard

The Indonesian side has listed the proposed competency standard for the Energy Manager in NSI. It is expected to prepare other competency standards such as Energy Auditor, Assessor for Energy Management, and Energy Manager for Industrial Processes. Establishment of the competency standard for Energy Manager was appropriate for successful implementation of EE&C in Indonesia. The preparation of competency standard for Energy Auditor, however, raises several questions on its feasibility. The most significant question is whether a pool of qualified individuals is available. The Energy Manager program is yet to be started at the time of writing. It will be difficult to ensure enough number of qualified engineers who are able to provide consulting services of energy audit for the private sector. But the number of available qualified energy Managers with relatively lower qualification than the auditor is unclear.

Appointment of assessors for the examination will be critical when the national-level examination is carried out. The qualifications of the assessor have not been published. In the course of the study, the Study Team will continue to assist MEMR on this matter and to provide necessary information when requested.

The need for energy managers focusing on industry processes has been proposed by MOI. The competency for such managers may have some duplication in competency compared to the existing Energy Manager competencies proposed by MEMR. At the factory-level it may be difficult to draw the line because the roles and responsibilities of the two managers with separate qualification levels since in the real situation the roles may be similar to each other. When MOI starts the preparation of the proposed energy manager on its own, MEMR needs to assist MOI to avoid unnecessary duplications. It is further recommended that a platform to coordinate the two ministries should be established to discuss the issues related to EE&C regularly.

h) Issue Regarding the Heat Subjects in Competency

The Study Team has pointed out that the competency standard for energy managers prepared by MEMR may cover thermo-mechanical subjects. The Indonesian side has replied that the standard is prepared based on the needs identified by the local industrial requirements. The team also questioned the feasibility of defining similar competency for energy auditors as energy manager because of the difference between responsibilities of energy manager and auditors. The team further suggested that two separate qualifications for energy manager should be defined based on the level of energy consumption as was done in Japan. (In Japan, smaller factory only nominates a person who is in charge of energy management under the guidance of qualified energy managers. In a large factory, a qualified individual should serve as the energy manager who is responsible for all aspects of energy use.)

i) Dissemination of Energy Management Techniques and Technology

The enactment of the Energy Law has led to more effective regulations toward commercial buildings. In the private sector, however, there is a need of providing education and training on EE&C techniques and technologies to all levels of managers and engineers covering all industrial sectors. The existing program carried out by ETCERE is only targeted to government officers who account for less than 100 participants every year. The training center has a plan to extend the program allowing private sector employees to participate. The Study Team will support these initiatives.

The Japanese side has pointed out that the ETCERE in Jakarta is not equipped with sufficient facilities for providing EE&C training for the industrial sector. The Indonesian side explained that the facility is adequate because the content of the training is focusing on the managerial aspect of the requirements, and it does not need to have a large facility area. If necessary in the long run, the parcel of land next to the facility may be purchased.

Table 4.2.1-2 Facility of ETCEMR

Items	Specifications and description
Land	3,590 m^2
Building	Total Floor Area: 3,500 m^2, floor plan,3
Lodging facilities (dormitory) for participants coming from outside Jakarta	Specifications of lodging facilities etc. ETCERE does not have dormitory facility and takes the participants coming from outside Jakarta to Wisma/hotel nearby education and training place.
Lecturing halls	Number 4, size 7x7m^2, equipment and capacity etc:
Seminar rooms	Number: 1 size 187.2m^2; equipment: presentation screen, parallel microphone, in focus and capacity: 150 persons

Table 4.2.1-3 Comparison of MEMR and MOI Training Facilities

Items and Issues	ETCERE	MOI Research Center
Primary focus of the institution	Training provider exclusively for the employees of MEMR with a focus on energy and mineral resources (e.g. electricity)	Research institution. Subjects include (1) calibration of measuring devises, (2) chemical, (3) packaging, (4) food science, (5) industrial waste management.
Human Resources and expertise	Main expertise is electricity, renewable energy (mini hydro power), some motor and air conditioning	Expertise includes chemical process, solid waste management, water quality control etc. Some thermal sciences because of combustion of solid waste was one of the study subject in the past.
Financial Resources	Not Available	Not Available
Facility and Location	Land area is limited. It is situated in the mixture of industrial/residential area. No space for expansion.	Large space with a couple of buildings hosting several laboratories. Some vacant space within the building.
Training Program	Exclusively for the public sector employees	Approx 320 trainees including those from the private sector.
Other Issues	Affiliate of MEMR. Its aim is to train public employees and not the private sector employees.	Consider the relationship and demarcation with MEMR. Close tie with the industry sector near Jakarta

j) Education and Training Institutions and Training Curriculum

The basic design of education and training for the proposed Energy Manager Certification Program is reviewed and presented in the Table 4.2.1-3 based on the collection of available data. The table will be a preliminary study result to be used for a PCM workshop scheduled in June 2008, during the fourth field survey of the Study. It is planned to share the current status of the training and to reach agreement on the training program among stakeholders. The Training Matrix presented here is a tentative plan to be used in the workshop.

Table 4.2.1-4 Tentative Training Design Matrix

Issues to be discussed	Options	Finding	Note
Who should be trained initially?	(1) Begin by training the trainers; (2) by training senior leadership; (3) by training the supervisors of frontline staff; or, (4) by strengthening frontline staff.	Initial target of the training would be (1) instructors and lecturers of ETCERE, and (2) senior leadership of ETCERE. Overall training design would be a *cascade* strategy to formulate training program to begin with training of trainers at ETCERE. It would cascade down to the senior leadership of the industrial sectors with a specific focus on (i) iron and steel, (ii) textile, (iii) food and beverage, (iv) paper and pulp, and (v) commercial building. The next step, the most substantive technology transfer, would be a training program focusing on supervisors through introduction of energy manager certification program. Dissemination of EE&C technology in the frontline staff would be carried out by advanced level trainees who received training at ETCERE. Awareness building for EE&C is still necessary since all levels of society have weak understanding of needs of energy conservation. Therefore, it is important to include training activities in the overall design that mix levels, functions and organizational perspectives. To do so, initial training for energy manager may be targeted to senior Managers at MEMR, MOI. Then the next would be TOT at prospective training institutions.	1. A cascade strategy is a cost-effective approach for training. Begin with training of trainers. Then cascade down to senior leadership, supervisors and frontline workers. 2. Organizational problems identified cannot be solved at a single organizational level.
How should trainees be selected and grouped?	Restrict training to members of MEMR or include staff from multiple organizations (including MOI, Training Center and others) ; restrict training to members of a single organizational unit or include staff from multiple units; restrict training to one organizational level or include people with a mix of organizational responsibilities;	Currently, the training subjects are limited to EE&C in commercial building at the ETCERE because of MEMR’s jurisdiction. Initial strategy presented by MEMR for starting the training by focusing on commercial building would be functioning. Under the senior leadership with MEMR and MOI, MEMR should establish a platform to discuss and coordinate cross-cutting issues related to EEC. In particular EEC training for industrial process may be extended with the coordination between MEMR and MOI.	1. In general, trainee groupings should correspond to the roles and functions within organizations that have a bearing on the problem that the training is attempting to address. Usually, this involves trainees from multiple units. 2. Where there are important points of similarity, a mix of organizations and/or levels within an organization offers productive cross-fertilization of ideas, promotes innovation, and enhances the training climate.

Issues to be discussed	Options	Finding	Note
Who should design and implement the training on EE&C?	Internal facilitators (MEMR staff members); Study Team members; external local facilitators (roles of local consultants); or, a mix of these types.	With a support from JICA experts, Indonesian Instructors will develop and furnish a basic textbook based on the training for improving the quality of Type 2 Energy Managers that is provided by the METI or by a Designated Training Agency pursuant to the provision of an Ordinance of the METI. The proposed training program should be developed in accordance with the outcomes derived from Japan's past technical cooperation in Asia as well as the on-going international initiatives led by USDOE and ISO to standardize EEC technology based on ANSI MSE 2000:2005	1. Training is best designed and implemented by those closest to the organization who possess the requisite capacity building and training skills. In ascending order of preference, this means that priority is given to international facilitators; external local facilitators; internal facilitators. 2. Where international or external facilitators are used, their role should primarily focus on training of trainers (TOT) and short-term backstopping local trainers who are graduates of TOT programs.
Where should the training take place?	On-site in the factory; off-site at the Training Center; off-site at a training or technical institution?	At the time of writing, the training facility is not yet identified. Indonesian side provided information on possible training and education institutions. Indonesian side has provided prospective training site including ETAEMR training center as a primary training center initially. Other facilities may be utilized as training centers for the proposed examination for Energy Manager Certification.	1. The training site may be finalized through coordination between MEMR and MOI. The role of the two ministries needs to be defined and clarified for promoting EEC technology to all industries.
What materials are needed to support the training?	Packaged, off-the-shelf courseware; open-ended, locally prepared exercises; case studies; a mix of types.	(1) Available training resources and materials Not identified yet. A new textbook aiming at the exam will be developed based on the competency defined. (2) Any packages available None. The training curriculum is under development based on the proposed competency standard listed in NSI. (Work schedule and date of completion should be defined when the law is enacted.) (3) Bahasa Indonesia version available in any cases?	1. Whatever their origin, good training materials allow participants to solve authentic open-ended problems in group settings and address a range of organizational constraints including inadequate knowledge and organizational culture.

Issues to be discussed	Options	Finding	Note
		The above-mentioned training curriculum is developed in Bahasa Indonesia.	
What training methodology should be employed?	Open-ended discussion and exercises designed to inculcate new attitudes and values; hands-on, structured, skills-based training designed to impart specific knowledge essential to capacity building; a mix of types.	(1) What is the idea that Indonesian-side envisions for short and long term in the future? Current finding indicates that initial focus should be on commercial buildings. (Energy conservation at public building has been defined by the separate regulation to enforce EE&C.) Mid-term objective may be industry with coordination between MOI and MEMR. Further objectives need to be discussed with MEMR and MOI. (There is a need for identifying and finalizing more specific objectives nearer than the policy goal of achieving energy intensity of less than 1.0 by 2025.)	1. In general, fundamental changes in organizational capacity require shifts in organizational culture. This is best accomplished by providing trainees with group-centered opportunities to explore new values and give voice to any resistance they may feel toward them.
What should the training objectives be?	Mastery of specific functional skills; changes in organizational culture; team-building; enhanced capacity for organizational learning; introduction of TQM or some other customer-focused change; new capabilities to respond to changes in the external environment.	(1) Training Objectives need to be discussed in more detail based on the finalized competency standard. In-depth discussion to include heat subjects in the competency is necessary. (2) Different objectives needs to be defined based on who the target trainees are. Senior manager should be taught the subjects related to awareness building for EEC rather than technical ones. Mid-level manager with technical background should be taught practical subjects based on the needs assessments. (3) Possible integration of TQM and EEC is one prospective subject matter for both senior and mid-level Managers because ISO50001 series will be officially launched by the end of 2010. Further discussion needs to be conducted in the course of the Study.	1. Selection of objectives must be realistic. In general, training can pave the way for fundamental organizational change, but is not, by itself, sufficient to accomplish such change. Overly ambitious objectives may turn people off when the expected results fail to materialize. 2. Training should be viewed as but one element of a capacity building strategy.
What should the length, duration, and timing of training be?	Short (under a week) and intensive; moderate (5-10 days) and intensive; long (11 days and up) and intensive; short and extensive (e.g., 4 days over 4 months); moderate, and extensive; long,	(1) Upon completion of training design based on the competency standard, detailed discussion would be carried out between Indonesian side and Japanese experts.	1. Intensive training is usually less difficult to plan and deliver, but may result in intolerable levels of disruption to the organization's functioning. 2. When training is extensive, it is more difficult to maintain momentum for change but easier to discuss

Issues to be discussed	Options	Finding	Note
	and extensive.		problems associated with the application of training content to an organizational setting.
How should the training be evaluated?	Participant feedback; client feedback; observation of participants; observation of services to clients; assessments of the organization's functional capacities; comparative assessments (before and after training) of the organization's effectiveness in achieving its mission; or, a mix of several of these options.	(1) Target group To be identified (2) Evaluation methodology, if any. Peer evaluation and Questionnaire survey. (3) Timing and frequency of evaluation of the training? Questionnaire survey should be conducted regularly. Detailed plan should be included when the training plan is developed.	1. The ultimate purpose of training is to achieve a fundamental change in an organization's achievement of mission. Impact evaluation must address this issue. 2. Formative evaluation is critical to improving an organization's training program and can be gathered from many difference sources including participants, clients, and observers.
How should training be financed?	Fully funded by the sponsor (e.g., the support organization); through a cost-sharing arrangement between the organization and the sponsor; fully funded by the organization; modest trainee financial contribution to cover some aspect of the training program (e.g., materials, lodging, in-kind donation of time).	(1) Budget of training within MEMR and MOI annually? Further discussion is necessary for cost recovery for the certificate/training program. (Along with the estimation of the administration cost) (2) How are they financed? To be discussed	1. Cost-sharing helps organizations to value the training they receive. 2. Trainees should be expected to contribute to the cost of training only when participation in training is at their option, and when direct benefit will accrue to them as a result of their having participated in the training (e.g., salary increments, promotions).

k) Accreditation and Certification for Energy Managers

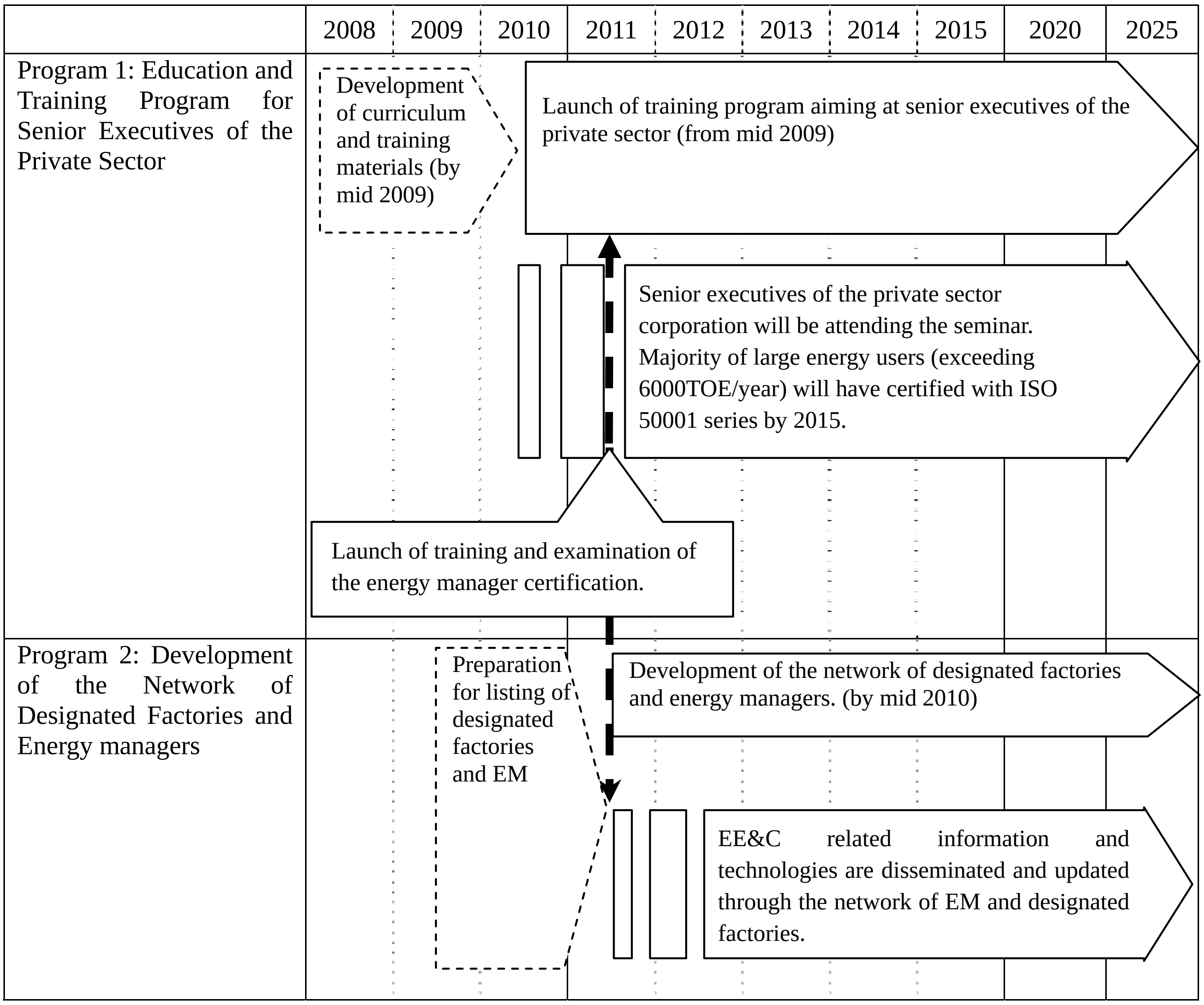
As described in 3.2, the Indonesian side is under discussion on certification for energy managers within the framework of national qualification standard procedures. The procedures for accreditation, therefore, are administered by various external agencies including BNSP under the Ministry of Labor and Transmigration, MEMR, ETAEMR and ETCERE (see Figure 4.2.1-2). Because of the necessity of coordination among these agencies and ministries, it is recommended to establish official communication channels. In addition, the on-going discussion and the review for preparation of examination (e.g. organizational arrangement for ensuring assessors, development of training curriculum, and trainer training, etc.) should be accelerated. The Study Team will continue to assist MEMR for its initiatives and to provide necessary information on this matter.

l) Standardization of Energy Management Technology

One of the effective approaches for realizing EE&C in developing countries is to standardize optimization of energy consuming facilities. The specific approach is to collect and share basic optimization technology through continuous improvement and optimization of facility operation, so-called low cost and no cost option for EE&C. The know-how for achieving EE&C by utilizing such technology should be systematically collected, documented in a manual to be shared as “common technology” and utilized by the whole country. When such an approach is adopted, ongoing initiative of standardization of energy management led by ISO should be taken into account.

3) Roadmap for formulating functional energy management program from the period from 2009 to 2025 is figured out in Table 4.2.1-5.

Table 4.2.1-5 Roadmap for the Energy Manager Program (1/3)



Program 1: Education and Training Program for Senior Executives of the Private Sector

Development of curriculum and training materials (by mid 2009)

Launch of training program aiming at senior executives of the private sector (from mid 2009)

Senior executives of the private sector corporation will be attending the seminar. Majority of large energy users (exceeding 6000TOE/year) will have certified with ISO 50001 series by 2015.

Launch of training and examination of the energy manager certification.

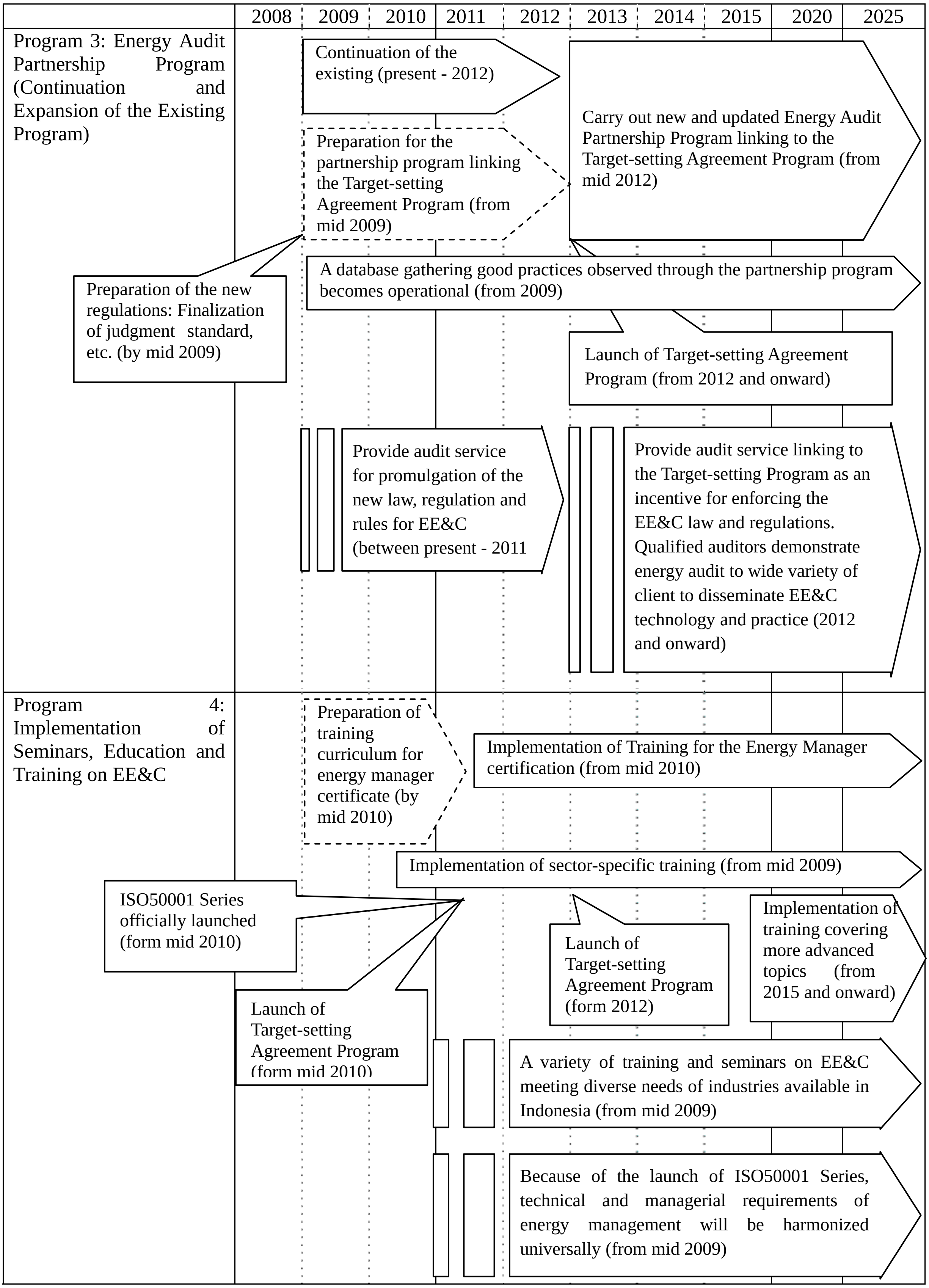
Program 2: Development of the Network of Designated Factories and Energy managers

Preparation for listing of designated factories and EM

Development of the network of designated factories and energy managers. (by mid 2010)

EE&C related information and technologies are disseminated and updated through the network of EM and designated factories.

Table 4.2.1-5 Roadmap for the Energy Manager Program (2/3)



Program 3: Energy Audit Partnership Program (Continuation and Expansion of the Existing Program)

Continuation of the existing (present - 2012)

Carry out new and updated Energy Audit Partnership Program linking to the Target-setting Agreement Program (from mid 2012)

Preparation for the partnership program linking the Target-setting Agreement Program (from mid 2009)

Preparation of the new regulations: Finalization of judgment standard, etc. (by mid 2009)

A database gathering good practices observed through the partnership program becomes operational (from 2009)

Launch of Target-setting Agreement Program (from 2012 and onward)

Provide audit service for promulgation of the new law, regulation and rules for EE&C (between present - 2011

Provide audit service linking to the Target-setting Program as an incentive for enforcing the EE&C law and regulations. Qualified auditors demonstrate energy audit to wide variety of client to disseminate EE&C technology and practice (2012 and onward)

Program 4: Implementation of Seminars, Education and Training on EE&C

Preparation of training curriculum for energy manager certificate (by mid 2010)

Implementation of Training for the Energy Manager certification (from mid 2010)

Implementation of sector-specific training (from mid 2009)

ISO50001 Series officially launched (form mid 2010)

Launch of Target-setting Agreement Program (form 2012)

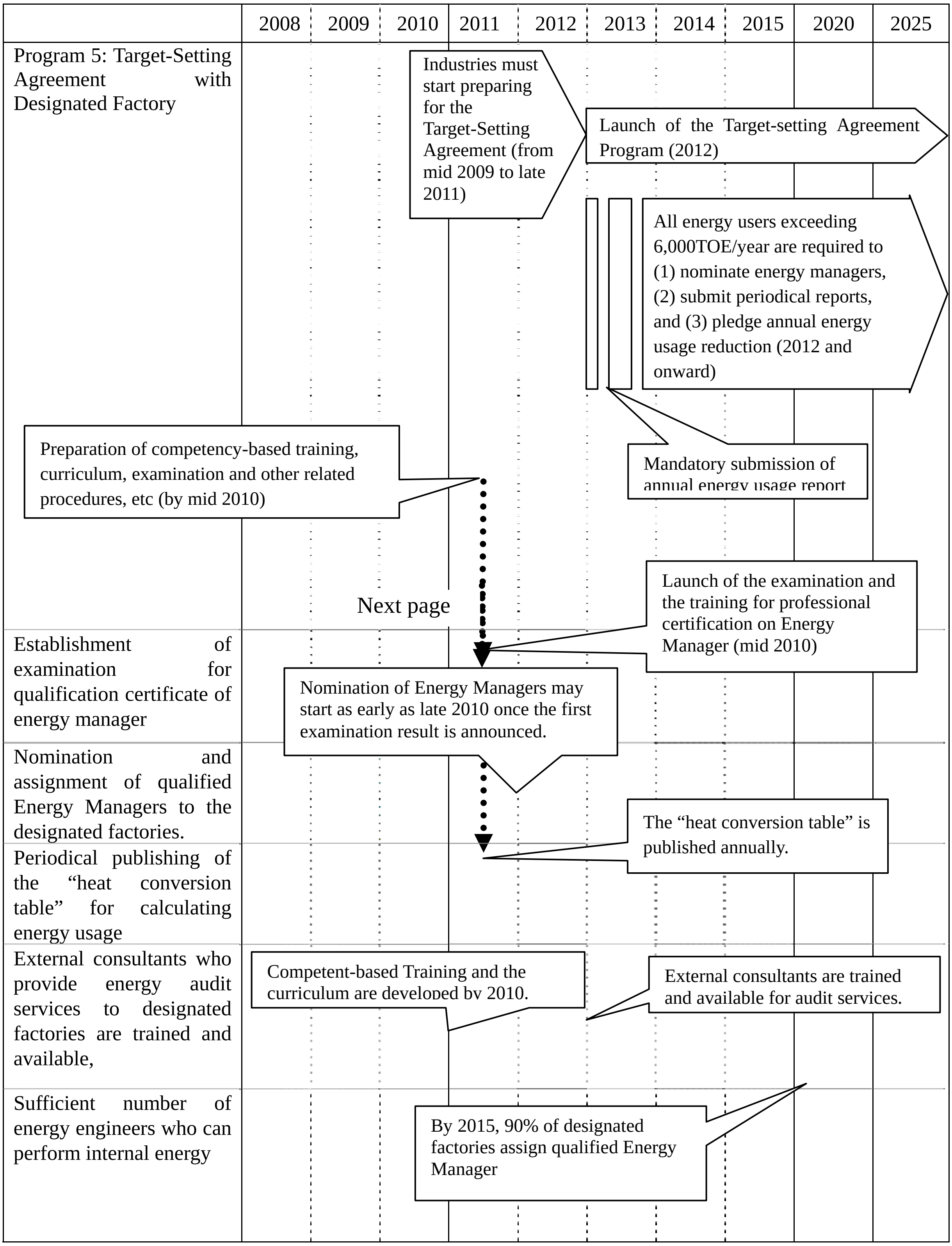
Implementation of training covering more advanced topics (from 2015 and onward)

Launch of Target-setting Agreement Program (form mid 2010)

A variety of training and seminars on EE&C meeting diverse needs of industries available in Indonesia (from mid 2009)

Because of the launch of ISO50001 Series, technical and managerial requirements of energy management will be harmonized universally (from mid 2009)

Table 4.2.1-5 Roadmap for the Energy Manager Program (3/3)



4.2.2 Energy Efficiency Labeling Program

(1) General

Program outline and action plans which shall be carried out for the implementation of the labeling program are shown in APPENDIX.

(2) Roadmap (draft)

Roadmap from 2008 to 2025 of the labeling program including illumination lamps, ballasts, TVs, refrigerators, air conditioners, personal computers, rice cookers, fans, well pumps and washing machines is shown in Table 4.2.2-1. The schedule was given by MEMR. Direction and recommendation for the actual establishment and operation of the labeling program are as mentioned below.

1) Legal framework

(Legislation of the MEMR Minister Decree);

In the draft of Governmental Regulation for the Energy Conservation, the practical management rule for the labeling program is expected to be issued as a ministerial decree. Thus, Present DGEEU decree which stipulates such rules shall be up-graded to a ministerial decree. The following are the items which should be included in the ministerial decree as general information for the labeling program.

a) Products to which the labeling program is intended to be applied
b) Role of manufacturers, importers and sellers and the government
c) Mandatory display of energy efficiency performance (Obligation to display labels which show the actual value of the energy efficiency such as electricity consumption and COP, etc. rather than the comparison label for energy efficiency target or standard).
d) Rule of the establishment of stakeholder committee for labeling criteria
e) Penalty

The labeling criteria for each product shall be issued in the form of public announcements from MEMR one by one.

2) Issue of regulation and public announcement;

Since the labeling program is voluntary, consensus on the program must be reached between business operators, their associations and administration before the issue of the regulations. This will ensure that business operators participate in the program intentionally and actively. The regulation shall be widely announced to business operators and also consumers.

3) Mandatory Display of Energy efficiency

Since the labeling program is voluntary, all the products in the market may not be labeled. In that case consumers cannot know the energy efficiency of products without label. Thus, display of energy efficiency on the products or packages shall be made mandatory for all products besides the requirement of labeling. In case of such display, consumers can understand and compare energy efficiency of different products at the shop.

Besides Japanese “Energy conservation law”, “Household Goods Quality Labeling Law” stipulates the contents of display which includes energy efficiency for appliances.

4) Establishment of committees for the labeling criteria and target setting;

Role of retailers and/ or their association is important for the operation of labeling program besides manufacturers and importers. As stakeholders, their participation in the committee for the labeling criteria and target setting is expected.

5) Products to which Labeling program is to be applied:

Official announcement about the products to which the labeling program is scheduled to be applied shall be published by the government in order to make manufacturers and other stakeholders prepare for the program.

6) Standardization for method of measurement of energy efficiency

(Establishment of standards for testing and calculation method for quality);

As per the original plan, standards for testing methods for quality including durability shall be provided first. If testing and calculation methods for energy consumption or efficiency of the products are stipulated in the standards for quality, such methods shall be applied to measurement for energy efficiency. In case there is no stipulated method in the quality standards, a new measurement method for energy efficiency shall be provided.

(Study of necessity for industrial standardization, adoption of existing foreign standards);

Establishment of SNI is not absolutely necessary if international or foreign countries standards can be applied in Indonesia.

7) Labeling criteria (Star mark rating)

As mentioned above, the criteria based on target setting and achievement ratio for the energy efficiency is simple and easy to understand, provided that the same method is applied to the all products with label. In India, target setting is adopted for the label of air conditioners, but achievement ratio is not adopted.

Labeling criteria for CFL which has been proceeding in Indonesia and star mark rating which is specified directly from energy efficiency doesn’t have the idea of “Target setting”. Thus, this issue shall be discussed.

8) Target value of energy efficiency and target year

By means of not only evaluating present energy efficiency, but also setting target values and time limits, review of the labeling program can be carried out efficiently. Upholding the target can have some positive effect on manufacturers, retailers and also consumers. Actually Japanese “Top runner method” has got good results.

9) Research for energy efficiency of products in the market (Setting for performance level);

In order to set the level of “High efficiency” and “Low efficiency” on the products sold in the market, major products shall be tested and evaluated for energy efficiency. In case that foreign labeling criteria are directly introduced, there is some possibility that almost all products in the market are given only two star rating or less.

10) Review of labeling program

Effect of the program shall be evaluated based on the sales data of labeled products submitted by the manufacturers or importers. Market research including that of unlabeled products is also expected to provide information on the difference between labeled and unlabeled products.

11) Database

; Around 30 new models of products such as TVs and refrigerators are featured into the market by a manufacturer in a year including model change. Penetration of labeling will need some concentrated management of data for the energy efficiency of the products, and improvement of convenience for business operators and general consumers. Thus, database shall be established.

12) Testing and verification

(Manufacturers laboratory test)

; Almost all manufacturers who produce major household appliances such as TVs, refrigerators and ACs must have their own laboratories and have the ability to implement the measurements required for determining the energy efficiency of the product in accordance with the standards such as ISO, IEC and JIS. Since models of products are changed frequently, it is not convenient on considerations to make it mandatory for manufacturers to get their products tested by an accredited testing laboratory. In order to spread the labeling program, label certification shall be given based on the result of manufacturer’s laboratory tests.

(Verification of manufacturer’s laboratory test)

On the other hand, a verification test by the government shall be absolutely necessary to maintain validity of the manufacturer’s data and an accredited testing laboratory shall be commissioned by the government to conduct such tests.

13) Public information

(Training to retailers and sellers)

; Consumers cannot fully understand the energy efficiency of the products only by seeing labels on products or packages. Well trained sellers who know enough about labels and can explain the same to the customers must be appointed in shops. Sign boards explaining EE labels are also expected to be displayed besides the products.

(3) Specific condition of each product

1) Refrigerators

(Measurement method of energy efficiency)

SNI 04-6711-2002 has already issued in Indonesia as the standard for measurement of electricity consumption. The standard seems to like as ISO8561. Ambient temperature is specified by 32 degree. The test method doesn't adopt door open and close which is introduced in JIS C 9801.

(Accredited testing laboratory)

BPPT has started measurement of refrigerator.

(Displaying items)

Following items shall be displayed inside or outside of all products

a) Name of product and type,
b) Nominal inner volume,
c) Annual electricity consumption with standard,
d) Outer size,
e) Manufacturer

2) TV sets

(Measurement method of energy efficiency)

There is no world wide standard such as ISO or IEC specifying measurement method of energy efficiency. Energy efficiency is given combining electricity consumption of operation mode and standby mode in several countries including Japan.

(Accredited testing laboratory)

Minimum condition of testing is to measure electricity consumption of TV set in an air-conditioned room. Many testing laboratories could be nominated.

(Display items)

Following items shall be displayed on the side or backside of all products

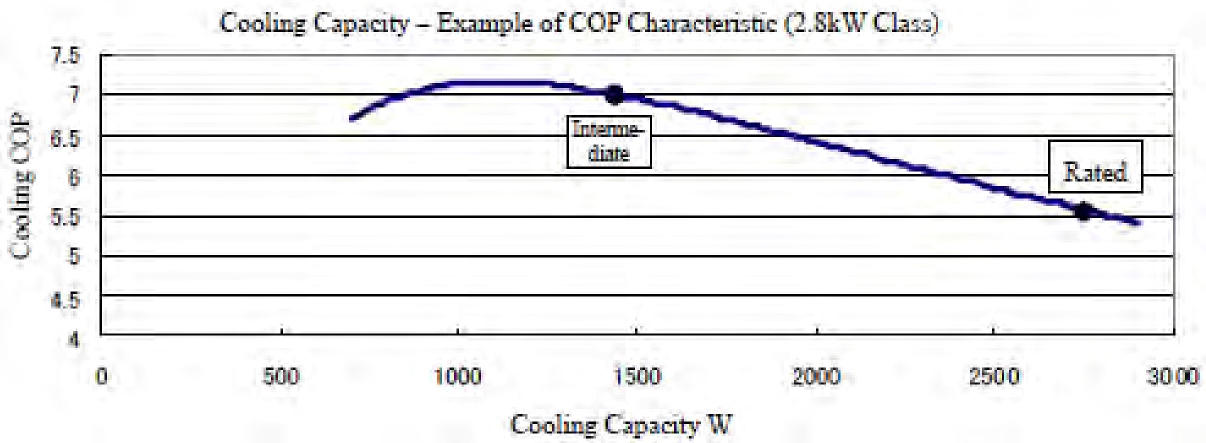
a) Size and type,
b) Annual electricity consumption,
c) Manufacturer

3) Air-conditioners

(Measurement method of energy efficiency)

Rated COP (or EER) is the most popular value for energy efficiency. ISO5151 provides testing and calculation method. In Japan APF (Annual Power Factor) has been substituted instead of rated COP as energy efficiency since 2006, because air-conditioners are used in winter for heating. COP at medium load is also considered for the calculation of APF. This method closes up and highly appreciates frequency control drive type, which brings good energy efficiency at the medium load when the climate is not hot. (See Fig 4.2.2-1)

Since air-conditioners are operated at medium or low load in Indonesia, APF might be preferable to be adopted in order to spread frequency control drive type of units. Although, rated COP can be used as the value for energy efficiency in the first stage, and gradually APF should be applied.



Source: Final Summary Report by Air Conditioner Evaluation Standard Subcommittee, Energy Efficiency Standards Subcommittee of the Advisory Committee for Natural Resources and Energy

Fig. 4.2.2-1 Cooling Capacity - COP Characteristic (2.8 kW Class)

(Accredited testing laboratory)

Calibrated room type or balanced ambient room type calorimeter specified in ISO5151 is estimated to cost 1.0-1.2 million USD by some Japanese providers. Air-enthalpy test chamber is cheaper than room type calorimeter, but costs 0.7-0.8 million USD. Thus, testing equipment is so expensive that only a limited number of testing laboratories will be nominated to conduct the tests.


Outlook of the test room

Air flow measuring case

Fig. 4.2.2-2 Air-enthalpy Test Chamber (Ohnishi Netsugaku Co., LTD Broacher)

(Display items)

Following items shall be displayed on the surface of indoor unit and outdoor unit.

a) Rated cooling capacity,
b) Rated electricity consumption,

c) Rated COP or EER,

d) Manufacturer

4) Lamps and ballasts

(Measurement method of energy efficiency)

“Lumen per Watt” shall be used for fluorescent lamps which is same as CFL. “Rated optical output ratio” shall be used for ballasts.

(Accredited testing laboratory)

Integrated sphere-photometer is needed for lamps and ballast. The accredited laboratories which have certification for the testing of CFL can also conduct testing of ballasts.

(Display items)

Fluorescent lamps shall be provided with the indication of a) Size and type, b) Electricity consumption, c) Total luminous flux, d) Lumen per Watt for the energy efficiency, e) Name of manufacturer on the products or package.

Indication for ballast shall be of a) Size and type, b) Electricity consumption, c) Rated optical output ratio for the energy efficiency, d) Name of manufacturer.

5) Personal computers

(Measurement method of energy efficiency)

“Watt per one million calculation” is used as the measurement method in Japanese Top Runner Standard. On the other hand the Energy Star Marks is used popularly.

(Display items)

Personal computers shall be provided with the indication of a) Name and type, b) Energy efficiency, c) Name of manufacturer on the products or package.

6) Fans

(Measurement method of energy efficiency)

Measurement method of energy efficiency for fans is very difficult, because the purpose of fan is to decrease wind-chill equivalent temperature of human beings. The method of measuring wind ferocity in front of fan is not suitable for the type of fan which doesn’t give air flow directly to people, but gives air flow to whole room space.

Therefore, the measurement method on structure and/ or function as if the fan has high efficiency motor or if air flow can be controlled finely, may be suitable.

7) Rice cookers

(Measurement method of energy efficiency)

Japanese Top Runner Standard specifies the measurement method of energy efficiency as the relation between cooking capacity and the electricity consumption not only for cooking but also keeping rice hot. The same method is recommended to be adopted.

(Accredited testing laboratory)

Many laboratories can conduct tests for the labeling provided that they have watt meters.

(Display items)

Rice cookers shall be provided with the indication of a) Name and type, b) Energy efficiency, c) Name of manufacturer on the products or package.

8) Household well pumps

(Measurement method of energy efficiency)

Energy efficiency can be given by multiplying rated motor efficiency and rated pump efficiency for the sake of convenience. Although, this efficiency is different from the efficiency at the actual water head including pipe frictional losses in household use and rated efficiency, investigation about actual water head and water volume shall be needed.

(Accredited testing laboratory)

The facilities such as water tanks which have head gap, piping and pressure gauges may be needed.

(Display items)

The products shall be provided with the indication of a) Name and type, b) Energy efficiency, c) Name of manufacturer.

9) Washing machines

(Measurement method of energy efficiency)

Washing machines are of three types; single basin, double basin and drum. Measurement method for energy efficiency shall be established for each of these types in such a way that relative performance can also be compared. Additionally, water consumption shall be evaluated. Measurement method of washing performance can be referred from relevant provision in JIS C9606.

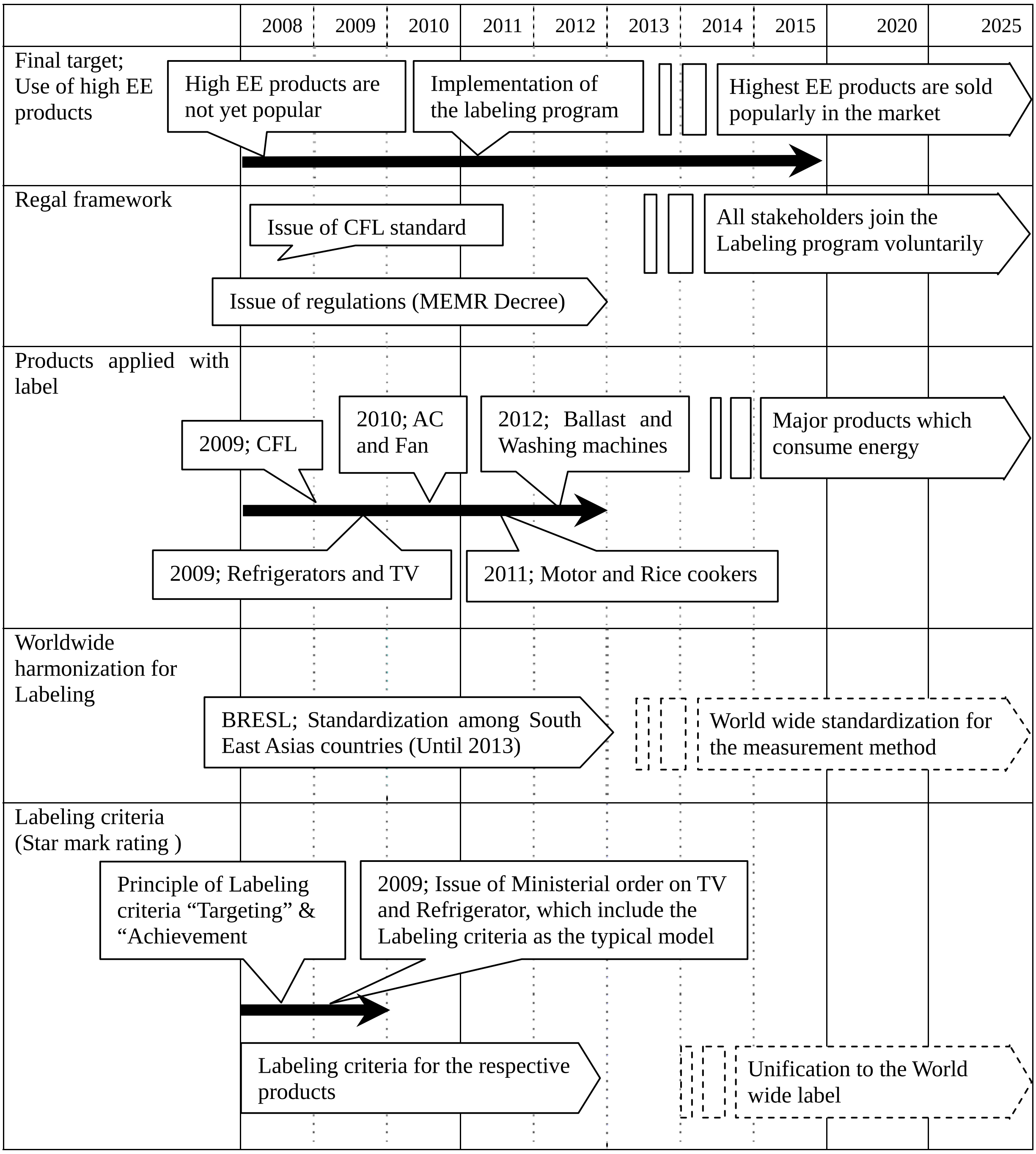
(Accredited testing laboratory)

The laboratories which have the ability of conducting tests for TVs or refrigerators can also conduct tests for washing machines.

(Display items)

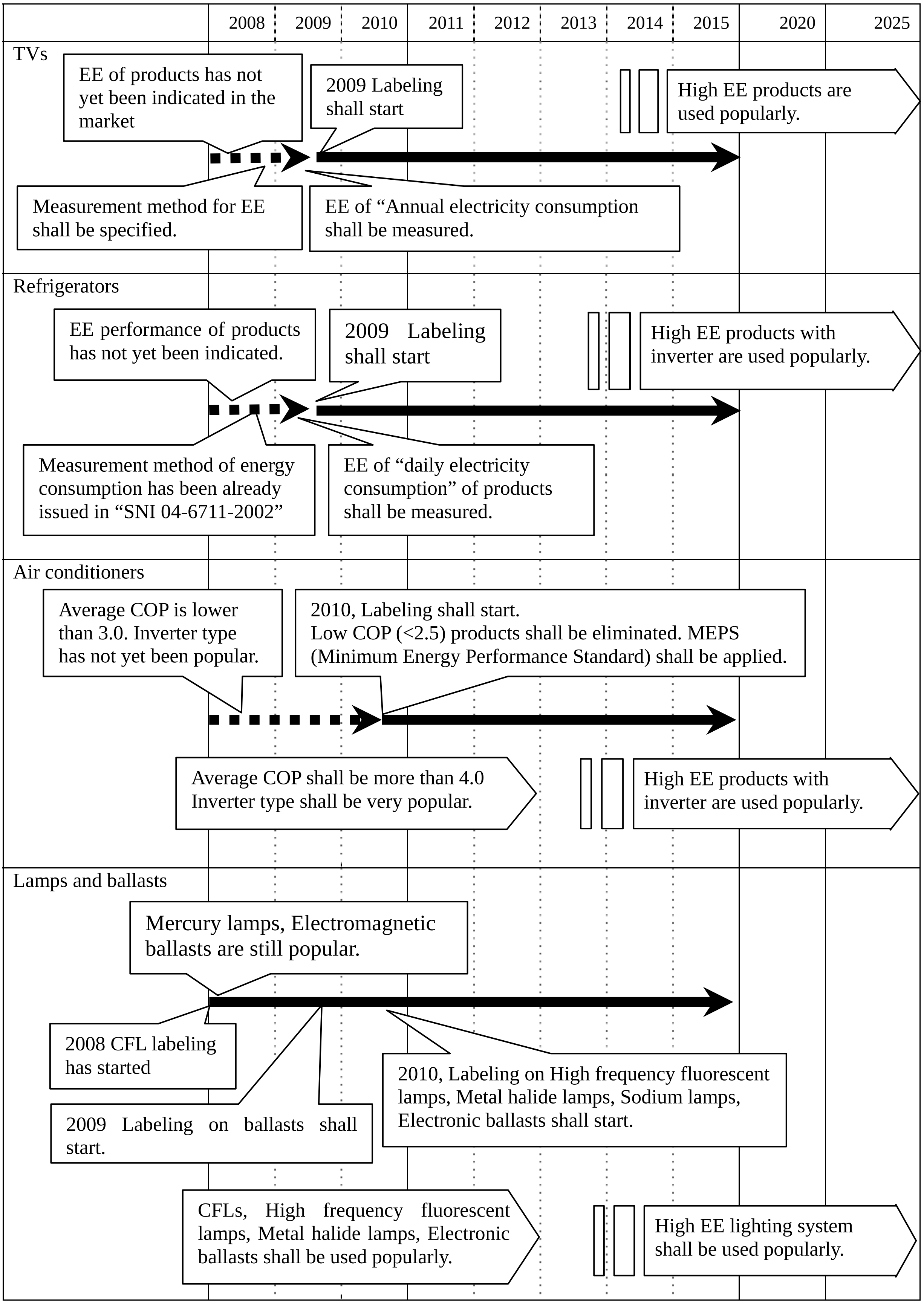
Washing machine shall be provided with the indication of a) Name and type, b) Washing capacity c) Energy efficiency, d) Name of manufacturer on the products or package.

Table 4.2.2-1 Roadmap for the Labeling Program (1/3)



EE; Energy Efficiency

Table 4.2.2-1 Roadmap for the Labeling Program (2/3)



TVs

EE of products has not yet been indicated in the market

2009 Labeling shall start

High EE products are used popularly.

Measurement method for EE shall be specified.

EE of "Annual electricity consumption shall be measured.

Refrigerators

EE performance of products has not yet been indicated.

2009 Labeling shall start

High EE products with inverter are used popularly.

Measurement method of energy consumption has been already issued in "SNI 04-6711-2002"

EE of "daily electricity consumption" of products shall be measured.

Air conditioners

Average COP is lower than 3.0. Inverter type has not yet been popular.

2010, Labeling shall start.
Low COP (<2.5) products shall be eliminated. MEPS (Minimum Energy Performance Standard) shall be applied.

Average COP shall be more than 4.0
Inverter type shall be very popular.

High EE products with inverter are used popularly.

Lamps and ballasts

Mercury lamps, Electromagnetic ballasts are still popular.

2008 CFL labeling has started

2009 Labeling on ballasts shall start.

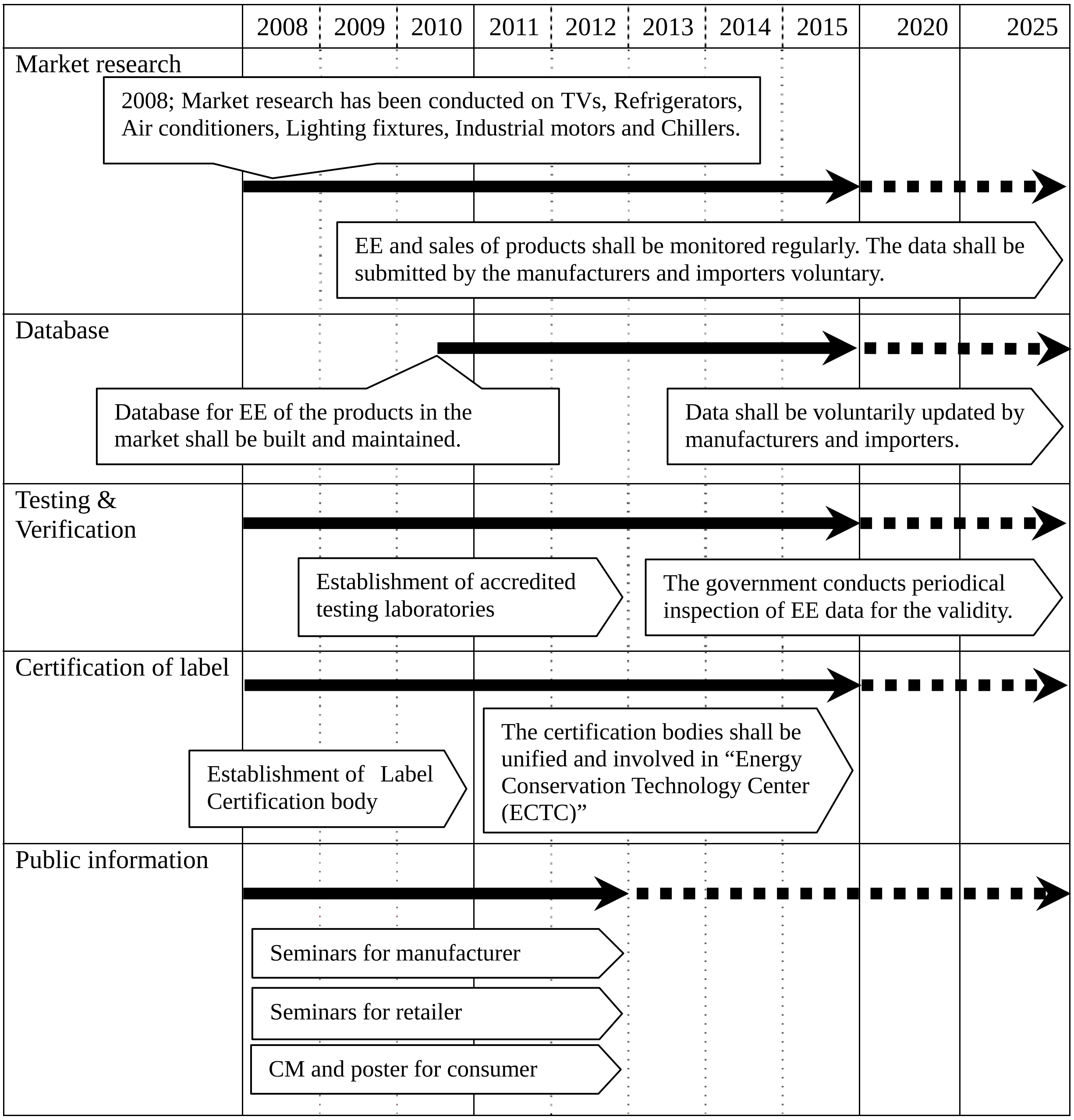
2010, Labeling on High frequency fluorescent lamps, Metal halide lamps, Sodium lamps, Electronic ballasts shall start.

CFLs, High frequency fluorescent lamps, Metal halide lamps, Electronic ballasts shall be used popularly.

High EE lighting system shall be used popularly.

EE; Energy Efficiency

Table 4.2.2-1 Roadmap for the Labeling Program (3/3)



Market research

2008; Market research has been conducted on TVs, Refrigerators, Air conditioners, Lighting fixtures, Industrial motors and Chillers.

EE and sales of products shall be monitored regularly. The data shall be submitted by the manufacturers and importers voluntary.

Database

Database for EE of the products in the market shall be built and maintained.

Data shall be voluntarily updated by manufacturers and importers.

Testing & Verification

Establishment of accredited testing laboratories

The government conducts periodical inspection of EE data for the validity.

Certification of label

Establishment of Label Certification body

The certification bodies shall be unified and involved in “Energy Conservation Technology Center (ECTC)”

Public information

Seminars for manufacturer

Seminars for retailer

CM and poster for consumer

EE; Energy Efficiency

4.2.3 DSM in Electricity Business

(1) Prospective Measures as DSM Program

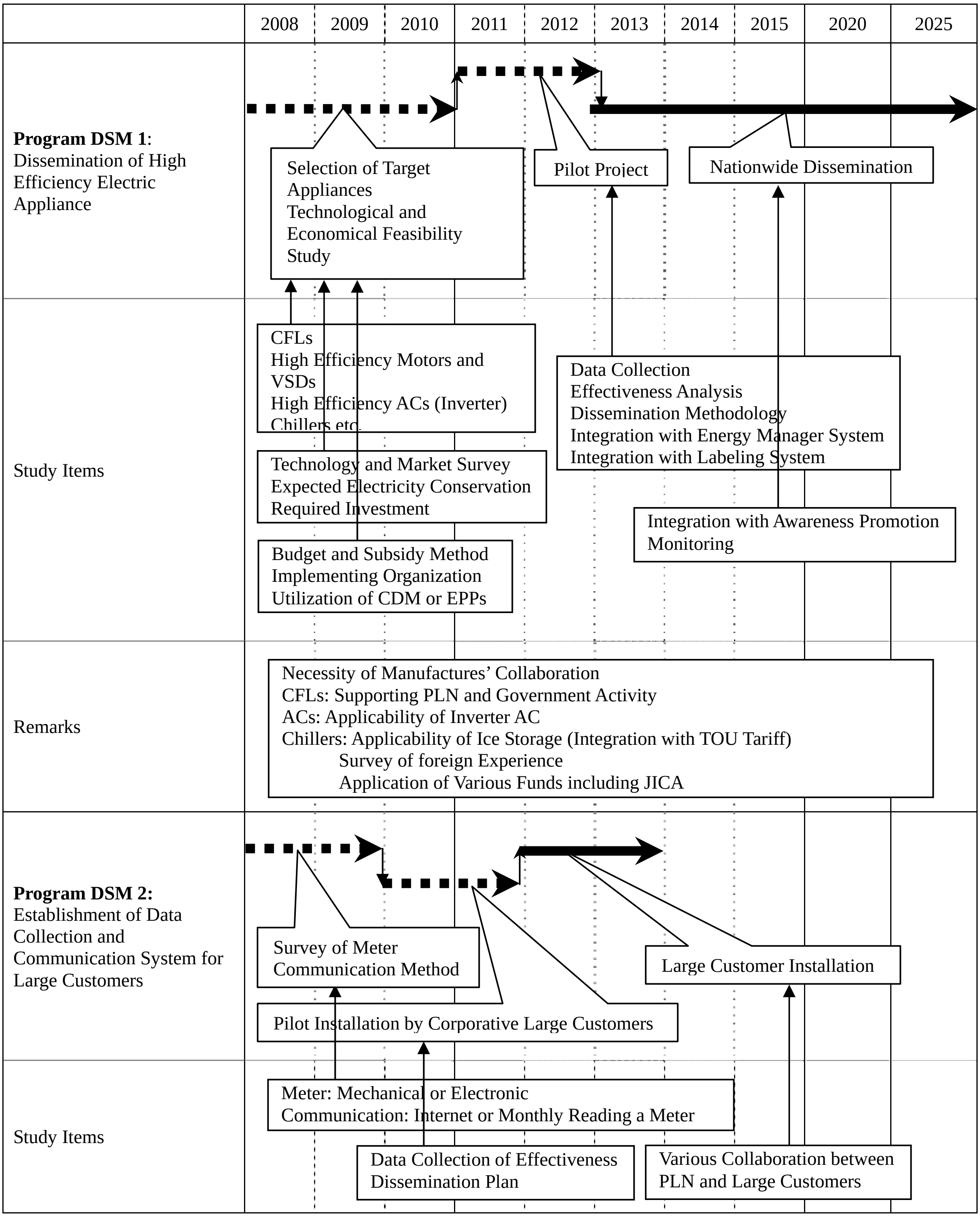
The Study Team discussed the issues mentioned in the previous Chapters with PLN and MEMR and selected prospective measures as DSM program. Program outline and action plan are shown in APPENDIX.

Table 4.2.3-1 Prospective DSM Program

Category	Item/New Idea	Content/Problem	Countermeasure	Counterpart
High Priority Electric Appliances	CFLs	Dissemination to People	Subsidy	MEMR/PLN Residential
	High Efficiency Motors/VSDs	Awareness of EC Effectiveness	Labeling	MEMR/PLN/MOI Industrial
Middle Priority Electric Appliance	ACs	Low COP	Availability of High COP Product (labeling, MEPS) Introduction of Inverter Air Con	MEMR/PLN Residential and Commercial
	Chillers	Economics	Technology Improvement	
		Fund	Study of EPP scheme	
Tariff	Establishment of Data Collection System for Large Customers	Communication and Cooperation	Meter Installation for Load Management (MW, kWh, Power Factor, Load Curve)	MEMR/PLN/MOI Industrial and Commercial
	Optional Tariff	Load Management and Emergency Contract	Study of Win-Win Contract	
	Power Factor Improvement	Initiation of PF Improvement	Promotion of PF Improving Equipments	MEMR/PLN/MOI/ Industrial and Commercial
		Not Attractive Tariff System (Penalty Type) Threshold of 85%	Demand Charge × $\frac{185\text{-PF}}{100}$	
Audit	Energy Analysis Support System (EASS)	Simple Auditing and Cooperation	Suggestion to Customer for EC Load Adjustment Collaboration	PLN/Consultants Industrial and Commercial
Awareness for EC Promotion	Seminar/ Workshop TV Program /Education /Booklet	Selection	High Efficiency Appliance Selection Performance Comparison of Various Products in the Market and Disclosure	MEMR/PLN All Sectors/School
		Operation	Methodology of EC (AC Setting Temperature)	
		Education	Public/Children	

(2) Roadmap for formulating functional DSM program from the period from 2009 to 2025 is shown in Table 4.2.3-2.

Table 4.2.3-2 Roadmap for the Demand Side Management Program (1/3)



Program DSM 1: Dissemination of High Efficiency Electric Appliance

Selection of Target Appliances
Technological and Economical Feasibility Study

Pilot Project

Nationwide Dissemination

Study Items

CFLs
High Efficiency Motors and VSDs
High Efficiency ACs (Inverter)
Chillers etc.

Technology and Market Survey
Expected Electricity Conservation
Required Investment

Budget and Subsidy Method
Implementing Organization
Utilization of CDM or EPPs

Data Collection
Effectiveness Analysis
Dissemination Methodology
Integration with Energy Manager System
Integration with Labeling System

Integration with Awareness Promotion
Monitoring

Remarks

Necessity of Manufactures' Collaboration
CFLs: Supporting PLN and Government Activity
ACs: Applicability of Inverter AC
Chillers: Applicability of Ice Storage (Integration with TOU Tariff)
Survey of foreign Experience
Application of Various Funds including JICA

Program DSM 2: Establishment of Data Collection and Communication System for Large Customers

Survey of Meter Communication Method

Pilot Installation by Corporative Large Customers

Large Customer Installation

Study Items

Meter: Mechanical or Electronic
Communication: Internet or Monthly Reading a Meter

Data Collection of Effectiveness
Dissemination Plan

Various Collaboration between PLN and Large Customers

Table 4.2.3-2 Roadmap for the Demand Side Management Program (2/3)

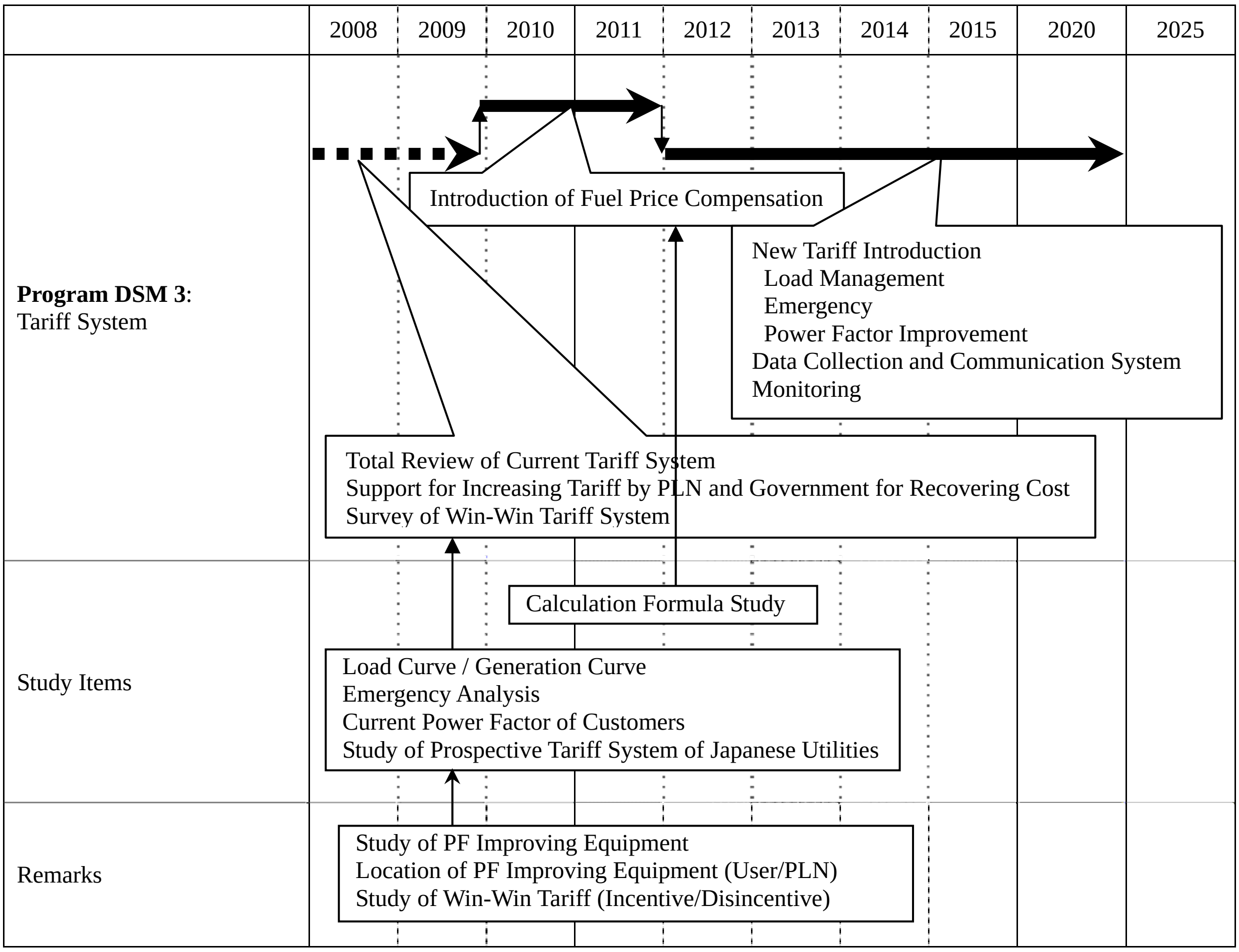
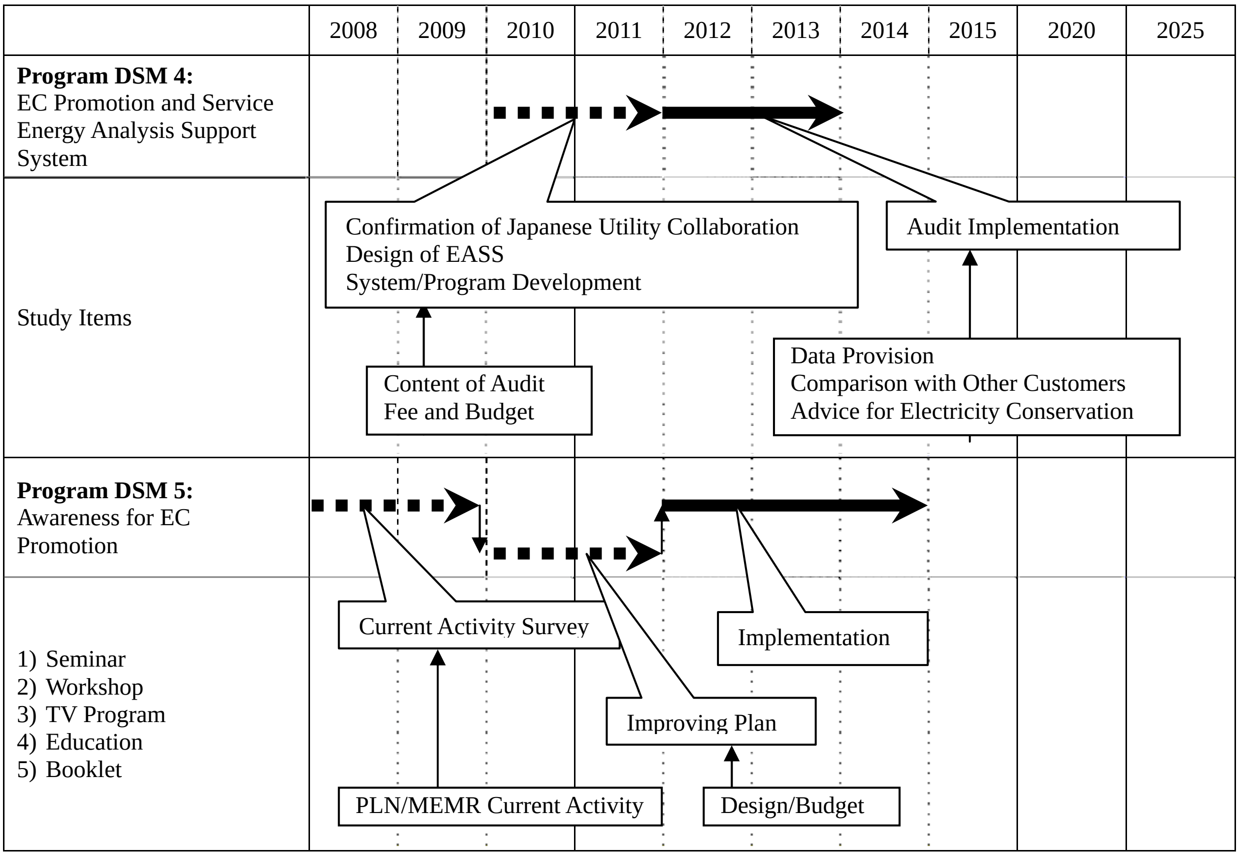


Table 4.2.3-2 Roadmap for the Demand Side Management Program (3/3)



4.2.4 Common Program

As "Common Strategy for Promoting EE&C", the following measures should be discussed further. The outline of proposed program and action plan are shown in APPENDIX.

(1) Establishment and expansion of award program for achievement of EE&C activities

The award program has high priority because it is considered to be an effective incentive for promoting EE&C for its publicity when managed properly. There are some existing award programs in Indonesia. They can be expanded in in the immediate future. Additional award programs may be carried out in the mid-term plan.

The only award program existing in Indonesia is administered by ASEAN Center for Energy (ACE) which acknowledges EE&C activities carried out by commercial buildings. The program, however, may need to reach out to industry. To do so, which industry and how to extend the program may be the issues to consider. In addition, support from MOI may be an effective approach to carry out the award program.

The proposed award program should be an opportunity to learn lessons from the good practices and to promote the most effective approach as role model for the specific sector. It also provides a framework for implementing effective EE&C practices. To do so, systematic collection and analysis of EE&C practices and the publication of the analytical results is necessary. Additional activities may include seminars and training to provide participants with an opportunity to learn from the existing examples. In addition, the award program should be fully supported by the Ministry of Energy and Mineral Resources and, possibly, the Ministry of Industry. Other possible award program may be supported by the private sector. They are omitted in this Study because they may be implemented internally by linking salary and benefits for their employees.

(2) Establishment of Clearing House (Promoting EE&C design and use of EE&C goods and materials)

The sole purpose of establishment of this program is to collect technical and product information related to EE&C. The proposed establishment of a clearing house provides a one-stop service to distribute such information to those who are interested in implementing EE&C. Prospective information that may be provided will be technical information (energy efficient production design, machinery and equipment, etc.) and introduction of financial support for EE&C (focal point for application procedures, etc). Typical information that may be provided is: new technology and equipment such as invertors, HF fluorescent lamps, small once-through boiler and ceramic fiber insulation, etc. In addition, it may cover energy saving potential by employing such technologies and methodologies by utilizing audio and visual displays for ease of understanding by broader audiences. In order to introduce the technology and to disseminate the information, an exposition focusing on EE&C (EE&C Expo) may be carried out. The exposition may lead to developing a partnership with the private sector which can play an integral role in implementing EE&C in Indonesia. (These activities will lead to establishment of Energy Conservation Technology Center). It should be noted that DANIA has expressed interest in supporting the establishment of a clearing house with objectives similar to this program.

(3) Establishment of Energy Conservation Technology Center (ECTC)

ECTC will be established as the national center in Indonesia to provide services related to EE&C. The government of Indonesia will promote and disseminate EE&C technology and information through the ECTC. The initial tasks prior to the official inauguration of the centre (- 2015) will be to fulfill the number of preconditions for establishing the ECTC (e.g. bylaws and legal grounds, organizational arrangement, personnel, financial resources, facility and equipment, etc.) Support from the private sector such as financial, technical and human resources, are indispensable for sustainability of the ECTC.

The time for establishing the ECTC will be ripe when the proposed three programs of (1) Energy Manager Program, (2) Energy Conservation Labeling Program, (3) Clearing house have been implemented steadily. It is expected that the private sector, particularly manufacturing and commercial building sector will soon express their interest in supporting the center because it will realize the importance of the roles that the center can play. The private sector together with the government will provide resources necessary for establishment and operation of the ECTC. Actual establishment of the center will be expected in the Stage II (after 2016).

Initial functions of the ECTC could include: (1) providing and disseminating EE&C-related information, (2) providing information on EE&C machinery and equipments (including overseeing implementation of the product labeling program for EE&C, (3) promotion of EE&C in the industry and the public sector (including implementation of proposed energy manger program and the Energy Star Program, etc), (5) implementation of training and examination for the Energy Manager Program, and (6) Publishing and educational activities. Gradually it may be expanded to (7) research and development on EE&C, (8) authentication of EE&C labels, and (9) other supporting tasks (e.g. secretariats for various committees and commissions).

(4) Establishment of financial mechanisms to support EE&C promotion and dissemination

There are three elements to facilitate investment on EE&C. They include: (a) establishment of Special Fiscal Account, (b) establishment of low interest loans for EE&C related investment, and (c) provision of Tax easement for promoting EE&C.

The first item (a) Establishment of Special Fiscal Account is to create a fiscal account specifically designated to support energy-related activities. The revenue should be collected from all energy-related economic transactions such as sale of gasoline, oil, petrol-chemical, electricity, etc. Energy development of all kind, research and development for new energy and renewable energy, promotion of EE&C, subsidy for gas and petrol should be paid from the account.

The second item, (b) establishment of low interest loans for EE&C related investment is to provide a low-interest loan which is known as one of largest incentives for the industries to invest in EE&C technologies elsewhere. This is one of the highest priority tasks to be carried out by MEMR. Program loans from overseas, such as Two-Step Loan by JICA may be a good funding source to introduce the program in Indonesia. Specific areas to provide the preferred interest loan may include, but are not limited to: renovation, improvement and adoption of EE&C related machinery and equipment, and special loans to support ESCO activities. It is considered effective because the current interest rate is as high as 12% in Indonesia.

The last item, (c) Provision of Tax Easement for Promoting EE&C is to provide a tax easement. It is one of the strongest incentives for the private sector to invest in EE&C. Industries in Japan have lobbied the government for many years to provide tax easement to support EE&C-related investment since 1970s. Tax codes specifically listed for EE&C investment include: lower import tax rate for EE&C goods, special depreciation to investment, and tax exemption of education and training cost, etc.

(5) Promotion and Acceleration of Research and Development

MEMR shall enhance collaboration with universities and research organizations such as BPPT to accelerate research and development on EE&C. Initial emphasis will be on non-technical areas, such as management and operation rather than technical areas effective to achieving EE&C in Stage I. Examples may include: laws, customs, informal and formal associations unique to Indonesia. Training and dissemination of technology as well as new laws and procedures will benefit from them. In the mid to long term directions, development of machinery and equipment unique to Indonesia, such as high-efficiency air-conditioning systems for tropical areas, solar heating system, bio-energy, geo-thermal, etc. could be taken up. MEMR may want to provide subsidy to universities through the Ministry of Education. Funding may be supported by the fiscal arrangement mentioned in program 8.

(6) Preparation of Laws, Regulations and Standards for Promotion and Dissemination of EE&C

The highest priority in Stage I is to prepare various laws, regulation, rules for EE&C as soon as possible. For instance, the maintenance standard and judgment standard for EE&C machinery and equipment (e.g. surface temperature of industry-grade furnaces, heat recovery ratio, power factor of selected equipment, air ratio and temperature of heat recovery, etc.), and other regulations and standards for administering the proposed Energy Management Program should be prepared soon. Such rules and regulation may adapt existing ones abroad. A review should be undertaken to decide if it is necessary to develop rules & regulations unique to Indonesia. Such decisions may be taken from a committee consisting of domestic energy experts and representatives from industry.

(7) Establishment of national EE&C Data Base and related frame works

(Development of an Energy Conservation Supporting Database)

- Develop energy consumption statistics which integrate data of energy consumption consistently from the product level right up to sub-sector and sector level.

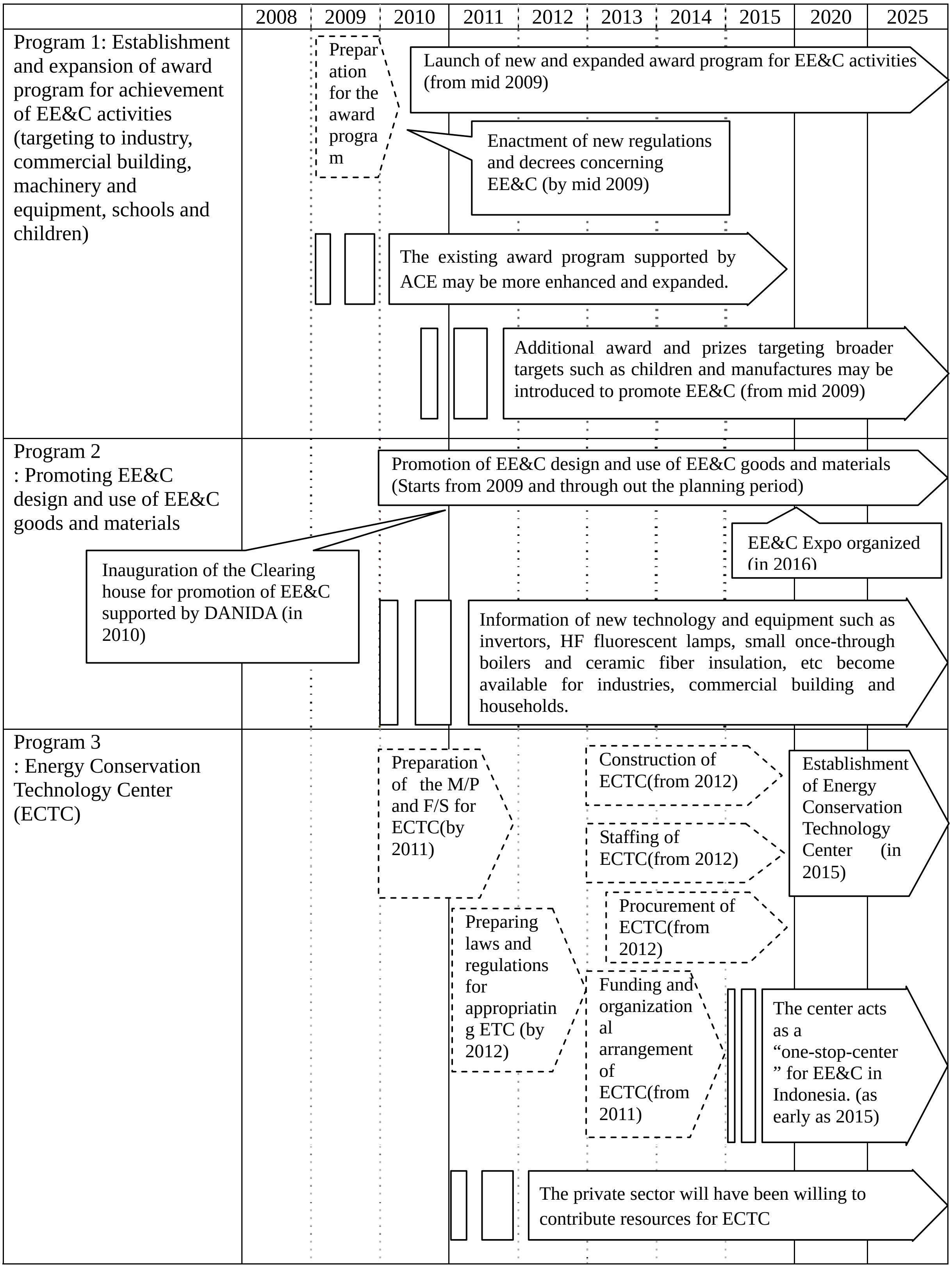
- Readjust and redefine the classification method of sector and sub-sector in both GDP statistics and energy consumption statistics to make them consistent with each other.
- Develop statistics comprised of data of gross floor space and electricity consumption of buildings by sector, region, and intended purpose.
- Compile a table of energy and CO_2 conversion factors reflective of the actual condition of Indonesia.
- The database with the above-stated contents will undergo continuous readjustment and improvement over the period of 2016-2025.

(Formulation of an Energy Conservation and CO2 reduction Master-plan)

- Discuss and draw up a guideline for the formulation of energy and CO_2 reduction master-plan based on the national common data above.
- Set up the goals of energy conservation and CO_2 reduction for respective sectors and subsectors to be realized in 2025.
- Develop a roadmap leading to the realization of goals in 2025 for respective sectors and subsectors.
- The master-plan will undergo continuous readjustment and improvement over the period of 2016-2025

Items (1) to (7) listed above are a list of priority programs targeting the EE&C policy goals in 2025 in Indonesia. Table 4.2.4-1 shows the road map of common programs.

Table 4.2.4-1 Roadmap for the Common Program (1/3)



2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2020 | 2025

Program 1: Establishment and expansion of award program for achievement of EE&C activities (targeting to industry, commercial building, machinery and equipment, schools and children)

Preparation for the award program

Launch of new and expanded award program for EE&C activities (from mid 2009)

Enactment of new regulations and decrees concerning EE&C (by mid 2009)

The existing award program supported by ACE may be more enhanced and expanded.

Additional award and prizes targeting broader targets such as children and manufactures may be introduced to promote EE&C (from mid 2009)

Program 2 : Promoting EE&C design and use of EE&C goods and materials

Promotion of EE&C design and use of EE&C goods and materials (Starts from 2009 and through out the planning period)

Inauguration of the Clearing house for promotion of EE&C supported by DANIDA (in 2010)

EE&C Expo organized (in 2016)

Information of new technology and equipment such as invertors, HF fluorescent lamps, small once-through boilers and ceramic fiber insulation, etc become available for industries, commercial building and households.

Program 3 : Energy Conservation Technology Center (ECTC)

Preparation of the M/P and F/S for ECTC(by 2011)

Construction of ECTC(from 2012)

Staffing of ECTC(from 2012)

Procurement of ECTC(from 2012)

Establishment of Energy Conservation Technology Center (in 2015)

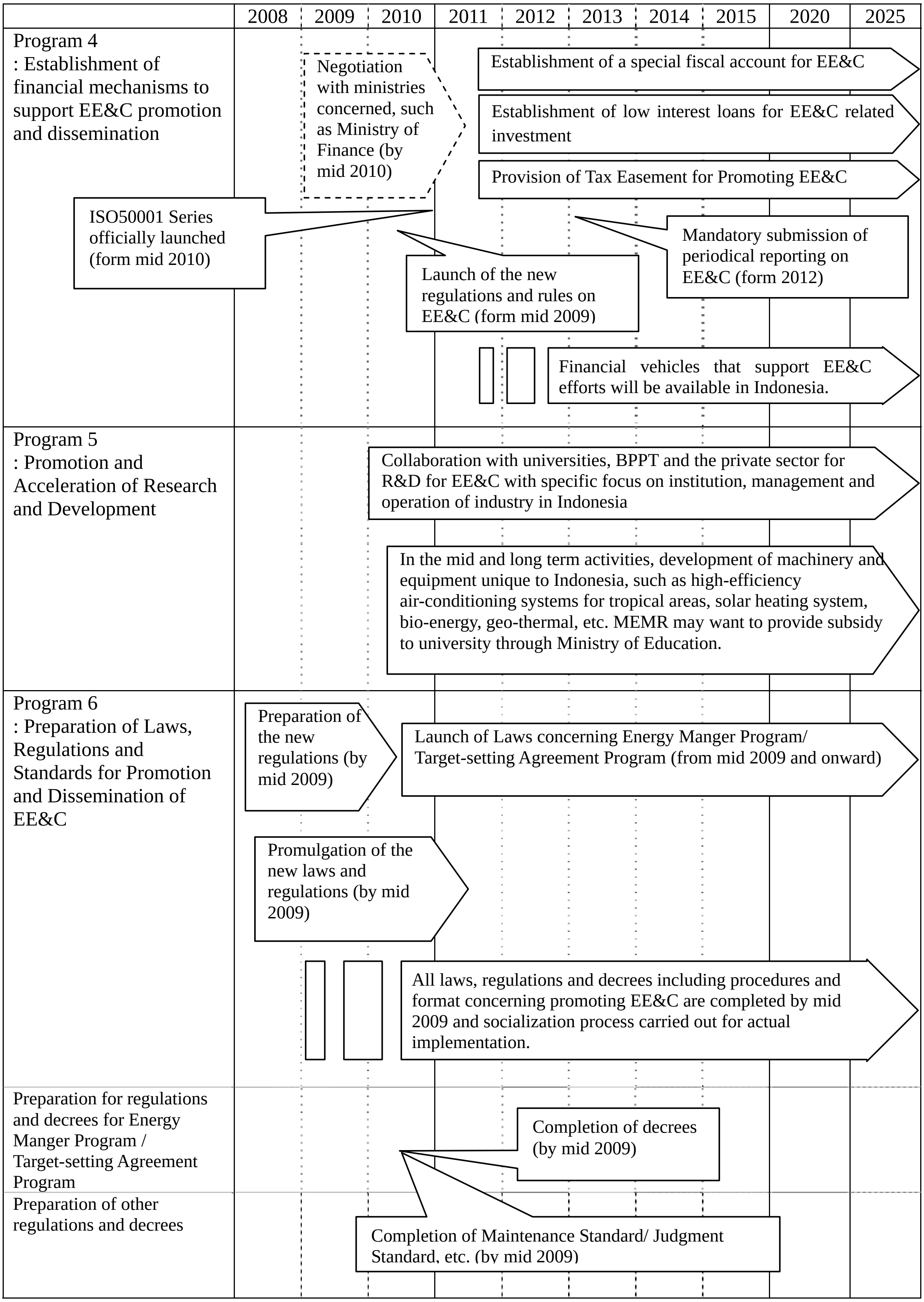
Preparing laws and regulations for appropriating ETC (by 2012)

Funding and organizational arrangement of ECTC(from 2011)

The center acts as a “one-stop-center” for EE&C in Indonesia. (as early as 2015)

The private sector will have been willing to contribute resources for ECTC

Table 4.2.4-1 Roadmap for the Common Program (2/3)



Program 4
: Establishment of financial mechanisms to support EE&C promotion and dissemination

Negotiation with ministries concerned, such as Ministry of Finance (by mid 2010)

Establishment of a special fiscal account for EE&C

Establishment of low interest loans for EE&C related investment

Provision of Tax Easement for Promoting EE&C

ISO50001 Series officially launched (form mid 2010)

Mandatory submission of periodical reporting on EE&C (form 2012)

Launch of the new regulations and rules on EE&C (form mid 2009)

Financial vehicles that support EE&C efforts will be available in Indonesia.

Program 5
: Promotion and Acceleration of Research and Development

Collaboration with universities, BPPT and the private sector for R&D for EE&C with specific focus on institution, management and operation of industry in Indonesia

In the mid and long term activities, development of machinery and equipment unique to Indonesia, such as high-efficiency air-conditioning systems for tropical areas, solar heating system, bio-energy, geo-thermal, etc. MEMR may want to provide subsidy to university through Ministry of Education.

Program 6
: Preparation of Laws, Regulations and Standards for Promotion and Dissemination of EE&C

Preparation of the new regulations (by mid 2009)

Launch of Laws concerning Energy Manger Program/ Target-setting Agreement Program (from mid 2009 and onward)

Promulgation of the new laws and regulations (by mid 2009)

All laws, regulations and decrees including procedures and format concerning promoting EE&C are completed by mid 2009 and socialization process carried out for actual implementation.

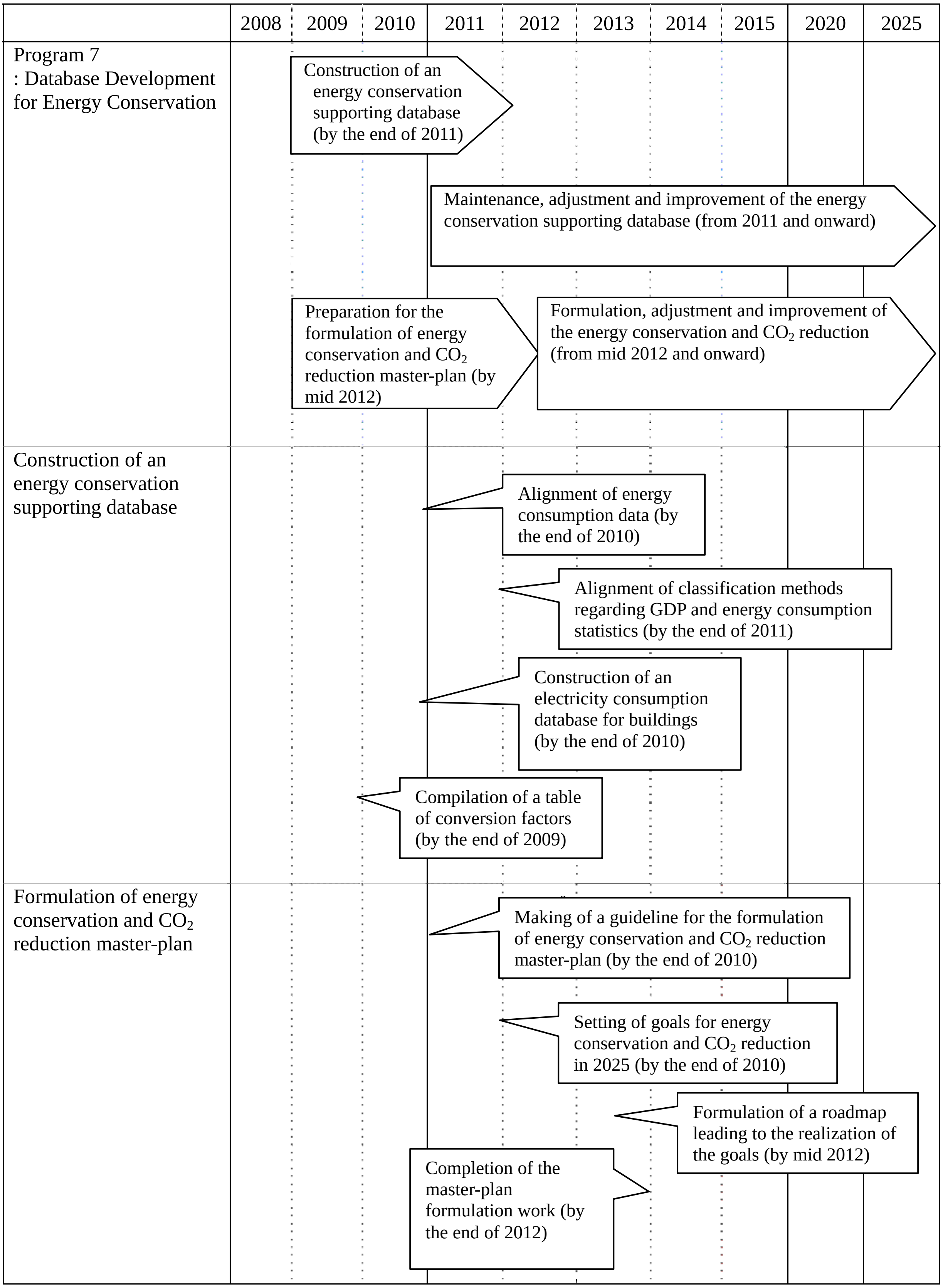
Preparation for regulations and decrees for Energy Manger Program / Target-setting Agreement Program

Completion of decrees (by mid 2009)

Preparation of other regulations and decrees

Completion of Maintenance Standard/ Judgment Standard, etc. (by mid 2009)

Table 4.2.4-1 Roadmap for the common Program (3/3)



Program 7
: Database Development for Energy Conservation

Construction of an energy conservation supporting database (by the end of 2011)

Maintenance, adjustment and improvement of the energy conservation supporting database (from 2011 and onward)

Preparation for the formulation of energy conservation and CO_2 reduction master-plan (by mid 2012)

Formulation, adjustment and improvement of the energy conservation and CO_2 reduction (from mid 2012 and onward)

Construction of an energy conservation supporting database

Alignment of energy consumption data (by the end of 2010)

Alignment of classification methods regarding GDP and energy consumption statistics (by the end of 2011)

Construction of an electricity consumption database for buildings (by the end of 2010)

Compilation of a table of conversion factors (by the end of 2009)

Formulation of energy conservation and CO_2 reduction master-plan

Making of a guideline for the formulation of energy conservation and CO_2 reduction master-plan (by the end of 2010)

Setting of goals for energy conservation and CO_2 reduction in 2025 (by the end of 2010)

Formulation of a roadmap leading to the realization of the goals (by mid 2012)

Completion of the master-plan formulation work (by the end of 2012)

4.3 Economic Effect and GHG Reduction Effect of Energy Conservation Promotion

4.3.1 Reaffirmation of the Steps and Scope of The Study

(1) Steps of The Study

As illustrated in Fig. 4.3.1-1, The Study has been conducted through three steps. As the first step, Analysis 1 centering on market survey of electrical products and Analysis 2 centering on energy audit and questionnaire survey were taken with an eye to acquiring basic data and information reflecting the country's energy conservation potential. The studies in the two Analysis were reinforced by a study on the introduction of DSM system. As the second step, energy conservation potential and CO_2 reduction potential were estimated based on results of the study in the first step, and were compared with the expected effect of the government's existing energy conservation master-plans. And finally in the third step, recommendations featured with a roadmap and action plans are to be presented to the Indonesian government, which is the very step we are now in.

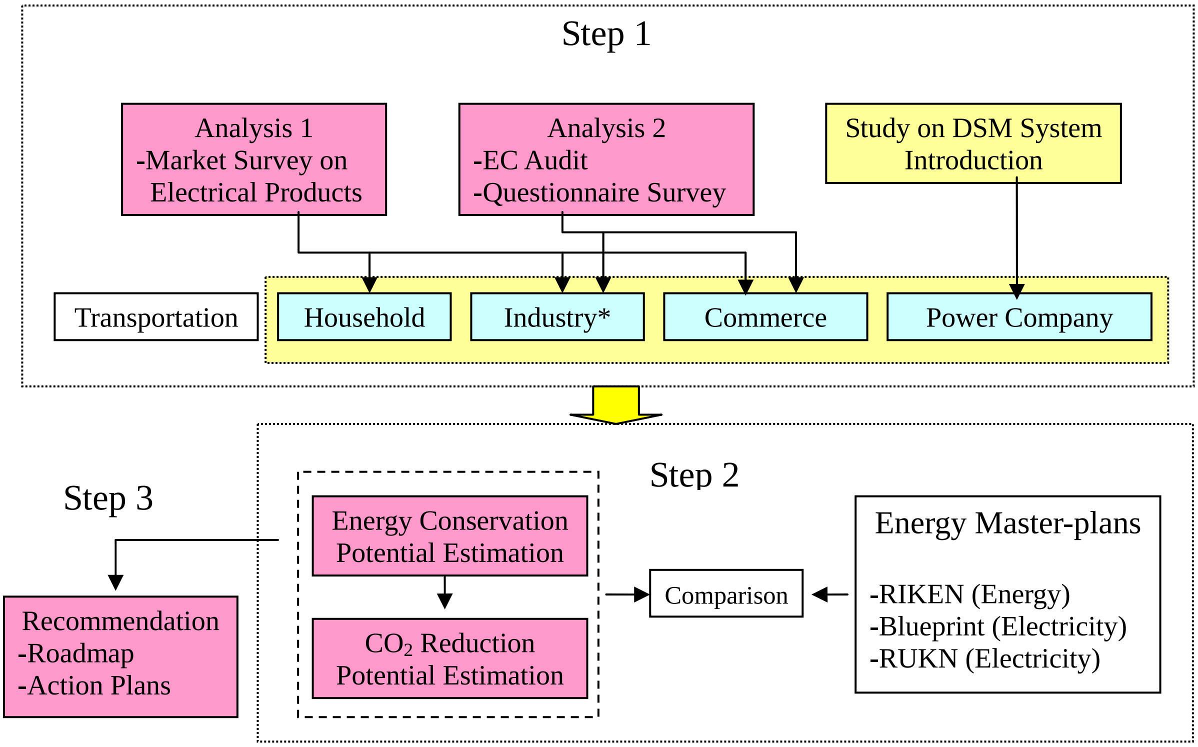


Fig. 4.3.1-1 Steps of The Study

(2) Scope of The Study

Fig. 4.3.1-2 visualizes the scope of The Study whereby to clarify the interrelationship between The Study and existing energy conservation master-plans made by the Indonesian government, as well as the relationship between Analysis 1 and Analysis 2 within The study. Additional reference needs to be made to the scope of Blueprint (Draft). Although it is defined as part of the larger area covered by Analysis 2 of The Study, strictly speaking, it should extend beyond the boundary of Analysis 2's area, as sectors like transportation and construction also consume a certain portion of electricity. However, since this portion is relatively insignificant, it is consciously neglected here to make the picture visually easy to understand.

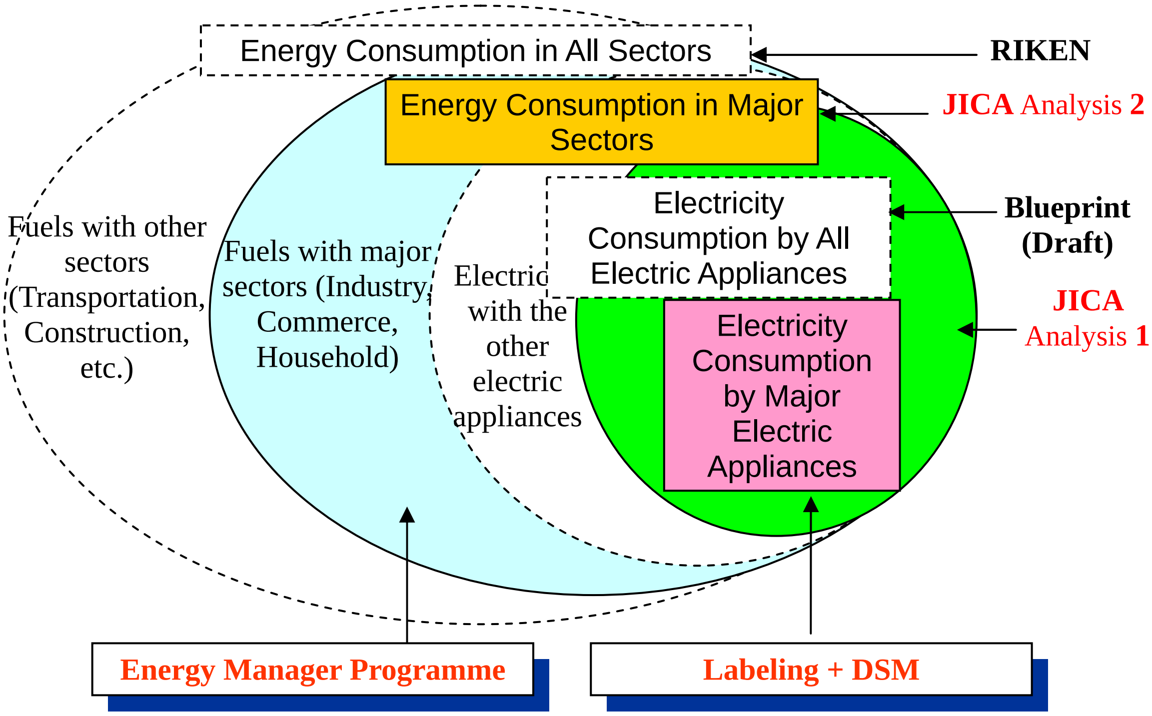


Fig. 4.3.1-2 Scope of The Study

4.3.2 Review of Established Energy Conservation Master-plans in Indonesia

(1) RIKEN (2005)

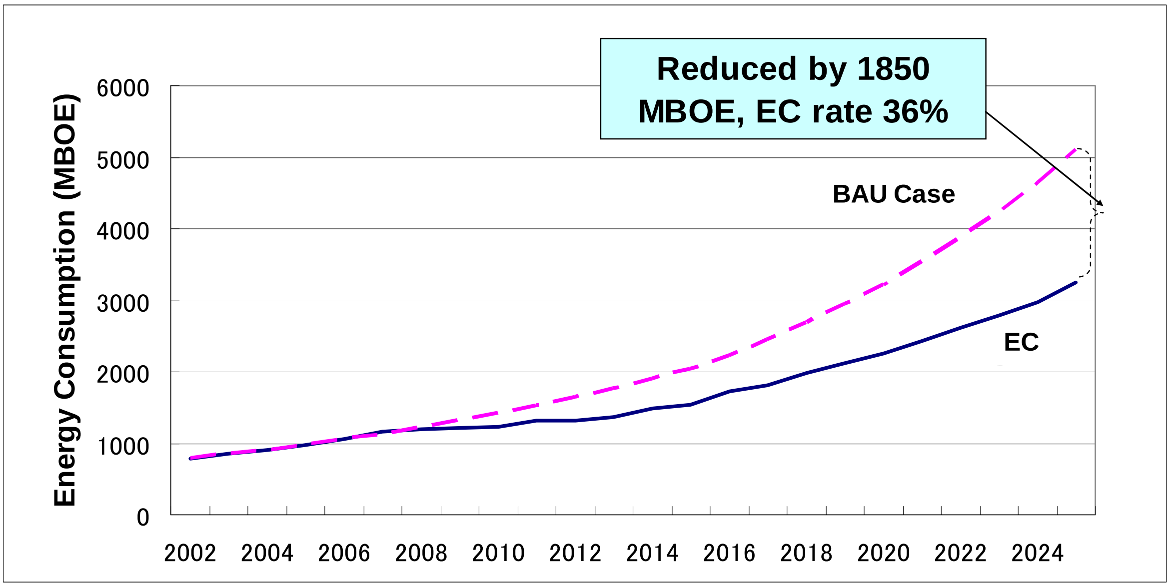
1) Basic Assumptions

The master-plan of RIKEN was made on the basic assumptions indicated in the table below. Projection of energy conservation potential regarding primary energy consumption in RIKEN is shown in Fig. 4.3.2-1

Table 4.3.2-1 Basic Assumptions with RIKEN

<table>
<tr><td>Item</td><td colspan="5">Indicator</td></tr>
<tr><td rowspan="2">Economic Growth Rate</td><td>2005</td><td>2010</td><td>2015</td><td>2020</td><td>2025</td></tr>
<tr><td>4.92%</td><td>5.13%</td><td>5.13%</td><td>6.51%</td><td>6.51%</td></tr>
<tr><td rowspan="2">Primary Energy Consumption Growth Rate(2005~2025)</td><td colspan="2">BAU Case</td><td colspan="3">EC Case</td></tr>
<tr><td colspan="2">8.4%</td><td colspan="3">6.3%</td></tr>
</table>

Source: MEMR "EE&C Program Implementation In Indonesia" , Appendix 1 and 2
(Calculated by BPPT based on data of 2002)
Note: The values of Primary Energy Consumption Growth Rate were estimated by the study team based on MEMR data.



Source: Based on MEMR "EE&C Program Implementation in Indonesia", Appendix 1-4 (Values calculated by BPPT based on data of 2002)

Fig. 4.3.2-1 Projection of Energy Conservation Potential by RIKEN

2) Projection of Energy Conservation Potential Regarding Primary Energy Consumption

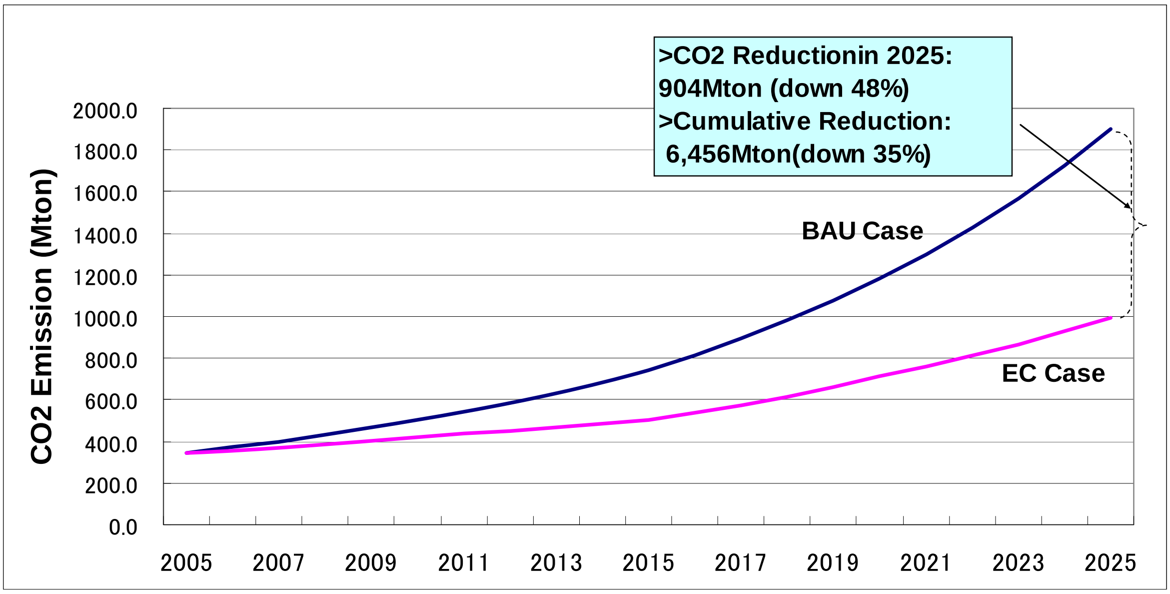
Based on the preceding basic assumptions, the values of primary energy consumption with regard to Business As Usual (BAU) case and Energy Conservation (EC) case in 2025 are estimated to be as follows:

➢ BAU case	5,103MBOE
➢ EC case	3,252MBOE

Accordingly, the potential of energy conservation in the year 2025 in terms of primary energy consumption reduction will be 1,851MBOE, and 36.3% in terms of energy saving rate (EC rate).

3) Projection of CO_2 Emission Reduction (Fig. 4.3.2-2)

It is possible to estimate the value of CO_2 emission reduction by utilizing the data regarding energy consumption structure in both the BAU case and the EC case provided by MEMR as well as the conversion factors between energy consumption and CO_2 emission calculated by the JICA Study Team. Thus, the value of CO_2 emission reduction in the year of 2025 and the cumulative value of CO_2 emission reduction from the year 2005 to 2025 are respectively estimated to be 904Mton and 6,456Mton. The results are reflected in Table 4.3.2-2.



Source: Based on MEMR “EE&C Program Implementation in Indonesia”, Appendix 1-4 (Values calculated by BPPT based on data of 2002 and partially estimated by the study team)

Fig. 4.3.2-2 Projection of CO_2 Emission Reduction by RIKEN

Table 4.3.2-2 CO_2 Emission Reduction with the EC Case of RIKEN

Item	BAU Case	EC Case
CO_2 Emission in 2025 (Mton)	1,900	996
CO_2 Emission Reduction in 2025 (Mton)		904 (47.6%)
Cumulative CO_2 Emission from 2005 to 2025 (Mton)	18,555	12,099
Cumulative CO_2 Emission Reduction from 2005 to 2025 (Mton)		6,456 (34.8%)

Source : MEMR “EE&C Program Implementation in Indonesia”, Appendix 1-4 (Values partially estimated by the study Team)

Moreover, the changes of energy mix from the year 2005 to 2025 in the Business As Usual (BAU) case and Energy Conservation (EC) case are indicated in Table 4.3.2-3, which form an indispensable basis for the estimation of the value of CO_2 emission reduction.

Table 4.3.2-3 Change of Energy Mix from Year 2005 to 2025

Energy Type	2005		2025			
			BAU Case		EC Case	
	MBOE	%	MBOE	%	MBOE	%
Oil	**520**	**52.4**	**640**	**19.7**	**3470**	**68.0**
Coal	**155**	**15.6**	**1100**	**33.8**	**970**	**19.0**
NG	**240**	**24.2**	**830**	**25.5**	**577**	**11.3**
CBM	**0**	**0.0**	**128**	**3.9**	**0**	**0.0**
LPG	**34**	**3.4**	**66**	**2.0**	**0**	**0.0**
Geothermal	**17**	**1.7**	**168**	**5.2**	**30**	**0.6**
Hvdro	**26**	**2.6**	**0**	**0.0**	**56**	**1.1**
Nuclear	**0**	**0.0**	**56**	**1.7**	**0**	**0.0**
Bio-fuel	**0**	**0.0**	**167**	**5.1**	**0**	**0.0**
Other Renewables	**0**	**0.0**	**98**	**3.0**	**0**	**0.0**
Total	**992**	**100.0**	**3253**	**100.0**	**5103**	**100.0**

Source: MEMR data

Source：MEMR “EE&C Program Implementation in Indonesia”, Appendix 1-4

The conversion factors between respective types of energy and CO_2 emission are listed in Table 4.3.2-4.

Table 4.3.2-4 Conversion Factors among Fuel, BOE and CO_2 Unit

Energy Type	BOE Conversion		CO_2 Conversion	
	Unit	Rate	Unit	Rate
Oil(ML)	KBOE/ML	6.608	Kton/ML	2.560
	(GJ/ML)	38,462	—	—
Kerosene (ML)	KBOE/ML	5.927	Kton/ML	2.489
Natural Gas (Mm^3)	KBOE/ Mm^3	6.346	Kton/ Mm^3	2.000
LP G(Kton)	KBOE/Kton	8.525	Kton/Kton	2.698
Coal (Kton)	KBOE/Kton	4.277	Kton/Kton	1.650
Electricity(GWh)	KBOE/GWh	1.863	Kton/GWh	0.762
(Primary Energy Base)	（kcal/kWh）	2,619	—	—

Note: 1. BOE conversion rates are based on “Indonesia Energy Outlook & Statistics 2006 ” by University of Indonesia. But the BOE conversion rate for electricity (primary energy base) is yielded by using the value of 2,619 Kcal/kWh calculated based on the data of “PLN Statistics 2005” (with a generating efficiency of 32.84%).

2. The conversion rate of 38,462GJ/ML for oil is yielded from the rate of 10GJ=0.26KL.

3. Regarding the CO_2 conversion rates, those of oil, natural gas and LPG are calculated by EMI, those of kerosene and coal are what have been used in Japan, and that of electricity is based on PLN statistics as of 2005.

(2) Blueprint for Electricity Conservation (Draft. January, 2008)

1) Basic Assumptions

In Blueprint for Electricity Conservation drafted by MEMR in January, 2008, the annual economic growth rate from 2000 to 2020 is assumed to be 6.3% on average, while the electricity consumption is supposed to grow at the rate of 6.8% with the BAU case and 4.4% with the EC case. (The values of electricity consumption rate were estimated by the JICA Study Team on the basis of MEMR data.)

Table 4.3.2-5 Basic Assumptions with Blueprint for Electricity Conservation

Item	Indicator
Economic Growth Rate (2000~2020)	6.3%
Electricity Consumption Growth Rate (2005~2025)	BAU Case: 6.8% EC Case:4.4%

Source: MEMR "Blueprint for Electricity Conservation (Draft. January, 2008)"

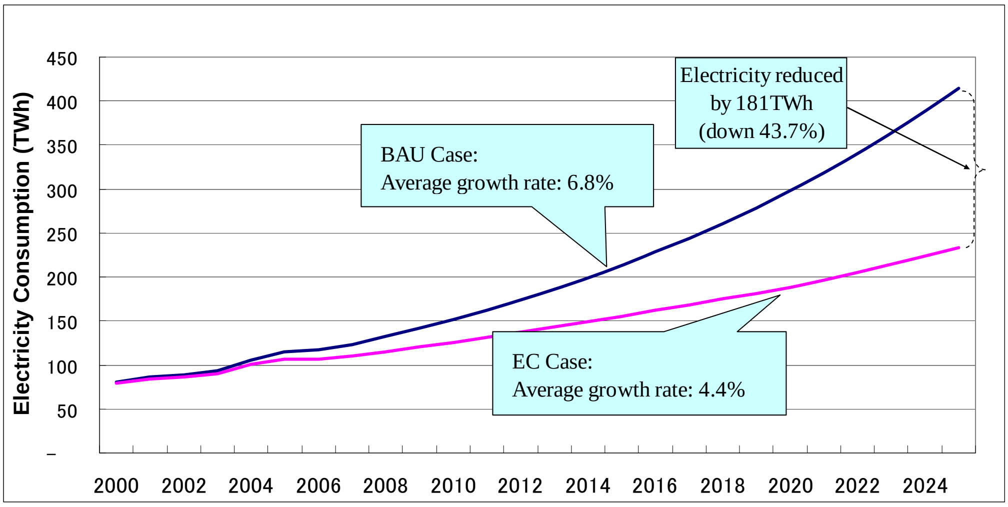
Note: The values of electricity consumption growth rate were calculated based on the data of the above source.

2) Projection of Energy Conservation Potential Regarding Electricity Consumption (Fig. 4.3.2-3)

Based on the estimated values of electricity consumption in 2020 revealed by the Blueprint for Electricity Conservation (draft), the values of electricity consumption in 2025 with regard to BAU case and EC case are respectively predicted as follows:

- BAU case 414TWh
- EC case: 233TWh

As a result, the potential for energy conservation in the year of 2025 in terms of electricity consumption reduction will be 181TWh (338MBOE), and 43.7% in terms of energy saving rate.

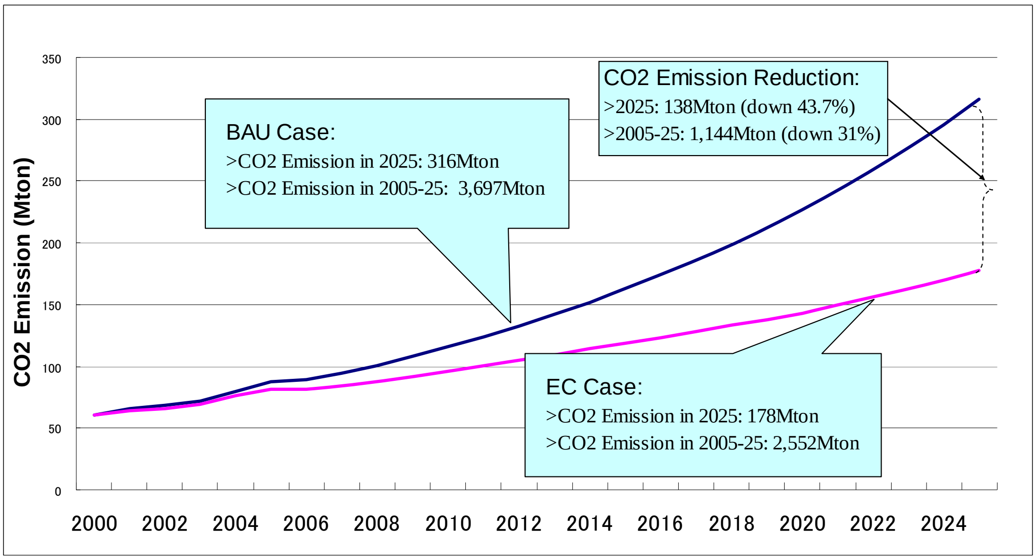


Source: Based on MEMR "Blueprint for Electricity Conservation (Draft. January, 2008)" (Values partially estimated by the study team)

Fig. 4.3.2-3 Projection of Energy Conservation Potential by Blueprint (Draft)

3) Projection of CO_2 Emission Reduction (Fig. 4.3.2-4)

By multiplying the values of electricity consumption and CO_2 conversion factor calculated by the JICA Study Team, the values of CO_2 emission reduction in the year of 2025 and the cumulative amount of CO_2 emission reduction over the period of 2005~2025 are estimated to be 138Mton and 1,144Mton respectively.



Source: Based on MEMR “Blueprint for Electricity Conservation (Draft. January, 2008)” (Values partially estimated by the study team)

Fig. 4.3.2-4 Projection of CO_2 Emission Reduction by Blueprint (Draft)

Table 4.3.2-6 CO_2 Emission Reduction with the EC Case of Blueprint (Draft)

Item	BAU Case	EC Case
CO_2 Emission in 2025 (Mton)	316	178
CO_2 Emission Reduction in 2025 (Mton)		138 (43.7%)
Cumulative CO_2 Emission from 2005 to 2025 (Mton)	3,697	2,552
Cumulative CO_2 Emission Reduction from 2005 to 2025 (Mton)		1,144 (31.0%)

Source：MEMR “Blueprint for Electricity Conservation (Draft. January, 2008)”

4.3.3 Potential of Energy Conservation and CO_2 Emission Reduction with JICA Study

The methodology regarding the estimation of energy conservation and CO_2 emission reduction is reflected in Fig. 4.3.3-1.（Analysis 1 and 2）

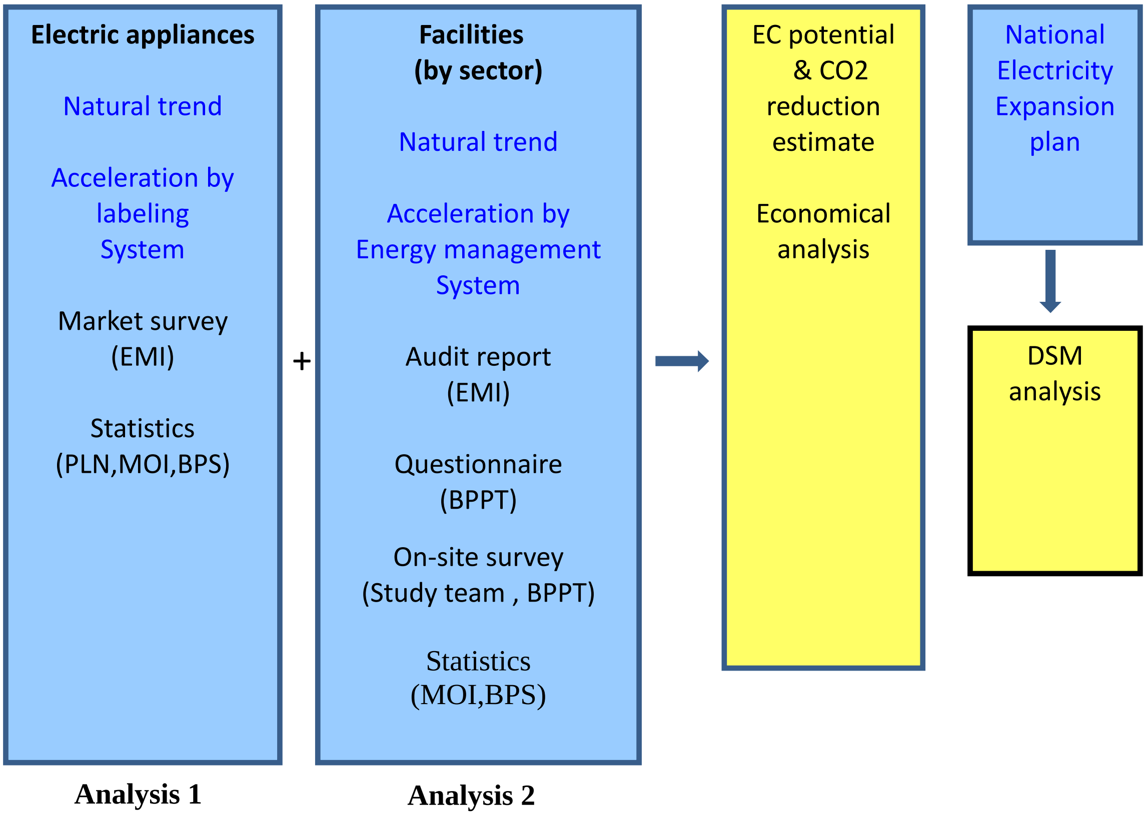


Fig. 4.3.3-1 Concept of Energy Conservation Potential and Economic Effect Estimation

(1) Analysis 1 : Energy Conservation Potential Estimation Based on Results of Market Survey on Electric Products

1) Potential of Energy Conservation

In Analysis 1, the potential of energy conservation is estimated by looking upon the projected result in RUKN as the BAU Case and the results of market survey on electric products conducted by the JICA Study Team as the EC Cases. Basic assumptions for the estimation and results of the estimation as follows:

➢ Basic Assumptions for the Estimation of EC Potential (Table 4.3.3-1)

a) GDP Growth Rate

The value of GDP growth rate is assumed to be 6.3% throughout the period of 2008-2025, the same as what was set in RUKN.

b) Growth Rate of Electricity Consumption

Regarding the growth rate of electricity consumption, three cases are considered. The average growth rate throughout the period of 2008-2025 with BAU Case is assumed to be 7.1% derived from the projected values of future electricity consumption in RUKN, while that of the EC Low Case and EC High Case are respectively estimated to be 5.8% and 4.3%. Both the EC Low Case and the EC High Case are based on the results of market survey, with the EC High Case suggesting an accelerating adoption of high-efficiency electric products.

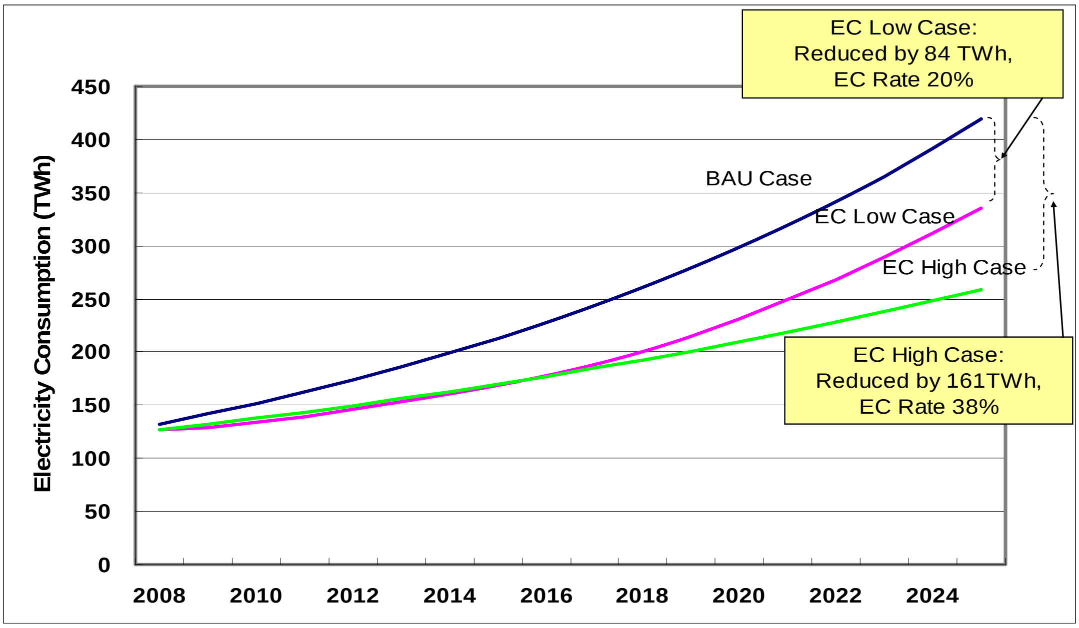
Table 4.3.3-1 Basic Assumptions for EC Potential Estimation with Analysis 1

Item	Indicator		
GDP Growth Rate (2008~2025) (%)	6.3 (RUKN)		
Electricity Consumption Growth Rate (2008~2025) (%)	BAU Case	EC Low Case	EC High Case
	7.1(RUKN)	5.8	4.3

Note: The values of Electricity Consumption Growth Rate with EC cases were calculated by the study team based on results of market survey.

- Estimation of EC Potential in 2025（Fig. 4.3.3-2）

The result of estimation based on the above-mentioned basic assumptions shows that the values of electricity consumption in 2025 with the BAU Case, EC Low Case and EC High Case will respectively be 420TWh, 336TWh and 259TWh, whereby the potential of electricity consumption saving in 2025 can be expected to be 84TWh (EC rate at 20%) and 161TWh (EC rate at 38%) respectively with the EC Low Case and EC High Case.



Source: Based on results of market survey on electric products.

Fig. 4.3.3-2 Projection of EC Potential with Analysis 1

2) Projection of CO_2 Emission Reduction（Table 4.3.3-2, Fig 4.3.3-3）

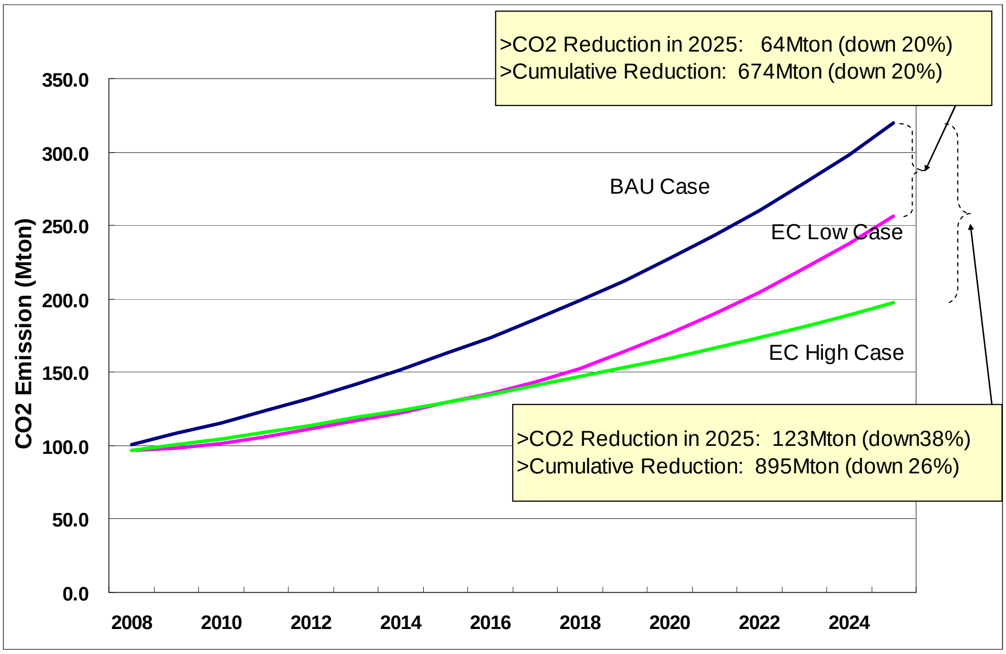
The volume of CO_2 emission with Analysis 1 is expected to reduce by 64~123Mton in the year of 2025 as compared with the RUKN BAU case, and the rate of reduction to be

20~38%. As for cumulative result of CO_2 emission reduction over the period of 2005~2025, the value is projected to be 674~895Mton and the rate of reduction to be 20~26%.

Table 4.3.3-2 CO_2 Emission Reduction with the EC Case of JICA Study Analysis 1

Item	BAU Case	EC Case
CO_2 Emission in 2025 (Mton)	320	197～256
CO_2 Emission Reduction in 2025 (Mton)		64~123 (20~38%)
Cumulative CO_2 Emission from 2008 to 2025 (Mton)	3,436	2,542~2,763
Cumulative CO_2 Emission Reduction from 2008 to 2025 (Mton)		674~895 (20~26%)

Source：The values were estimated based on results of EE&C potential estimation in Analysis 1.



Source: Based on results of EE&C potential estimation in Analysis 1. (Values partially estimated by the study team)

Fig. 4.3.3-3 Projection of CO_2 Emission with Analysis 1

(2) Analysis 2 : Energy Conservation Potential Estimation Based on Results of Energy Audit

With regard to the Analysis 2 of JICA study, energy conservation potential is estimated taking into account the different situations among different sectors and sub-sectors and different types of energy based on the actual results of energy audits already carried out in the past and the results of energy audits conducted by the JICA Study Team.

1) EE&C Potential Estimation

- Assumption about the Incremental Realization of EE&C Potential in Industrial Sector[1]

According to the experience acquired by JICA's experts in their practices in Japan as well as other developing countries, energy conservation effect can usually be realized

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[1] In this report, "industrial sector" refers to "manufacturing sector".

by 3 approaches, i.e. the approaches of Energy Management Reinforcement, Equipment Modification and Equipment Replacement. Based on the results of energy audit conducted by the JICA team and information acquired from the other sources[2], energy conservation potential in the sub-sector of iron & steel, textile, food, cement and other sub-sectors of industry by 2025 are estimated to be 30%, 30%, 15%, 10% and 23%, respectively and, by aggregating these values for respective sub-sectors taking into consideration the difference among energy types, the total value of EC potential for the whole industrial sector is yielded as 21.2%. The incremental realization of EE&C potential by sub-sector through the above-mentioned 3 approaches is reflected in Table 4.3.3-3, and the values of EE&C potential for the whole industrial sector by energy type in each of the 3 approaches are indicated in Table 4.3.3-4.

The difference between Table 4.3.3-3 and 4.3.3-4 is that while the former is meant to estimate the incremental realization of EE&C potential by sub-sector, the latter illustrates the breakdown of the whole sector’s EE&C potential by energy type.

As energy used by the sectors of industry, commerce, household、transportation and the others respectively account for 53.7%, 3.4%, 13%, 25.6% and 4.4% according to BPS data, the realization of EE&C potential is expected to result in an 11% EE&C effect to the whole economy.

Table 4.3.3-3 Incremental Realization of EC Potential in Industrial Sector (Unit: %)

Stage	Approach1	Approach2	Approach3	Total Result
	Mainly2005~15	Mainly2016~20	Mainly2021~25	2005~25
Iron & Steel	12	5	13	30
Textile	10	5	15	30
Food	5	5	5	15
Cement	4	2	4	10
Other Industries	8	4	11	23

⬇

Industry	7.4	4.1	9.7	21.2

Notes: *Approach1: Constant improvement by good management, control and maintenance without capital investment

*Approach2: Improvement of individual equipment with minor investment

*Approach3: Improvement of the entire process of production with investment in large scale started from 2021

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[2] Information of energy conservation potential in the sub-sector of iron & steel and textile is acquired through energy audit conducted by the JICA team, while that of food and cement is from NEDO reports “Study on Diagnosis on Energy Saving Plan in Cement Industries in Republic of Indonesia” (March, 2007) and "Feasibility study on energy audit in the food and beverage industry in Indonesia” (March, 2007), and that of the other sub-sectors is from the report by the Ministry of Environmental Protection “State of Environment Report in Indonesia 2005” (Table 6.6 ; original data from MEMR).

Table 4.3.3-4 EC Potential in Industrial Sector by Energy Type (Unit: %)

Stage	Approach1	Approach2	Approach3	Total Result
	Mainly 2005~15	Mainly 2016~20	Mainly 2021~25	2005~25
Oil	8.0	4.5	10.7	23.2
Kerosene	7.0	4.5	8.8	20.3
Natural Gas	7.8	4.3	10.2	22.3
Coal	5.4	2.7	6.3	14.4
Total Fuels	7.4	4.0	9.7	21.1
Electricity	8.1	4.5	11.0	23.6
Total of Industry	**7.4**	**4.1**	**9.7**	**21.2**

Source: The EE&C potential by energy type and their gradual realization were calculated and assumed based on data of Table 4.3.3-3 and MEMR "Statistics of Indonesia Energy Economy 2006" .Incremental Realization of EE&C Potential in Commercial and Household Sector

Table 4.3.3-5 Incremental Realization of EE&C Potential in Commercial Sector (Unit: %)

	Office	Government office	Shopping Mall	Hospital
Establishment of energy management organization	5.0			
Operational management	16.5			
Heat loss reduction from building (Heat exchanger)		8.2	7.1	
Air conditioner management				20.0
Introduction of Hf fluorescent lamp (dimmer)		9.8		
Review of power distribution system			3.3	5.0
Introduction of BEMS	5.0	8.0	5.0	
Total	26.5	31.0	20.4	20.0

Stage Sector	Approach1	Approach2	Approach3	Total EC Potential [2005~25]
	Mainly2005~15	Mainly2016~20	Mainly2020~2025	
Commerce	10	5	10	25

Source: Based on the results of field study.

Tentative Incremental Realization Scenario of EE&C Potential for All Major Sectors

The tentative incremental realization scenario of EE&C potential for all the major sectors is reflected in Table 4.3.3-6. Notice needs to be taken that while the energy types of industry sector include fuels and electricity, sectors of commerce and household sector

Table 4.3.3-6 EE&C Potential Incremental Realization Scenario for All the Major Sectors (Tentative) cement is from NEDO reports "Study on Diagnosis on Energy Saving Plan in Cement Industries in Republic of Indonesia" (March, 2007) and

"Feasibility study on energy audit in the food and beverage industry in Indonesia" (March, 2007), and that of the other sub-sectors is from the report by the Ministry of Environmental Protection "State of Environment Report in Indonesia 2005".

Table 4.3.3-6 EE&C Potential Incremental Realization Scenario for All the Major Sectors

Item Sector	Focused Energy Source	EC Implementation Potential (%)			
		Approach-1 (mainly ~2015)	Approach-2 (mainly ~2020)	Approach-3 (mainly ~2025)	2005~25 Total
Food processing	Multi	5	5	5	15
Iron & Steel	Multi	12	5	13	30
Textile	Multi	10	5	15	30
Cement	Multi	4	2	4	10
Other Indus.	Multi	8	4	11	23
Industry in total		*7.4*	*4.1*	*9.7*	*21.2*
Commerce	Electricity	10	5	10	25
Household	Electricity	10	10	10	30

Source:: Based on field study, NEDO report and MEMR report. Data of food and

Note:: Regarding the proportion of electricity consumption among total energy consumption in the commercial sector, it is expected to be 62% in Year 2025 with the BAU Case, and 55% with the EC Case. As for the proportion of electricity consumption in the household sector, it is expected to be 28% in the same year with the BAU Case, and 22% with the EC Case. The parts colored red represent sectors within the scope of JICA study.

The main points of the above-mentioned tentative EE&C potential incremental realization scenario are summed up as follows:

a) Approach-1 and Approach-2

- With reinforcement of energy management（Zero cost for users and low cost for the government) , modification and addition of parts (cost of minor investment） , it is assumed to be possible to achieve EE&C by 10-20% within a period of 5 to 10 years.
- At present, problems of incomplete energy management system on the factory floor and mid-level managers' lack of expertise and experience remain obstacles to the promotion of EE&C.

b) Approach-3

As far as analysis sectors of this study are concerned, more significant EE&C could possibly be achieved by investment of larger scale to replace existent equipment with energy-efficient one. EE&C of respective sectors could be achieved in the following ways:

- Iron & steel : 10% plus EE&C by introducing high-efficiency reheating furnace would be possible.
- Textile : 20% EE&C mainly through heat recovery in dyeing process would be possible.
- Food, cement and others : It looks promising to utilize the results of NEDO pilot projects in the fields of heat recovery, cooling and biomass technology, etc.
- Building : 10% plus EE&C by BEMS could also be possible.
- Household : 30% EE&C could be possible mainly in AC and refrigerator with inverter, TV and lighting; though introduction of Labeling system is urgently needed.
- Two-step loan or project financing loan using ODA soft loan from international financial institutions like JICA, ADB and the World Bank would be effective options for the introduction of promising though costly EE&C technology needed as a result of NEDO Study.

Projection of Aggregate EC Potential with Analysis 2 of JICA Study (Fig. 4.3.3-4)

Primary energy consumption in 2025

The total primary energy consumption in the year 2025 is projected to be 3,681 MBOE with JICA EC case as compared with the value of 4,232MBOE with the BAU case[3].

b) EC Potential in the Year of 2025 with JICA EC Case

EC potential in the year of 2025 expressed as the difference of energy consumption between the BAU Case and the JICA's EC Case is expected to be 551MBOE with an EC rate of 13%. It is worth noting that, as the scope of Analysis 2 has been confined to sectors of industry (manufactures only), commerce and household while excluding transportation and other major energy consuming sectors, EC potential estimated thereby looks much smaller than that of RIKEN's EC Case. The same can also be said about CO_2 emission reduction potential to be discussed there after.

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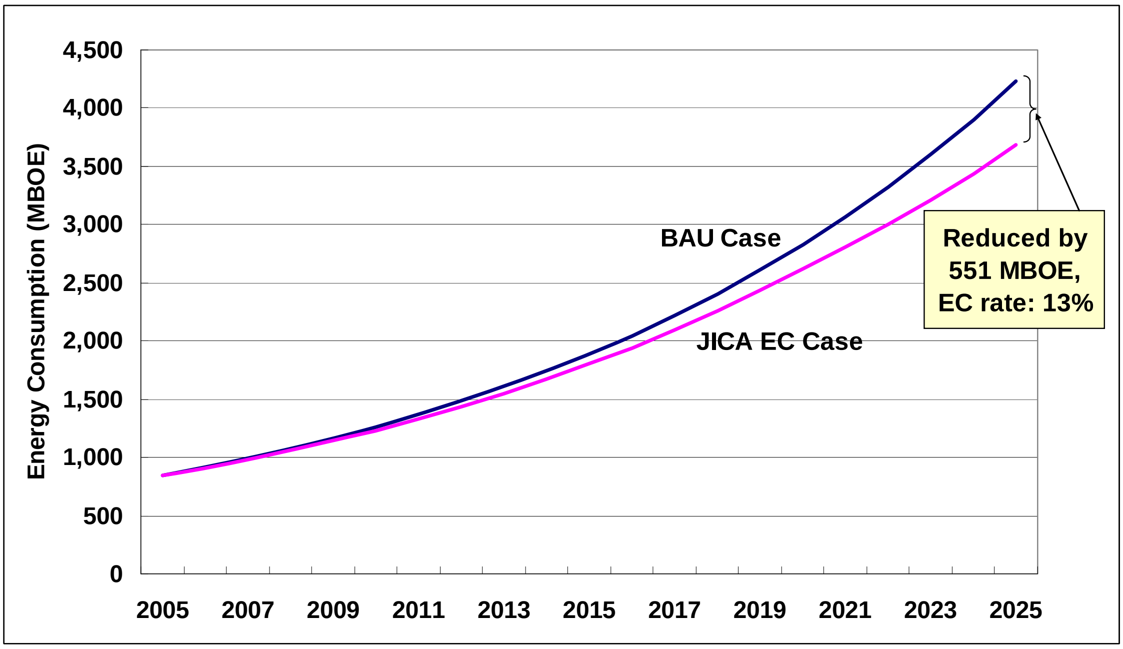
[3] Energy consumption growth rate adopted here is 8.4%, the value used in RIKEN BAU Case, but as for the baseline, data of 2005 are adopted based on MEMR's "Statistics of Indonesia Energy Economy 2006".



Source: JICA' EC case: Based on results of field study by the study team, NEDO reports「"Study on Diagnosis on Energy Saving Plan in Cement Industries in Republic of Indonesia" (March, 2007) and "Feasibility study on energy audit in the food and beverage industry in Indonesia" (March, 2007), Ministry of Environment Protection 環境省"State of Environment Report in Indonesia 2005" , MEMR "Statistics of Indonesia Energy Economy 2006" and "Statistics of Electricity and Energy 2005".

BAU case: Based on data of primary energy consumption in 2005 from MEMR "Statistics of Electricity and Energy 2005" together with the value of energy growth rate (8.4%) used in RIKEN BAU Case.

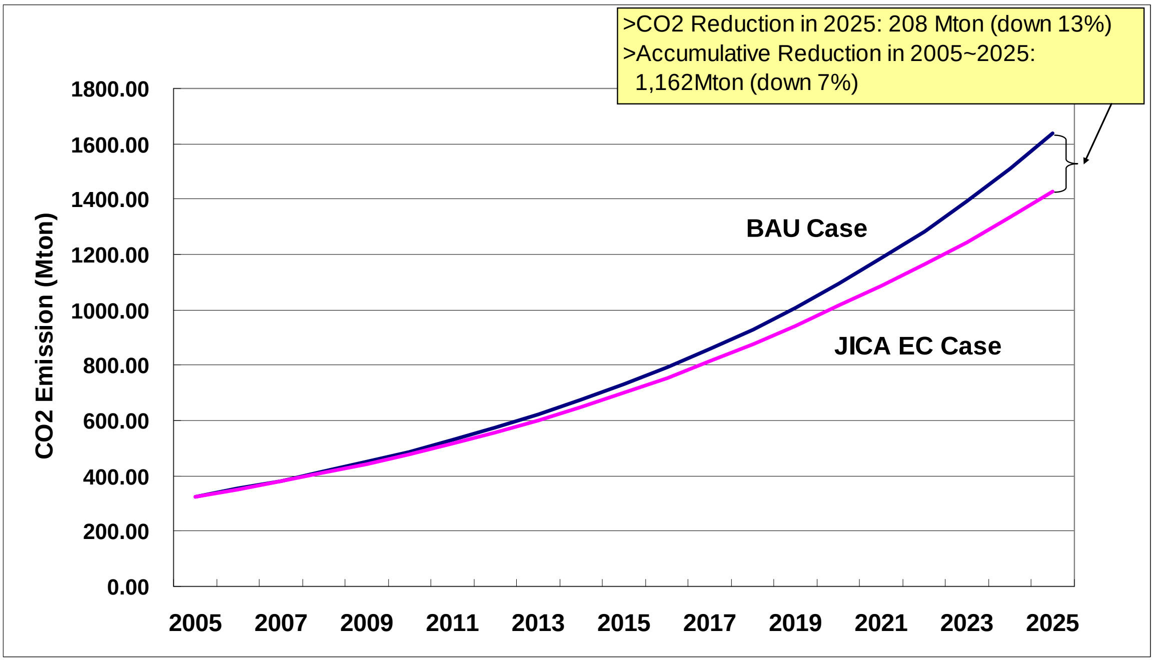
Fig. 4.3.3-4 Projection of EC Potential with Analysis 2

Estimation of CO_2 Emission Reduction

CO_2 Emission Reduction in 2025 and Cumulative CO_2 reduction by 2025

(Fig.4.3.3-5, Table 4.3.3-6)

Based on the foregoing results of EC potential estimation by sector and sub-sector and by energy type as well as the previously indicated conversion rates between energy unit and CO_2 unit, the prospect for CO_2 emission reduction in 2025 is estimated to be 208Mton with a reduction rate of 13%, while the cumulative CO_2 reduction from 2005 to 2025 will be 1,162Mton with a reduction rate of 7%.

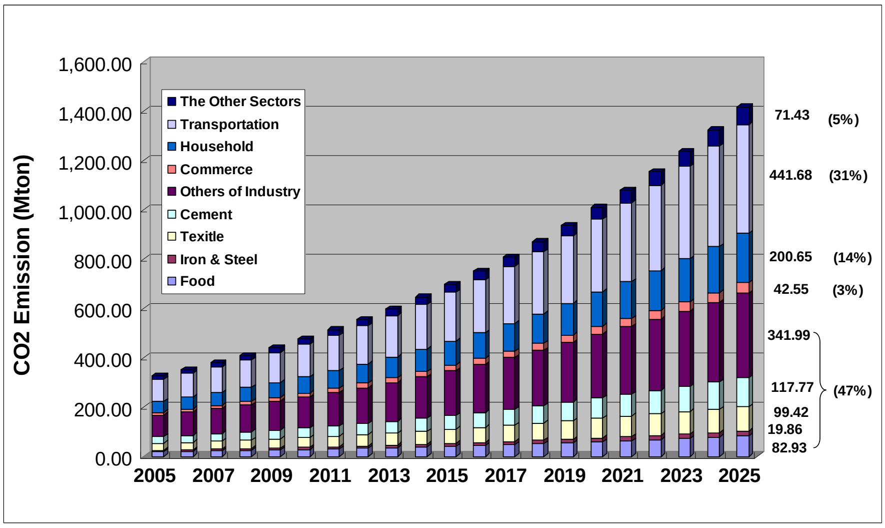


Source: Based on the data of Fig.4.3.3-4.

Fig. 4.3.3-5 Projection of CO_2 Emission with Analysis 2

CO_2 Emission in 2025 by Sector and Sub-sector (Fig. 4.3.3-6)

Even after the realization of EC potential in 2025 suggested by Analysis 2 of the JICA study, the industrial sector will still be expected to be the largest CO_2 emitter, and, account for 47% of the total CO_2 emission with Analysis 2 of JICA Study adopted. Transportation will be another major CO_2 emitter with a share of 31%, second only to the industry sector, followed by the household sector (14%). As far as the sub-sectors of industrial sector are concerned, cement will top the others in CO_2 emission.



Source: Based on the data of Fig.4.3.3-4.

Fig. 4.3.3-6 Breakdown of CO_2 Emission in 2025 by Sector and Sub-sector

It should be borne in mind that transportation sector has been excluded from the scope of JICA study and hence its EC potential and CO_2 emission reduction potential has been under-evaluated.

4.3.4 Comparison of Energy Conservation and CO_2 Emission Reduction Potential between The Study and Established Master-plans

Comparisons of Analysis 1 vs. Blueprint for Electricity Conservation (Draft) and Analysis 2 vs. RIKEN in terms of energy conservation and CO_2 emission reduction potential are conducted respectively as follows.

(1) Analysis 1 vs. Blueprint (Draft)

1) Comparison Regarding Energy Conservation Potential

The potential of energy saving in the year 2025 with Analysis 1 is expected to be 84~161TWh (157~300MBOE), as compared with 181TWh (338MBOE), the Blueprint analysis for energy conservation in the same year. As illustrated in the foregoing Fig. 4.3.1-2, since the scope Analysis 1 is confined to electricity consumption by major electric products, it should be reasonable that the value of EC potential with Analysis 1 is expected to be smaller than that of the Blueprint, which covers electricity consumption by all the electric appliances in all sectors.

Additionally, it should be noted here that, as the baseline value of electricity consumption in 2008 and the basic assumption of electricity consumption growth rate employed in the BAU Case of Analysis 1 are based on that of RUKN instead of Blueprint, there is the problem of discrepancy in data sources, though the discrepancy between these two data sources is in fact not that significant as to impinge on the appropriateness of the above-stated results.

2) Comparison Regarding CO_2 Emission Reduction Potential

CO_2 emission in the year of 2025 is expected to reduce by 64~123Mton with Analysis 1 as compared with the analysis value of 138Mton for Blueprint. Meanwhile, the cumulative volume of CO_2 emission reduction throughout the period of 2005~2025 with JICA Analysis 1 is estimated to be 674~895Mton, as compared to 1,144Mton of Blueprint. The smaller value on the part of Analysis 1 compared to that of the blueprint is attributable to the same reason stated in the previous paragraph. Moreover, what was touched upon above about the problem of discrepancy in data sources is also applicable to the discussion here.

(2) Analysis 2 (Scenario 2) vs. RIKEN

1) Comparison Regarding Energy Conservation Potential

Energy conservation potential in terms of volume in the year 2025 with Analysis 2 is predicted to be 551MBOE (EC rate at 13%), which will be smaller than the RIKEN analysis for energy conservation (1,851MBOE) in the same year by a wide margin. Two reasons account for this result. The first one is that, as discussed previously, while JICA Analysis 2 is focused on the three sectors of industry (manufacture), commerce and household, RIKEN is supposed to cover all sectors. The second one is that, as the baseline value of energy consumption adopted in the RIKEN BAU Case was based on data of 2002, its subsequent value in 2005 (978MBOE) is much larger than that of the JICA BAU Case in the same year (843MBOE） based on data of MEMR "Statistics of Electricity and Energy 2005".

2) Comparison Regarding CO_2 Emission Reduction Potential

With the JICA Analysis 2, CO_2 emission in the year of 2025 is expected to be reduced by 218Mton, much smaller than the analysis value of 904Mton for RIKEN.

Regarding the cumulative volume of CO_2 emission reduction over the period of 2005~2025, the result with JICA Analysis 2 is estimated to be 1,242Mton as compared to the RIKEN analysis value of 6,456Mton.

Details of the above-stated comparison are rearranged in Table 4.3.4-1.

Table 4.3.4-1 Energy Conservation and CO_2 Reduction Potential with JICA Study vs. That of Existing EC Master-plans

Item	Blueprint for Electricity Conservation (Draft, Jan. 2008)		JICA Analysis 1 （Electric Products）		RIKEN		JICA Analysis 2 （Sectors and Facilities）	
	BAU Case	EC Case	BAU Case	EC Case	BAU Case	EC Case	BAU Case	EC Case
Economic Growth	6.3% (00~25)		6.3% （05~25）		2005 4.92% 2010 5.13% 2015 5.13% 2020 6.51% 2025 6.51%		6.5%	
Primary Energy Consumption Growth	----	----	----	----	8.4% （2002~2025）	6.3% （2002~2025）	8.4% （2005~2025）	Vary with sector
Electricity Consumption Growth	6.8% （2000~2025）	4.4% （2000~2025）	7.1% (2006~2025)	4.3~5.8% (2006~2025)	----	----	----	----
Volume of Energy Conservation in 2025	----	181TWh (338)MBOE (Electricity Only)	----	84~161TWh （157~300MBOE） (Electricity Only)	----	1,851MBOE	----	551MBOE
Rate of Energy Conservation in 2025	----	44% (Electricity Only)	----	20~38% (Electricity Only)	----	36%	----	13%
Volume of CO_2 Reduction in 2025	----	138Mton	----	64~123Mton		904Mton		218Mton
Rate of CO_2 Reduction in 2025	----	44%	----	20~38%		48%		13.3%
Cumulative Volume of CO_2 Reduction in 2005~2025	----	1,144Mton	----	674~895Mton (2008~2025)		6,456Mton		1,242Mton
Rate of CO_2 Reduction in 2005~2025	----	31.0%	----	20~26% (2008~2025)		35%		7%

Note: Values of BAU Case of Analysis 2 are based on RUKN data.

4.3.5 Economic Analysis on the Relevance of EC&C Program Put Forward by the Study Team

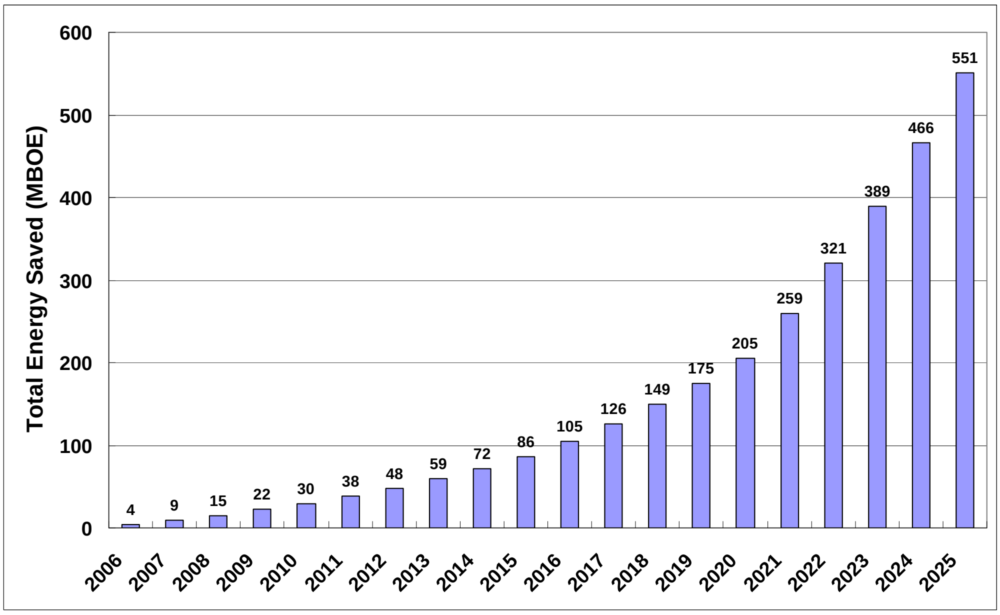
(1) Estimation of Total Benefit Brought forth by EE&C

The EE&C program put forward by the Study Team, as explained previously, is expected to be bring about benefit to Indonesia, and it is assumed to be the result yielded from the afore-mentioned Analysis 2.

Regarding the total benefit, it would be reasonable to add to the total amount the item of PLN's saving in power facility investment as a result of EE&C and the item of residual value of fixed assets besides the item of energy consumption cost saved by EC. However, in order to make it simple for calculation, only the latter is included here. It needs to be kept in mind that, since the effect of energy conservation relevant to the Analysis 1 of the Study is supposed to be included in that of Analysis 2, the estimation of benefit resulting from energy consumption reduction is solely based on the result of energy conservation calculation by Analysis 2.

1) Energy Consumption Reduction by Analysis 2 of the Study

Based on the previously stated result yielded by Analysis 2 of the Study, annual energy consumption reduction by 2025 can be depicted in Fig. 4.3.5-1.



Source: Based on data of the foregoing Fig.4.3.3-4

Fig. 4.3.5-1 Energy Consumption Reduction Estimated by Analysis 2 of the Study

2) Monetization of Energy Consumption Reduction Effect

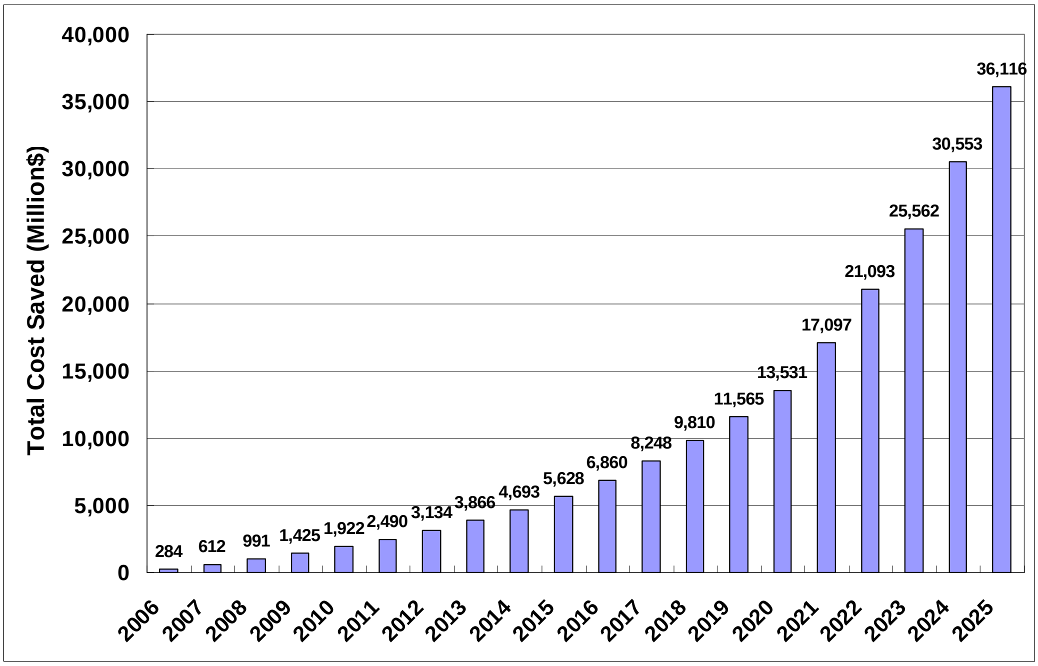
The prices of respective types of energy expressed in US$ per BOE are arranged in Table 4.3.5-1. The price of electricity is further divided into three types respectively applied to the sectors of industry, commerce and household. As the latest official data of energy prices available currently are as of 2006, data as of this year are used to convert the value of energy consumption reduction into monetary unit.

Table 4.3.5-1 Energy Prices (Non-subsidy) by Type of Energy

			2002	2003	2004	2005	2006
Industry	Oil	$/BOE	26.7	30.0	27.4	45.1	73.5
	Kerosene	$/BOE	11.3	14.0	12.7	35.4	37.4
	Natural Gas	$/BOE	13.2	18.5	24.8	41.1	43.8
	LPG	$/BOE	31.5	39.5	37.9	50.7	55.3
	Coal	$/BOE	5.7	6.4	5.8	6.0	8.8
	Electricity	$/BOE	80.8	102.2	98.2	94.6	112.4
Commerce	Electricity	$/BOE	108.2	127.5	119.8	115.3	121.1
Household	Electricity	$/BOE	71.7	100.7	97.9	93.4	102.7

Source: Based on "Handbook of Energy & Economic Statistics of Indonesia 2007" by Center for Data and Information on Energy and Mineral Resources, MEMR

Note: The price of ADO, which accounts for the largest proportion of oil consumption, is used to represent the price of oil here.



Source: Based on data of the foregoing Fig.4.3.3-4 and Table 4.3.5-1

Fig. 4.3.5-2 Monetarily Converted Annual Value of Energy Consumption Reduction

The monetary values of energy consumption reduction converted by the above-stated energy prices are reflected in Fig. 4.3.5-2., which shows that the monetarily converted annual value of energy consumption reduction is expected to increase from $1.4 billion in 2009 to $36.1 billion in 2025.

(2) Total Cost Estimation

1) Government's Expenditure

The EC&C program put forward by the Study Team, as previously explained, is estimated to entail government's expenditure classified by strategy and period as shown in Table 4.3.5-2: (Same as Table3.5-1)

Table 4.3.5-2 Breakdown of Government's Expenditure (2009~2025) (Unit: $)

Item/New Idea	Ⅰ (2009-2015)	Ⅱ (2016-2020)	Ⅲ (2021-2025)	Total (2009-2025)
Education and Training (on EE&C for senior executives, etc.)	3,240,000	3,670,000	3,670,000	10,580,000
Development of the Network of Designated Factories and Energy Managers	126,400	171,500	467,500	765,400
Energy Audit Partnership Program (continuation and expansion of the existing one)	4,740,000	4,060,000	4,880,000	13,680,000
Implementation of Seminars, Education and Training on EE&C	2,539,300	2,569,900	639,900	5,749,100
Making Obligatory Target-setting for EE&C by Designated Factories	3,970,000	2,972,000	2,972,000	9,914,000
Introduction of EE&C Labeling System	1,520,000	850,000	850,000	3,220,000
Promotion of Electricity Demand Side Management (DSM)	13,000,000	10,000,000	10,000,000	33,000,000
Establishment and Expansion of Award Program for Achievement of EE&C Activities	420,000	300,000	300,000	1,020,000
Promoting EE&C Design and Use of EE&C Gooes and Materials	1,930,000	2,040,000	113,000	4,083,000
Energy Conservation Technology Center (ECTC)	3,930,000	1,430,000	1,700,000	7,060,000
Establishment of Financial Mechanism to support EE&C Promotion and Dissemination	180,000,000	0	0	180,000,000
Promotion and Acceseration of Research and Development	874,000	2,010,000	1,828,000	4,712,000
Development of Database and Formulation Master-plan	350,000	350,000	350,000	1,050,000
Preparation of Laws, Regulations and Standards for Promotion and Dissemination of EE&C	0	0	0	0
Total	36,639,700	30,423,400	27,770,400	94,833,500
Annual Budget (Total÷Years of Each Stage)	5,636,877	6,084,680	5,554,080	5,747,485

Source: Based on MEMR data, results of interview survey conducted by JICA Study Team and practices in Japan.

Note: The item of "Establishment of Financial Mechanism to Support EE&C Promotion and Dissemination" is excluded from the total amount owing to its difference from the needed budget of the program in terms of attribute.

2) Private Sector's Expenditure

Meanwhile, expenditure by the private sector relevant to the implementation of the EE&C program is assumed to consist of the items arranged in Table 4.3.5-3. The rationale for these assumptions is explained in the notes underneath the table.

Table 4.3.5-3 Breakdown of Private Sector's Expenditure (2009~2025）（Unit: $）

Item	I (2009-2015)	II (2016-2020)	III (2021-2025）	(2008-2025)
Training of energy managers*1	14,080,000	10,400,000	10,400,000	34,880,000
Training of sales persons for EC products*2	700,000	500,000	500,000	1,700,000
Cost of label management*3	560,000	1,000,000	1,500,000	3,060,000
Accreditation of energy-efficient electric products*4	65,000	50,000	50,000	165,000
Minor capital investment intended for individual equipment improvement in EC performance*5		25,000,000,000		25,000,000,000
Major capital investment intended for Improvement of overall production process*6			75,000,000,000	75,000,000,000
Total	**15,405,000**	**25,011,950,000**	**75,012,450,000**	**100,039,805,000**

Note: *1. 1) 1,000$/person
2) EM trainees for the initial 3 years: 1,600EM /year (2EM/company × 800 company)
3) Failed examinees: 30%
4) Replacement: 1/3 of existent EM per year starting from the fourth year
*2. 1) 100$/person
2) SP trainees: 1,000SP/ year
*3. 1) Cost for 1 company per year: 100$
2) Companies granted with labels: Increment of 20 companies per year (2009-2025)
*4. 1) Cost of Accreditation: 100$/type
2) Number of types of products getting certified: 50 types in year 2009 and 100 types per year from 2010 to 2025
*5. Total investment in the period of 2016 -2020: 25 billion$ (5 billion$/year)
*6. Total investment in the period of 2020 -2025: 75 billion$ (15 billion$/year)

3) Total Cost Including Government and Private Sector's Expenditure

As revealed by Table 4.3.5-4, total cost including expenditure by the government and the private sector is estimated to amount to $100.1 billion. Although the portion contributed by the government will be not more than $95 million, it is expected to exert a pump-priming effect to attract the pouring of private sector investment as high as $100billion into this program.

Table 4.3.5-4 Total of Government and Private Sector's Cost (2009~2025) (Unit: $)

Items		**I (2009-2015)**	**II (2016-2020)**	**III (2021-2025）**	**(2009-2025)**
Government	Strategy 1	3,786,400	4,141,500	4,437,500	12,285,400
	Strategy 2	14,363,300	12,459,900	9,510,900	36,247,100
	Strategy 3	18,190,000	13,972,000	13,972,000	46,134,000
	Total Government Cost	36,339,700	30,573,400	27,920,400	94,833,500
Private Sectors	Cost of Private Sectors	15,405,000	25,011,950,000	75,012,450,000	100,039,805,000
Total Cost		**51,744,700**	**25,042,523,400**	**75,040,370,400**	**100,134,638,500**

Source: Based on Table 4.3.5-1 and Table 4.3.5-2

(3) Analysis of Investment Appropriateness Regarding the Implementation of EE&C Program

Based on the above-mentioned results of cost and benefit evaluation regarding the implementation of EE&C program, the appropriateness of investment will be analyzed through calculation of Cash-flow (CF), Net Present Value (NPV) and Economic Internal Rate of Return (EIRR) with a view to assess the economic effects.

1) CF

In the process of a CF calculation, the annual values of net cash-flow-in are yielded by offsetting cash-flowing-in with cash-flow-out of respective year. With regard to cash-flow-in of this program, the monetarily converted values of energy consumption reduction reflected in Fig. 4.3.5-2 can be applied directly here, while in the case of cash-flow-out calculation, the values of government and private sector expenditures slated for disbursement in three stages are further averaged out into annual values within respective stages, and the private sector expenditures have been estimated considering the actual need of fund required for the implementation of the program.

The result of CF is presented in Table 4.3.5-5. Although the benefit on the side of cash-flow-in includes only the item of monetarily converted energy consumption reduction, the annual net cash-flow-in yielded by subtracting cash-flow-out from cash-flow-in is expected to be a positive value of $1.4 billion in the first year of the program period (2009), and will remain a positive value every year till the end of the program period (2025), when the value will reach the level of $21.1 billion.

Table 4.3.5-5 CF Resulted from the Implementation of EE&C Program put forward by the Study for the Whole Country of Indonesia (Unit:1,000)

Year	Cost			Benefit		Net Cash Flow-in
	Government Cost	Cost of Private Sectors	Total Cost	Cost Reduced by EC	Total Benefit	
2009	5,637	1,725	7,362	1,425,000	1,425,000	1,417,638
2010	5,637	2,230	7,867	1,922,000	1,922,000	1,914,133
2011	5,637	2,250	7,887	2,490,000	2,490,000	2,482,113
2012	5,637	2,270	7,907	3,134,000	3,134,000	3,126,093
2013	5,637	2,290	7,927	3,866,000	3,866,000	3,858,073
2014	5,637	2,310	7,947	4,693,000	4,693,000	4,685,053
2015	5,637	2,330	7,967	5,628,000	5,628,000	5,620,033
2016	6,085	5,002,350	5,008,435	6,860,000	6,860,000	1,851,565
2017	6,085	5,002,370	5,008,455	8,248,000	8,248,000	3,239,545
2018	6,085	5,002,390	5,008,475	9,810,000	9,810,000	4,801,525
2019	6,085	5,002,410	5,008,495	11,565,000	11,565,000	6,556,505
2020	6,085	5,002,430	5,008,515	13,531,000	13,531,000	8,522,485
2021	5,554	15,002,450	15,008,004	17,097,000	17,097,000	2,088,996
2022	5,584	15,002,470	15,008,054	21,093,000	21,093,000	6,084,946
2023	5,584	15,002,490	15,008,074	25,562,000	25,562,000	10,553,926
2024	5,584	15,002,510	15,008,094	30,553,000	30,553,000	15,544,906
2025	5,584	15,002,530	15,008,114	36,116,000	36,116,000	21,107,886

Source: Based on Table 4.3.5-1, 4.3.5-3 and 4.3.5-3, and Fig. 4.3.5-2

Note : NPV=$36,190,304,999＞0

The reason for such a favorable result of CF estimation can be explained by the runaway growth of energy prices in general and the oil price in particular.

2) NPV

The net present value of the above-mentioned net cash-flow-in, i.e. the NPV can be calculated by the formula below:

$$NPV = \sum_{i-1}^{n} \frac{values_i}{(1 + rate)^i}$$

,where "values" represents cash-flow values, "n" represents the number of years throughout the period, "i" represents the number of a certain year in the sequence of all the years within the period. The discount rate is assumed to be 10% as is commonly used. The result shows that the NPV of net cash-flow-in throughout the period of 2009-2005 is a huge positive value of $36.2 billion, which can be attributed to the reason explained previously. Generally speaking, so long as the value of NPV is greater than or equal to 0, the investment of a project is considered appropriate. Accordingly, there is no doubt that the above-mentioned result of NPV justifies the appropriateness for the implementation of the proposed EC program.

3) EIRR

As a common sense in the calculation of EIRR, the cost and benefit should be relevant to the national economy, and the price used as the basis for calculation should be what is called "Shadow Price". With regard to the proposed program, as seen in the CF calculation, the monetarily converted energy consumption reduction recorded on the benefit side has been estimated using the non-subsidy energy prices known as the "Shadow Price", and meanwhile, the prices used as the basis for cost calculation are also assumed to be the non-subsidy "Shadow Price" or prices used in the international market.

Moreover, although the item of PLN's saving in power facility investment as a result of EE&C and the item of residue value of fix assets should have also been included in the total amount of benefit, owing to the lack of information, these two items were excluded from the calculation of CF and NPV.

(4) Sensitivity Analysis

It should be borne in mind that the results have been arrived at from calculation based on the energy prices as of 2006. As was pointed out previously, the higher the energy prices grow, the larger the monetarily converted value of EE&C effect will become, if the future energy price is higher than the 2006 level, the favorable effect on the proposed EE&C program will doubtlessly grow larger. But, if the future energy price is lower than the 2006 level, the benefit of this program will scale down and it might even happen that the implementation of the program become inappropriate.

In this regard, the sensitivity analysis here assume only the case when energy price is lower than the 2006 level, whereby to estimate the consequent effect on the appropriateness of the EE&C program. As shown in Table 4.3.5-6, two cases assuming energy prices falling by 47-48% from the 2006 level are set as the basis for sensitivity analysis regarding CF and NPV.

Table 4.3.5-6 Assumptions of Energy Prices Falling by 47% and 48% from the 2006 Level

			2006 Price	**47% Down**	**48% Down**
Industry	Oil	$/BOE	73.5	39.0	38.2
	Kerosene	$/BOE	37.4	19.8	19.4
	Natural Gas	$/BOE	43.8	0.0	0.0
	LPG	$/BOE	55.3	29.3	28.8
	Coal	$/BOE	8.8	4.7	4.6
	Electricity	$/BOE	112.4	59.6	58.4
Commerce	Electricity	$/BOE	121.1	64.2	63.0
Household	Electricity	$/BOE	102.7	54.4	53.4

1) Case Assuming Energy Prices Falling by 47% from the 2006 Level

When energy prices fall by 47% from the 2006 level, net cash-flow-in will become a negative value from 2016 to 2018 and from 2021 to 2024, but NPV for the whole period of 2009-2025 will remain a positive value, registering $533 million.

Table 4.3.5-7 CF in the Case of 47% Down from 2006 Price Level with Regard to the EE&C Program Put forward by the Study (Unit:$1,000)

Year	Cost			Benefit		**Net Cash Flow-in**
	Government Cost	**Cost of Private Sectors**	**Total Cost**	**Cost Reduced by EC**	**Total Benefit**	
2009	5,637	1,725	7,362	630,000	630,000	622,638
2010	5,637	2,230	7,867	850,000	850,000	842,133
2011	5,637	2,250	7,887	1,101,000	1,101,000	1,093,113
2012	5,637	2,270	7,907	1,386,000	1,386,000	1,378,093
2013	5,637	2,290	7,927	1,709,000	1,709,000	1,701,073
2014	5,637	2,310	7,947	2,075,000	2,075,000	2,067,053
2015	5,637	2,330	7,967	2,488,000	2,488,000	2,480,033
2016	6,085	5,002,350	5,008,435	3,041,000	3,041,000	-1,967,435
2017	6,085	5,002,370	5,008,455	3,664,000	3,664,000	-1,344,455
2018	6,085	5,002,390	5,008,475	4,365,000	4,365,000	-643,475
2019	6,085	5,002,410	5,008,495	5,152,000	5,152,000	143,505
2020	6,085	5,002,430	5,008,515	6,034,000	6,034,000	1,025,485
2021	5,554	15,002,450	15,008,004	7,608,000	7,608,000	-7,400,004
2022	5,584	15,002,470	15,008,054	9,372,000	9,372,000	-5,636,054
2023	5,584	15,002,490	15,008,074	11,343,000	11,343,000	-3,665,074
2024	5,584	15,002,510	15,008,094	13,544,000	13,544,000	-1,464,094
2025	5,584	15,002,530	15,008,114	15,996,000	15,996,000	987,886

Source: NPV=$532,940,814＞0

2) Case Assuming Energy Prices Falling by 48% from the 2006 Level

When the range of energy price falling reaches 48% as compared to the 2006 level, the negative value of net cash-flow-in will grow larger, thus resulting in the negative result of NPV as $4.4 million, and the investment associated with the implementation of this program will turn out unprofitable.

Table 4.3.5-8 CF in the Case of 48% Down from 2006 Price Level with Regard to the EE&C Program put forward by the Study (Unit:$1,000)

Year	Cost			Benefit		Net Cash Flow-in
	Government Cost	ost of Private Secto	Total Cost	Cost Reduced by EC	Total Benefit	
2009	5,637	1,725	7,362	618,000	618,000	610,638
2010	5,637	2,230	7,867	834,000	834,000	826,133
2011	5,637	2,250	7,887	1,080,000	1,080,000	1,072,113
2012	5,637	2,270	7,907	1,360,000	1,360,000	1,352,093
2013	5,637	2,290	7,927	1,677,000	1,677,000	1,669,073
2014	5,637	2,310	7,947	2,036,000	2,036,000	2,028,053
2015	5,637	2,330	7,967	2,441,000	2,441,000	2,433,033
2016	6,085	5,002,350	5,008,435	2,983,000	2,983,000	-2,025,435
2017	6,085	5,002,370	5,008,455	3,595,000	3,595,000	-1,413,455
2018	6,085	5,002,390	5,008,475	4,282,000	4,282,000	-726,475
2019	6,085	5,002,410	5,008,495	5,054,000	5,054,000	45,505
2020	6,085	5,002,430	5,008,515	5,920,000	5,920,000	911,485
2021	5,554	15,002,450	15,008,004	7,465,000	7,465,000	-7,543,004
2022	5,584	15,002,470	15,008,054	9,195,000	9,195,000	-5,813,054
2023	5,584	15,002,490	15,008,074	11,129,000	11,129,000	-3,879,074
2024	5,584	15,002,510	15,008,094	13,288,000	13,288,000	-1,720,094
2025	5,584	15,002,530	15,008,114	15,694,000	15,694,000	685,886

Source: NPV=$-4,446,033＜0

3) Summary of the Effects of Energy Price Decline

Results yielded from the calculation based on the above-mentioned 3 cases are summarized by Table 4.3.5-9, which illustrates the effects of energy price decline on the economic viability of the proposed EE&C program. It is desired that this evaluation methodology would be utilized by C/P.

Table 4.3.5-9 Comparison of Economic Viability among Three Cases with Different Energy Prices（Unit：$1,000）

Item		Case with 2006 Energy Price	Case of 47％ down from 2006 Price Level	Case of 48％ down from 2006 Price Level
Net Cash Flow-in	2009	1,417,638	622,638	610,638
	2010	1,914,133	842,133	826,133
	2011	2,482,113	1,093,113	1,072,113
	2012	3,126,093	1,378,093	1,352,093
	2013	3,858,073	1,701,073	1,669,073
	2014	4,685,053	2,067,053	2,028,053
	2015	5,620,033	2,480,033	2,433,033
	2016	1,851,565	-1,967,435	-2,025,435
	2017	3,239,545	-1,344,455	-1,413,455
	2018	4,801,525	-643,475	-726,475
	2019	6,556,505	143,505	45,505
	2020	8,522,485	1,025,485	911,485
	2021	2,088,996	-7,400,004	-7,543,004
	2022	6,084,946	-5,636,054	-5,813,054
	2023	10,553,926	-3,665,074	-3,879,074
	2024	15,544,906	-1,464,094	-1,720,094
	2025	21,107,886	987,886	685,886
NPV		36,190,305＞0	532,941＞0	-4,446＜0

Source: Based on the foregoing relevant tables.

APPENDIX

Index of Program Outline and Action Plan

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Program Outline No. 1

1. TITLE	Education and Training (on EE&C for senior executives, etc)
2. LOCATION	Mainly ETCERE （EMI）
3. IMPLEMENTING AGENCIES	MEMR
4. TARGET/PARTICIPANTS	Executive Officers and directors of major corporations, senior manager of factories, etc.
5. OBJECTIVES	Heighten executives' awareness on EE&C
6. EXPECTED EFFECTS	Various ideas and measures of EE&C will be adopted in the decisions made by executives of the private sector
7. PROJECT COSTS	Total: US $ 10.5 million (～2025)
8. IMPLEMENTATION SCHEDULE	2009-2025

9. DESCRIPTION

- Executive seminars targeting senior executive officers and other decision-makers of the private sector.
- The goal of the program is that the participants should start adopting general EE&C knowledge for their business operations and management.
- Initial learning objectives are that the participants are able to (1) acquire knowledge in the trend of the latest lows and regulations for EE&C and the measures adopted by the private sector, (2) acquire knowledge in advanced technology in EE&C, and (3) comprehend some of the best practices implemented by advanced companies, etc.
- In the following stages II and III, the topics may be tailored to the participants' interest and various additional topics covered as necessary.
- One of the aims of the proposed program is to introduce the roles of ETCERE and MEMR as "One Stop Centers for EE&C" for those who need technical assistance. Another aim is to initiate employees of the participants to receive & impart education and training program described in the Action Plan "Education and Training (on EE&C for senior executives, etc)".
- The program is initially carried out mainly by lectures utilizing audio and visual materials. Large capital investment such as construction of training facility, etc were not considered because initial seminar/training will be held at the training facilities of ETCERE and, when necessary, MEMR.

10. ISSUES

- This program is linked with the Energy Manger Program. The preparation of the Program should be launched prior to the start of the Energy Manager Program and the seminar should be carried out simultaneously.
- This program may be transferred to the proposed "Energy Conservation Technology Center Program" (Program outline No. 10) once it is launched.

11. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- In the lecture, introduction of good practices in Indonesia will be the most important element of the program. The compilation of the past examples, however, is not sufficient. The initial support to the program may include compilation of the past EE&C practices including the ones supported by NEDO, JETRO, etc in order to prepare effective training curriculum and teaching materials.
- Technical support to development of teaching methodology and materials may be adopted based on the past experience in technical corporations in EE&C by Japan.

Program Outline No. 2

1. PROGRAM TITLE	Development of the Network of Designated Factories and Energy Mangers
2. LOCATION	Whole country of Indonesia
3. IMPLEMENTING AGENCIES	MEMR
4. TARGET/PARTICIPANTS	Designated factories and their energy mangers
5. OBJECTIVES	Designated factories and the energy mangers nominated in the factories
6. EXPECTED EFFECTS	Dissemination and promotion of EE&C technology and other related information through the network
7. PROGRAM COSTS	Total: US $ 0.765 million (～2025)
8. IMPLEMENTATION SCHEDULE	2009-2025

9. DESCRIPTION

【Stage I】（2009～2015）

- MEMR will have established a network of energy managers nominated by the designated factory and Energy Manger Program according to the Energy Law. The network should be developed when the Energy Manger Program is enacted.
- EE&C related information (e.g. technical information, interpretation of rules, regulations and procedures, introduction of best practices) may be presented through the network. Issues and constraints associated with the program should be discussed with officials from ministries concerned.
- The hearing results may be reflected further to implementation of EE&C policies.
- This program should be continued through the Mid-term.

【Stage II】(2016～2020)

- Establishment of the network of technical information through sub sector-wise industry associations and groups, etc.
- Dissemination of advanced EE&C technology and practices through the network.
- The program will have started once the Energy Manger Program (including the Target Setting Agreement) is established (implemented mainly from the Stage II and continued in the Stage III).

【Stage III】(2021～2025)

（Continuation of activities above）

10. ISSUES

- This program is closely related to Energy Manger Program. The preparation of the Program should be launched prior to the start of the Energy Manager Program and the seminar should be carried out simultaneously.
- The content and information to be disseminated should be further discussed and identified depending on the priority and necessity of the participants to the network.
- Further consideration for entrusting the program to the research or educational institute such as EMI or universities may be discussed.
- Close coordination with MOI is a key for successful implementation because it has been a focal point with the industrial sector in Indonesia.
- This program may be transferred to the proposed " Energy Conservation Technology Center Program (Program No. 10)" once it is launched.

11. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- MEMR's authority over the industrial sector and its EE&C employees has been limited in the past. Therefore, support from donors including Japan will be effective.

Program Outline No. 3

1. TITLE	Energy Audit Partnership Program (Continuation and Expansion of the Existing Program)
2. LOCATION	Whole Country of Indonesia
3. IMPLEMENTING AGENCIES	MEMR
4. TARGET/PARTICIPANTS	Designated factories and buildings
5. OBJECTIVES	Energy intensity of the participating factories and building is reduced.
6. EXPECTED EFFECTS	Effective measures for EE&C are implemented at the participating companies.
7. PROJECT COSTS	Total US $ 13.6 million (-2025)
8. IMPLEMENTATION SCHEDULE	2009-2025 年

9. DESCRIPTION

（This is a program carried out through the Stage III）

- Free consultation and energy audit services provided by MEMR. An audit expert will be provided free of charge to provide “walk-through” type preliminary energy audit. This is a continuation and expansion of the existing energy audit partnership program.
- The prospective factories may be the ones whose executives participated in the seminar and workshop listed in the Program Outline No. 1 “Education and Training” that may expect multiple effect of the activities. Therefore application procedures of this program along with the advantages of receiving the services need to be explained during the workshop and the seminar.
- A purpose of the program is to disseminate the effectiveness of energy audit performed by audit experts contracted by MEMR. The number of the audits should be significantly increased by emphasizing on “walk-through” type preliminary energy audit rather than more precise energy audit services employing measuring devices which the on-going program has been providing. This will allow MEMR to expose more prospective factories and commercial buildings to the importance and benefit of energy audit services.
- Monitoring of the recommendations from the analysis should be much strengthened in order to track the improvement of energy efficiency. When the results of the services are reported, data should be compiled and published to public, particularly those participating factories, because the audit results contains a variety of tips useful for EE&C. (Current program does not have a reliable record of improvement in energy saving.)
- The compiled results and analysis should be published as Indonesia’s own best practice. The current program only discusses about reduction potentials not tangible results from the audit.

10. ISSUES

- This program may be realized by continuing and expanding the existing energy audit partnership program. The issue is the availability of resources (i. e. funding, capable consultants, etc). This program, however, is very important because it serves as the vanguard of whole EE&C strategy in Indonesia. In order to promote effective EE&C measures securing necessary resources is extremely important.
- Promotion activities with various channels are also important.
- On-going partnership program excludes energy audit of heat area. Enforcement in the heat related technology (data collection, analysis and reporting, etc.) is essential for improving EE&C potential in Indonesia.
- Reporting should be focusing on recommendations with higher energy reduction potential so that the participating factory/building may benefit immediately from the program. Local consultants, such as BPPT needs to carry out such responsibility as soon as possible. Number of the beneficiaries should be increased as much as possible (200 factories/building in 2007, 32 in 2006)
- Preliminary auditing should be implemented pro bono basis. Commercial-based auditing should be promoted beyond the level of the services supported by the program.
- This program may be transferred to the proposed “Energy Conservation Technology Center Program (Program Outline No. 10) once it is launched.

11. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Energy audit training including measuring, analysis and reporting should be provided to consultants prior to the launch of the program. When appropriate trainers are not available in Indonesia additional training for engineers may be considered by employing technical assistance from overseas.

Program Outline No. 4

1. TITLE	Implementation of Seminars, Education and Training on EE&C
2. LOCATION	Whole Country of Indonesia
3. IMPLEMENTING AGENCIES	ETCERE, Local Government, The Private Sector/Corporate Groups
4. TARGET/PARTICIPANTS	All industries, commercial buildings, energy managers, etc.
5. OBJECTIVES	Various EE&C measures are implemented
6. EXPECTED EFFECTS	Advanced EE&C technologies are promoted and disseminated Knowledge and skills of EE&C engineers are improved
7. PROJECT COSTS	Total US $ 5.74 million (-2025)
8. IMPLEMENTATION SCHEDULE	2009-2025

9. DESCRIPTION

【Stage I】(2009-2015)

- Implementation of sector-wide (e.g. textile, food, cement & ceramics, steel, etc), industrial machinery specific (e.g. air conditioner, electric power, pumps, compressed air, lighting, converter, rotating fans, etc.) seminar, training and education, and publications for promoting EE&C. Publications should be in Bahasa Indonesia. The highest priority should be placed on basic topics covered in the proposed examination for Energy Manger Certification. The training should be carried out by combing OJT and class room training.
- Good practices derived and compiled from the energy audit partnership program (Program Outline No.2 "Development of the Network of Designated Factories and Energy Mangers") is a key for promoting successful EE&C. Field trip to advanced factories and commercial buildings are also good learning opportunities for the participants.
- Seminar, education and training on EE&C (e.g. interpretation, procedures and new development of laws and regulation) should be carried out regularly.

【Stage II】(2016～2020)

- Importance of basic contents for seminars, training & education, as well as publishing described in the Stage I will not be changed. More advanced subjects, however, may be included.
- Training program may be carried out by the private initiatives of corporate groups. Such training and education should be inclusive of subcontractors as well as the employees within their affiliate groups. The purpose of such technology transfer would be to retain knowledge and experiences in EE&C vertically through a cascade system. Prerequisite for such technology transfer is to practice various management skills in the corporate groups. Because financial, technical and organizational supports from industries is essential for success of EE&C promotion, various promotion measures for technology transfer of EE&C from the corporate world should be encouraged.

【Stage III】(2021～2025)

（Continuation and expansion of the activities in the Stage II）

10. ISSUES

- Each items listed above should be carried out by a so-called top-down approach. The government should provide tax easements to cover the partial cost for education and training.
- The program should be transferred to Energy Conservation Technology Center (Program Outline No. 10). The center, when established, should select thematic topics to match the interest of the participants. MEMR and MOI will have to collaborate together effectively in order to request field trip or study tour to those who are interested in advanced initiatives taken by some companies. MOI and MEMR will assist such field trips because some companies may not want allow others any access to their facilities. The field trip may be implemented by combining with an award program.
- Currently, International Standard Organization (ISO) is preparing ISO50001 series, the first international energy management system standard, scheduled to launch in 2010.
- This program may be transferred to Energy Conservation Technology Center (Program Outline No.10) when it is established.

11. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Technical resources necessary for this program are available from various countries. Optimal results may be achieved when such resources are fully utilized.

Program Outline No.　5

1. TITLE	Target-Setting Agreement with Designated Factory
2. LOCATION	Whole country of Indonesia
3. IMPLEMENTING AGENCIES	MEMR
4. TARGET/PARTICIPANTS	All Industries and Commercial Building (Factories and buildings whose energy consumption exceeds 6,000 TOE/year for the moment), Energy Services Providers
5. OBJECTIVES	Reduction of energy usage
6. EXPECTED EFFECTS	Dissemination of effective EE&C technology Improved energy intensity in Indonesia
7. PROJECT COSTS	Total　US $ 9.91 million (-2025)
8. IMPLEMENTATION SCHEDULE	2009-2025

9. DESCRIPTION

【Stage I】（2009～2015）;Action Plan "Target-Setting Agreement with Designated Factory"

- Target setting agreement program consists of (1) designating factories and commercial buildings whose energy consumption exceeds certain amount (6,000TOE/year at the moment), (2) nominating qualified energy manger(s) who is responsible for overseeing effective energy use at respective factories and commercial buildings, (3) mandatory and periodical reporting of annual energy use, (4) voluntary or mandatory agreement for annual energy use reduction, and other necessary measures and supports to those comply with the program. Currently, the government of Indonesia is preparing various prerequisites and preconditions for introducing the program
- The preconditions for the program include: (a) establishment of examination for qualification certificate of energy manager, and (b) appropriate number of qualified energy mangers are nominated and assigned to the designated factories. Other preconditions may include: (c) "heat conversion table" for calculating energy usage is published annually, (d) external consultants who provide energy audit services to designated factories are trained and available, (e) sufficient number of energy engineers who can perform internal energy-related basic diagnosis for large companies (in-house auditors) are trained and available, (f) various supporting mechanisms to request external auditor for seeking energy audit services, and (g) in addition to the mandatory energy usage reporting, designated factories shall mandatorily pledge annual energy usage reduction (energy usage reduction with legal binging). Combining all these measures listed above, EE&C may be promoted to Indonesia.
- Presently the program has only begun. A variety of activities should be carried out to realize the program.

【Stage II】(2016～2020)

（Fair and equitable implementation of above）

- Among items listed above, preparation for examination and training for the auditors (external consultants) may be mainly carried out during Stage II (2016-2020) as its priority is relatively low compared to the establishment of energy mangers. In addition, establishment and dissemination of energy management technologies in industrial process may be carried out mainly in the Stage II as it requires rigorous collaboration with MOI.

【Stage III】(2021～2025)

（Fair and equitable implementation of above）

10. ISSUES

- Despite the urgency of above program, the current efforts for achieving the goals defined above are very limited in terms of man power, budget, and technical expertise. Therefore significant expansion of MEMR/DGEU is a key for success of the program. In particular, securing sustainable budget allocation is an important issue along with capacity building and organizational development.

- This program may be transferred to the proposed “Energy Conservation Technology Center Program (Program Outline No. 10) once it is launched.

11. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Institutional and technology support required for implementing the program is limited in Indonesia. Technical assistance from abroad may be one of the most effective approaches for achieving goals rapidly.

Program Outline No. 6

1. TITLE	Implementation of the Labeling program
2. LOCATION	Nation wide
3. IMPLEMENTING AGENCIES	MEMR, Accredited testing laboratory, Label Certification Body
4. TARGET / PARTICIPANTS	Manufacturer, Importer, Trader, Retailer, Consumer, etc.
5. OBJECTIVES	Labeling program shall be applied on major household appliances
6. EXPECTED EFFECTS	Spread of high efficiency products and elimination of low efficiency products
7. PROJECT COSTS	Total: US$ 3.22 million (~2025)
8. IMPLEMENTATION SCHEDULE	2009-2015

9. DESCRIPTION

(Application of the Labeling program to major household appliances and industrial machine)

Labeling program shall be applied on the following products which consume significant energy in houses in order to spread high efficiency products. Market research shall be carried out simultaneously.

	Product	Year of issue	Action Plan No.
Household appliances	TVs	2009	Labeling Program No. 1
	Refrigerators	2009	Labeling Program No. 2
	Fluorescent lamps (except CFL), Ballasts	2010	Labeling Program No. 3
	Air conditioners	2010	Labeling Program No. 4
	Personal computers	2010	Labeling Program No. 5
	Rice cookers	2011	Labeling Program No. 6
	Fans (Stand type)	2011	Labeling Program No. 7
	Pumps for well	2012	Labeling Program No. 8
	Washing machines	2012	Labeling Program No. 9

(Database for energy efficiency of household appliances)

Database shall be constructed and operated, in order that business operators and consumers can get current information about energy efficiency of products.

See Action Plan "Labeling Program No. 10"

(Public information of the program)

Public announcement and education for the promotion of Labeling program shall be conducted to the following 3 targets.

A; manufacturers, B; retailers, and, C; consumers

See Action Plan "Labeling Program No. 11"

10. ISSUES

- Since the program is voluntary, projects shall be such that manufacturers don't feel burdened and can easily join to the program.
- The committees which are organized in order to fix measurement method of energy efficiency and labeling criteria must include, mainly, manufacturers.
- For some products such as fans and washing machines it is thought that evaluation method of energy efficiency could be a little difficult.

11. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Energy efficiency of some products such as air conditioners shall be measured by means of an accurate test according to the standards and using special testing facilities. Technical advice and instruction may be needed for such test.
- Technical knowledge shall be needed to fix the measurement method for energy efficiency of each product. Technical advice and instruction may be needed.

Program Outline No. 7

1. TITLE	Promotion of Electricity Demand Side Management (DSM)
2. LOCATION	Whole country of Indonesia
3. IMPLEMENTING AGENCIES	PLN（MEMR）
4. TARGET/PARTICIPANTS	All users of electricity
5. OBJECTIVES	Establishment of sustainable tariff schedule
6. EXPECTED EFFECTS	Securing electric power supply through economically viable and equitable electric tariff
7. PROJECT COSTS	Total US $ 33million (～2025)
8. IMPLEMENTATION SCHEDULE	2009-2025

9. DESCRIPTION

【Stage I】（2009～2015）

- Implement experimental development study to identify specific measures to promote electricity DSM (e.g. pilot project on (a) installation of data collection system for large users, (b) energy audit for electricity users, (c) promotion activities, etc) ;Action Plan DSM No.1-No.5
- Review and revision of tariff schedule (Proposing economically viable and sustainable tariff. Improvement of power factor at user side）
- Provision of energy audit (EE&C through consultation and dialogue with end users)

【Stage II】(2016～2020)

(To be furnished by DSM Study Experts)

【Stage III】(2021～2025)

(To be furnished by DSM Study Experts)

10. ISSUES

- One of some prerequisites is PLN’s will to revise electricity tariff schedule. The current tariff lacks a strong incentive for promoting EE&C. Tariff should be deemed as a strong incentive for promoting EE&C in Indonesia.
- All revisions and changes of energy tariff schedules can be a political issue in Indonesia.

11. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Each company has its own know-how for load control and management technologies and technique. Foreign country’s knowledge is useful for Indonesia through technical assistance and/or on a commercial basis.

Program Outline No. 8

1. PROGRAM TITLE	Establishment and expansion of award program for achievement of EE&C activities (targeting to industry, commercial building, machinery and equipment, schools and children)
2. LOCATION	Whole country of Indonesia
3. IMPLEMENTING AGENCIES	MEMR（ACE, MOI, and/or Ministry of Environment）
4. TARGET/PARTICIPANTS	Industries, commercial buildings, schools, individuals
5. OBJECTIVES	All related industries with specific focus on designated factories, Manufacturers of EE&C equipment, schools and universities, students and children.
6. EXPECTED EFFECTS	To promote good practices and advanced examples of EE&C through presenting awards and prizes. To enhance awareness and consciousness of whole society on EE&C Promote advanced EE&C equipment and technology
7. COSTS	Total US $ 1.02 million (-2025)
8. IMPLEMENTATION SCHEDULE	2009-2025

9. DESCRIPTION

【Stage I】（2009～2015）

- Expanding the existing award program for commercial buildings carried out by ACE. Establish new award program targeting to different clientele, etc. The clientele and aim of the existing award program implemented by ACE has been clear and effective for promoting EE&C in Indonesia. Therefore it should be continued and expanded to different audiences.
- Currently, there is no award program for industrial establishments. A new annual award program for the best practices demonstrated by designated factories should be established and be presented by ministers of MEMR and MOI. Enhanced dissemination activities such as training, seminars advertisement and promotion should be considered.
- A new award program for EE&C activities by schools, students and children for enhancing awareness on EE&C should be established. Prizes should be given to various artworks including photo, picture and essay created by youth. School activities may be another area for consideration. Note that EE&C poster contest by ECCJ invites submission from various countries.
- Individuals particularly employees of designated factories should be given prizes and be acknowledged for their *Kaizen* proposals. This should be initiated through seminars and training for executives.
- This component should be continued up to Stage II.

【Stage II】(2016～2020)

（Continuation of activities above）

- Advanced and original technology development on EE&C carried out by the private sector and the individuals should be awarded. Only objectively verifiable technology should be eligible for the prize.

【Stage III】(2021～2025)

（Continuation of activities above）

10. ISSUES

- Award programs such as this require an institutional arrangement for validating (both technological and institutional) achievements objectively.
- The program should pay specific attention to transfer EE&C technology through peer to peer networks. Panels for commemorating the EE&C prize may be given for display at the entrance of the building, etc to acknowledge the achievement.
- Above program should be carried out through joint support from MEMR, MOI and/or MOE. Close coordination among related agencies should be considered.
- This program may be transferred to the proposed "Energy Conservation Technology Center Program (Project Outline No.10) once it is launched.

11. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- There are many award programs in EU, the United State, etc. The experience and knowledge from these countries should be included.

Program Outline No. 9

1. TITLE	Promoting EE&C design and use of EE&C goods and materials
2. LOCATION	Jakarta (Online services cover the whole country of Indonesia)
3. IMPLEMENTING AGENCIES	MEMR
4. OBJECTIVES	Increase access to technical information and other resources of EE&C.
5. EXPECTED EFFECTS	Disseminate EE&C related technology and its resources to the stakeholders. Empowered initiatives to adopt EE&C technology and management
6. PROJECT COSTS	Total: US $ 4.08 million (-2025)
7. IMPLEMENTATION SCHEDULE	2009-2025 年

8. DESCRIPTION

【Stage I】（2009～2015）

- EE&C related technology and information is spread across ministries and industries of Indonesia and is not available at a single point making it difficult for those willing to implement EE&C activities to find the required information. It is recognized that there is a strong need for establishing one-stop information and assistance services, a Clearing-House.
- Typical information that may be provided is: new technology and equipment such as invertors, HF fluorescent lamps, small once-through boiler and ceramic fiber insulation, etc. In addition, it may cover energy saving potential employing such technologies and methodologies by utilizing audio and visual displays for ease of understanding by broader audiences. Field trips to advanced factories may be planned and implemented as a form of seminar for profit making activities of the center.

【Stage II】(2016～2020)

- Based on the achievement of Stage I, EE&C Expo should act as a showcase for EE&C information and resources. The Exposition will be a forum for industry and individuals who are interested in EE&C to develop networks and cultivate business opportunities. The exposition will be organized regularly (for example every other year).

【Stage III】(2021～2025)

（Continuation of activities above）

9. ISSUES

- Development and implementation of one-stop services requires precise marketing survey and resources. For that reasons, a support from a foreign government is one option to launch the program. DANIDA may have expressed an interest in this program.
- Close coordination with MOI is a key for successful implementation because it has been a focal point with the industrial sector in Indonesia. Industry may provide information and other technical resources on *pro bono* basis.
- This program may be transferred to the proposed "Energy Conservation Technology Center Program (Program Outline No. 10) once it is launched.

10. JUSTIFICATION OF THE TECHNICAL ASSISTANCE

- On-going negotiation with DANIDA includes this program. It should be noted that the program is promising because this may lead to the development of the first implementing agency in EE&C in Indonesia.

Program Outline No. 10

1. TITLE	Establishment of Energy Conservation Technology Center (ECTC)
2. LOCATION	(Initially) Jakarta
3. IMPLEMENTING AGENCIES	MEMR
4. TARGET/PARTICIPANTS	All industry, commercial buildings, energy managers, manufacturers of EE&C-related machinery and equipment (electric appliances) , consumers
5. OBJECTIVES	Comprehensive EE&C measures are implemented in Indonesia
6. EXPECTED EFFECTS	Promotion and dissemination of advanced EE&C technologies Implementation of EE&C strategies (Energy Manger Program, Energy Conservation Labeling Program） Improvement of skills and knowledge of EE&C mangers
7. PROJECT COSTS	Total US $ 7.06 million (-2025)
8. IMPLEMENTATION SCHEDULE	2016-2025

9. DESCRIPTION

【Stage I】（2009～2015）

- Preconditions for establishment (e.g. bylaws and legal ground, organizational arrangement, personnel, financial resources, facility and equipment, etc.) should be furnished. Support from the private sector such as financial, technical and human resources, are indispensable for sustainability of the ECTC.
- The time for establishing the ECTC will be ripe when the proposed three programs of (1) Energy Manager Program, (2) Energy Conservation Labeling Program,, (3) Clearing house would be implemented steadily. Because the private sector, particularly manufacturing and commercial building sector will soon express their interest in supporting the center because they will acknowledge the importance of the roles that the center can play. The private sector together with the government will provide resources necessary for establishment and operation of the ECTC.

【Stage II】(2016～2020)

- Initial emphasis on activities of the ECTC will be limited to (1) providing and disseminating EE&C-related information, (2) providing information on EE&C machinery and equipment (including overseeing implementation of the product labeling program for EE&C, (3) promotion of EE&C in the industry and the public sector (including implementation of proposed energy manger program and the Energy Star Program, etc), (5) implementation of training and examination for the Energy Manager Program, and (6) Publishing and educational activities. Later, such activities as (7) research and development on EE&C, (8) authentification of Energy Efficiency labels, and (9) other supporting tasks (e.g. secretariats for various committees and commissions), may be carried out by the ECTC.

【Stage III】(2021～2025)

（Continuation and expansion of the above）

10. ISSUES

- Prerequisite for establishment of the ECTC is that the center will be acknowledged by its roles and importance and it should be fully supported by both the government and the private sector. Initial investments for establishing the ECTC should be provided by both government and the private sector.
- Current status does not fulfill the prerequisites regarding organization, laws, human resources funding and technology. The only shortcut for achieving the goal is to implement various programs and

projects steadily to promote EE&C by 2015. This will provide fulfillment of such preconditions.

11. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- There are very limited resources for the ECTC available in Indonesia. The Japanese government has vast experience of assisting similar institutions in Thailand, Turkey, Poland and Iran in the form of technical assistance.

Program Outline No. 11

1. TITLE	Establishment of financial mechanisms to support EE&C promotion and dissemination
2. LOCATION	Whole country of Indonesia
3. IMPLEMENTING AGENCIES	MEMR（MOF）
4. TARGET/PARTICIPANTS	All industries, commercial building, manufacturers of EE&C products
5. OBJECTIVES	Establishment of financial mechanisms to support EE&C activities
6. EXPECTED EFFECTS	Advanced EE&C technology is introduced in industries Many factories and commercial buildings adopt EE&C technologies
7. PROJECT COSTS	Total US $ 180 million (-2025)
8. IMPLEMENTATION SCHEDULE	2009-2025

9. DESCRIPTION

【Stage I】（2009～2015）

Financial support include the following objectives:

(1) Establishment of Special Fiscal Account

- In order to secure funding resources for implementation of the programs, a new fiscal policy should be introduced in Indonesia. A fiscal account specifically collected to be used for energy-related activities should be established. The revenue should be collected from all energy-related economic transactions such as gasoline, oil, petrol-chemical, electricity, etc.
- Energy development of all kinds, research and development for new energy and renewable energy, promotion of EE&C, subsidy for gas and petrol should be paid from the account.

(2)Establishment of low interest loans for EE&C related investment

- Provision of low-interest loan is one of largest incentives for the industries to invest in EE&C technologies. This is one of the highest priorities to be carried out by MEMR. Program loans from overseas, such as Two-Step Loan by JICA may be a good funding source to introduce the program in Indonesia.
- Specific areas to provide the preferred interest loan may include, but are not limited to,: renovation, improvement and adoption of EE&C related machinery and equipment, and special loans to support ESCO services. It is considered effective because the current interest rate is as high as 12% in Indonesia.

(3) Provision of Tax Easement for Promoting EE&C

- Another indispensable measure to accelerate EE&C-related investment is provision of tax easement. It is one of the strongest incentives for the private sector to invest in EE&C. Industries in Japan have lobbied the government for many years to provide tax easement to support EE&C-related investment since 19707s. Tax codes specifically listed for EE&C investment include: lower import tax rate for EE&C goods, special depreciation to investment, and tax exemption of education and training cost, etc.

【Stage II】(2016～2020)

（Continuation and expansion of above）

【Stage III】(2021～2025)

（Continuation and expansion of above）

10. ISSUES

- This program requires rigorous negotiation with the Ministry of Finance (MOF) because it requires reform in fiscal policy. Tax easement is an unpopular idea for MOF because they fears revenue loss. ~~Indonesia~~
- Foreseeable positive impact from the tax easement should be analyzed to convince MOF. There is a slight possibility that the proposed measures only lead to more imports of high efficiency machinery and equipment, not effective industrial development that contributes to the economy, because there are very limited domestic manufacturers producing EE&C equipment.

11. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Technical support may be necessary because Indonesian side does not have experience in financial mechanisms including the special account, the low-interest loan and tax easement.

Program Outline No. 12

1. TITLE	Promotion and Acceleration of Research and Development
2. LOCATION	Whole country of Indonesia
3. IMPLEMENTING AGENCIES	MEMR・Ministry of Education、BPPT
4. TARGET/PARTICIPANTS	Universities, all industries, building, manufacturers of EE&C products, etc.
5. OBJECTIVES	New technology in EE&C is developed
6. EXPECTED EFFECTS	Dissemination of EE&C technologies originated from Indonesia Diverse EE&C technologies promoted
7. PROJECT COSTS	Total: US $ 4.71 million (-2025)
8. IMPLEMENTATION SCHEDULE	2009-2025

9. DESCRIPTION

【 Stage I】（ 2009～2015）

- Carry out a variety of EE&C R&D activities by collaborating with universities, BPPT and the private sector.
- Emphasis will be initially non-technical areas, such as management and operations rather than technical areas effective to achieving EE&C in Stage I. Examples may include: laws, customs, informal and formal associations unique to Indonesia. Training and dissemination of technology as well as new laws and procedures will be the benefits from such activities.

【 Stage II】(2016～2020)

- In the medium and long term activities, e.g. development of machinery and equipment unique to Indonesia, such as high-efficiency air-conditioning systems for tropical areas, solar heating systems, bio-energy, geo-thermal, etc. MEMR may want to provide subsidy to university through Ministry of Education.
- Similar technical network with universities overseas could also be effective (Linkages and networking with universities overseas).

【 Stage III】(2021～2025)

（ Continuation and expansion of above)

10. ISSUES

- The technology development listed in Stage II should be carried out with long-term perspectives on achievement. (Expect no short-term outcome but long-term). The side effect of technology development include high-level of human resources development on EE&C. Research outcome is not the effectiveness of the R&D.

11. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Donor may act as a facilitator of networking among universities. (It is highly recommended because it will lead to the R&D platform of EE&C related engineers. Here the term networking does not mean an academic network, but a practical one. Therefore mere academic network without specific EE&C oriented goals and objective should be supported by the governments).

Program Outline No. 13

1. TITLE (Program)	Database Development for Energy Conservation
2. LOCATION	MEMR
3. IMPLEMENTING AGENCIES	MEMR
4. TARGET/PARTICIPANTS	Directorate General of Electricity and Energy Utilization, Center for Energy and Mineral Resources Data and Information of MEMR, and BPS
5. OBJECTIVES	The government is able to develop a medium- and long-term energy conservation strategy together with an establishment of indicators for energy conservation and CO_2 reduction with which the outcome of the strategy can be verified and applied to international comparison.
6. EXPECTED EFFECTS	• A database is developed with which the consistent calculation of energy efficiency economy-wide as well as by sector and sub-sector become possible. • A feasible and verifiable Energy Conservation and CO_2 reduction Master-plan is formulated.
7. PROJECT COSTS	Total US $ 0.365 million (～2015)
8. IMPLEMENTATION SCHEDULE	2009-2025

9. DESCRIPTION

【Development of an Energy Conservation Supporting Database】
- Develop energy consumption statistics which integrate data of energy consumption consistently from the product level through to the sub-sector and sector level.
- Readjust and redefine the classification method of sector and sub-sector in both GDP statistics and energy consumption statistics to make them consistent with each other.
- Develop statistics comprised of data of gross floor space and electricity consumption of buildings by sector, region, and intended purpose. ;Action Plan “Database Development for Energy Conservation”
- Compile a table of energy and CO_2 conversion factors reflective of the actual condition of Indonesia. ;Action Plan “Formulation of an Energy Conservation and CO_2 reduction Master-plan”
- The database with the above-stated content will undergo continuous readjustment and improvement over the period of 2016-2025.

【Formulation of an Energy Conservation and CO_2 reduction Master-plan】
- Discuss and draw up a guideline for the formulation of energy and CO_2 reduction master-plan.
- Set up the goals of energy conservation and CO_2 reduction for respective sectors and subsectors to be realized in 2025.
- Draw up a roadmap leading to the realization of goals in 2025 for respective sectors and subsectors. ; Action Plan “Formulation of an Energy Conservation and CO_2 reduction Master-plan”
- The master-plan will undergo continuous readjustment and improvement over the period of 2016-2025.

10. ISSUES
- Regarding the energy statistics, as it seems that there has been a lack of communication among the divisions of MEMR as well as between MEMR and BPS so far owing to a strong rivalry among people in charge of energy statistics in different organizations, it is imperative that MEMR take the lead in the formation of the project team as well as the implementation of the project.
- In order to acquire understanding towards the necessity of the program’s execution and support from the relevant government agencies and industry groups, it is highly desirable that MEMR make known the significance of the execution of the program, contending that the engagement with energy conservation and CO_2 reduction will not only bring benefit to Indonesia directly, but also contribute to the improvement of its International status by the display of an internationally applicable energy conservation database and the formulation of an excellent energy conservation strategy.

11. JUSTIFICATION FOR TECHNICAL ASSISTANCE
- The participation of a Japanese expert of energy economics and energy statistics well informed of energy statistics in various countries will help the team to develop systems to collect energy statistics available for international comparison with developed and neighboring countries, as well as to upgrade the knowledge and technical level of local counterparts in charge of energy statistics.

Program Outline No. 14

1. TITLE	Preparation of Laws, Regulations and Standards for Promotion and Dissemination of EE&C
2. LOCATION	Whole country of Indonesia
3. IMPLEMENTING AGENCIES	MEMR、MOI、BNS
4. TARGET/PARTICIPANTS	All industries, building, etc.
5. OBJECTIVES	Laws in EE&C are properly administered in Indonesia
6. EXPECTED EFFECTS	Effective EE&C policies are implemented based on fair and equitable laws and regulations
7. PROJECT COSTS	Total US $ 0 million (-2025)
8. IMPLEMENTATION SCHEDULE	2009-2025

9. DESCRIPTION

【Stage I】（2009～2015）

- The highest priority in Stage I is to prepare various laws, regulation, rules for EE&C as soon as possible. For instance, the maintenance standard and judgment standard for EE&C machinery and equipment (e.g. surface temperature of industry-grade furnaces, heat recovery ratio, power factor of selected equipment, air ratio and temperature of heat recovery, etc.), and other regulation and standards for administering the proposed Energy Management Program should be prepared soon.
- Whether or not overseas regulations and standard can be adopted as is should be discussed carefully. In addition, those that originated from Indonesia should be developed when necessary. To do so, a council consisting of government officials, experts in EE&C and representatives from industry associations should be organized to review and discuss various regulatory issues on EE&C.

【Stage II】(2016～2020)

- Administer and update the regulations and standards.

【Stage III】(2021～2025)

（Same as above.）

10. ISSUES

- To ensure harmonization among related laws and regulations overseen by various ministries in Indonesia, as well as international treaties, stakeholder meeting to discuss various issues on formulating laws and regulations is very important.
- This program will make it beneficial for directing factories and commercial buildings with legal binding. This, along with capacity development for audit techniques, enhances the effectiveness and legal status of energy audit activities. In order to do so, development and preparation of standards and regulations may be one of priority areas for the capacity building. (If necessary, various maintenance approaches, (1) post-incidence maintenance, (2) preventive maintenance, and (3) forecasting maintenance, may be introduced in Indonesia. These three approaches are important for realizing so-called “no cost and low cost EE&C”, or enhancement of “a good house keeping for effective EE&C”.
- To develop and prepare such regulations and standards rapidly, Indonesia may be able to adopt those currently used in other countries by lowering their standards. It may be considered to prepare within the scope of their development such as some articles of the newly developed EE&C-related regulations. Maintenance standard is closely related to the guidelines. User side must prepare the maintenance standards as well as operational manuals to comply with legal standards. The

government must prepare judgment standards and the user side must prepare their own maintenance manuals.

11. JUSTIFICATION FOR TECHNICAL COOPERATION

- “Maintenance of EE&C facility” is defined in the maintenance guidelines in Japan. It would be difficult for Indonesia to develop and prepare the guideline by themselves because it does not produce a vast selection of such machinery and equipment locally (If it was capable, such guidelines would have been completed in the past). Such guidelines and standards may be prepared and developed with overseas technical assistance..

ACTION PLAN - Education and Training (on EE&C for senior executives, etc)

1. TITLE	Education and Training (on EE&C for senior executives, etc)
2. LOCATION	Mainly ETCERE （EMI）
3. IMPLEMENTING AGENCIES	MEMR
4. TARGET/PARTICIPANTS	Executive Officers and directors of major corporations, senior manager of factories, etc.
5. OBJECTIVES	Heighten executives' awareness on EE&C
6. EXPECTED EFFECTS	Various ideas and measures of EE&C have been adopted in the decisions made by executives of the private sector
7. PROJECT COSTS	Total US3.24million (～2015)
8. IMPLEMENTATION SCHEDULE	2009-2015

9. DESCRIPTION

Stage 1 (2009-2015)

- Identification of enterprises based on the energy use (Large-scale end-users are selected)
- Development of the training content (including curriculum development, identification of training methodologies, etc.)
- Acknowledgment of on-going preparation for establishment of ISO50001 series. Preparation and development of management seminars on the ISO energy management system.
- Development and preparation of subsequent technical and management seminars.

10. ISSUES

- Absence of a platform to integrate EE&C efforts by industries, power utilities, commercial buildings, transportation, households, and enterprises (ICT, etc). MEMR should be given the power and authority to facilitate (and lead) the efforts backed by EE&C policy.
- Preparation and development of institutional and legal framework (e.g. by laws and technical standards supplementing the EE&C laws).
- Necessity to support MEMR (Technology and information are needed)
- Ensuring financial resources (utilization of both multi and bi-lateral support).
- This program is an initial step towards other technical assistance on EE&C.
- Linkage to the project for accruing CDM credit (utilization of private funds).

11. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Invitation from high ranking officials such as the President and the Ministers are very effective to promote the program.
- Assessment of technology, organizational arrangement for formulating prospective programs and projects, human resources for promotion, and detainment of technology and know-how.
- Experience of Japan in dissemination, etc.
- New technologies (New technologies not introduced in Indonesia in the past, such as inverter, ice accumulation, etc. Commercialization of these technologies is a key element. ）

ACTION PLAN- Energy Audit Partnership Program (Continuation and Expansion of the Existing Program)

1. TITLE	Energy Audit Partnership Program (Continuation and Expansion of the Existing Program)
2. LOCATION	Whole Country of Indonesia
3. IMPLEMENTING AGENCIES	MEMR
4. TARGET/PARTICIPANTS	Designated factories and commercial buildings
5. OBJECTIVES	Energy intensity of the participated factories and building is reduced.
6. EXPECTED EFFECTS	Effective measures for EE&C are implemented at the participating companies.
7. PROJECT COSTS	Total: US $ 4.74million (～2015)
8. IMPLEMENTATION SCHEDULE	2009-2015

9. DESCRIPTION

Stage 1 (2009-2015)

- MEMR will provide necessary financial resources and consultants for carrying out energy audit (preliminary audit) at the industry requested. This is the continuation of an existing energy audit partnership program.

10. ISSUES

- Linkage to the various program listed under the Strategy 1: Raising Awareness and Consciousness (It is ideal when the participants to the program 1 request this program.)
- Ensuring financial resources（There is a budget limitation. The number of factories receiving the audit should be increased.）
- Empowering capacity for auditing (improved project cycle of preparation – assessment – analysis – reporting)
- Strengthening the support to soft-side (i.e. enhancement of application of PDCA cycle: auditors should be aware of the importance of the methodology).
- Sizes of the enterprises are one of the key issues (Large corporation can support themselves: which segment of enterprises should be supported by public funding?)

11. JUSTIFICATION OF TECHNICAL ASSISTANCE

- Capacity development for auditing
- Financial assistance (May propose a formation of CDM project combining new technology such as inverter and other energy efficient technologies)

ACTION PLAN - Target-Setting Agreement with Designated Factory

1. TITLE	Target-Setting Agreement with Designated Factory
2. LOCATION	Whole country of Indonesia
3. IMPLEMENTING AGENCIES	MEMR
4. TARGET/PARTICIPANTS	All Industries and Commercial Building (Factories and buildings whose energy consumption is exceeding 6,000 TOE/year for the moment), Energy Services Providers
5. OBJECTIVES	Reduction of energy usage
6. EXPECTED EFFECTS	Dissemination of effective EE&C technology Improved energy intensity in Indonesia
7. PROJECT COSTS	Total: US $ 3.97million (～2015)
8. IMPLEMENTATION SCHEDULE	2009～2015

9. DESCRIPTION

Stage 1 (2009-2015)

Completion of ground work to implement the target-setting program is necessary. The specific items include:

- Examination for the Energy Manager Certification
  - (1) Preparation of institutional and legal framework for the examination (laws and regulations, etc.)
  - (2) Preparation and development of examination
  - (3) Assigning testing agencies
  - (4) Setting rules and regulations for granting the certification through accredited training program
  - (5) Accrediting training institution(s)
- Assignment and registration of qualified Energy Managers to the designated factories
  - (1) Designating the factories and enterprises which require mandatory reporting on energy use
  - (2) Registration of qualified energy manager(s)
  - (3) Notification of the regulations (i.e. registration, mandatory reporting, etc.)
- Preparation of heat conversion table and its maintenance annually
  - (1) Establishment of technical committee responsible for preparing the table
  - (2) Regular maintenance and update. Publication of the data to public.
- Securing sufficient number of external consultants for auditing
  - (1) Capacity development of external consultants for auditing (technology transfer)
  - (2) Discussion on feasibility of establishing auditor certification
  - (3) Institutional and legal framework for the qualification certificates
  - (4) Support in the creation of market that can provide reliable audit consultants. Healthy competition in the market.
- Securing sufficient number of internal engineers responsible for energy management (in-house engineers)
  - (1) Establishment of technology necessary to operate the factories. Training and technology transfer to in-house engineers. Human resources development
- Discussion of mandatory annual energy reduction
  - (1) Establishment of mandatory annual energy reduction. Imposing penalty for failure in reduction, etc.
  - (2) Establishment of database for collecting reporting and data analysis.

10.ISSUES

- In spite of the urgency, the requirement for necessary resources (human resources, funding, technology, etc) are significantly bigger than those of the current level. Drastic increase of these resources is inevitable. Securing financial resources for the program is as important as other elements such as capacity development and institutional development, etc.

11. JUSTFICATIONS OF TECHNICAL ASISSTANCE

- Reference to the energy management program in Japan

ACTION PLAN - Labeling Program No. 1

1. TITLE	Implementation of the Labeling program on TV
2. LOCATION	Nation wide
3. IMPLEMENTING AGENCIES	MEMR, Accredited testing laboratory, Label Certification Body
4. TARGET / PARTICIPANTS	Manufacturers, Importers, Traders, Retailers, Consumers, etc.
5. OBJECTIVES	Labeling program shall be applied on TV
6. EXPECTED EFFECTS	Spread of high efficiency TV sets

7. IMPLEMENTATION SCHEDULE & ANNUAL BUDGET 2009-2015, Total 103,000USD

	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Fixing measurement method and labeling criteria	▼							
Issue of ministerial decree		▼						
Introduction of testing facilities		▼						
Application of the Label		▨	▨	▨	▨	▨	▨	▨
Sampling and Testing			▨	▨	▨	▨	▨	▨
Market research				▼			▼	
Committee, Review of labeling criteria				▼			▼	
Annual budget（1,000USD）		13	13	19	13	13	19	13

8. DESCRIPTION

(Preparation of ordinance and standards)

- Stipulating the roles of manufacturers, importers, retailers and the government
- Fixing the measurement method for energy efficiency (Annual electricity consumption) and labeling criteria

(Energy efficiency test / Introduction and maintenance of testing facility)

- Manufacturers shall conduct tests and submit data to Label Certification Body.
- Label Certification Body shall issue Energy efficiency label to the manufacturers.
- The government shall conduct sampling test for the verification of the data submitted by the manufacturers. (The government will leave the test to the accredited testing laboratories.)
- Accredited testing laboratories shall be provided with the testing facilities needed for testing and measuring "Annual energy consumption" as the energy efficiency of TV. (Laboratories such as P3TEK, BPPT, B4T, PLN-LITBANG and PT. Scofind can be nominated.)
- Around 20 products shall be tested.
- If the laboratories have an indoor space of approximately 5m x 5m, new building for test room is not required. Air conditioners which can keep the temperature of test room tightly at 25˚C are absolutely necessary. Annual calibration of the measurement instrument is necessary.

(TV Labeling Committee)

- The government shall establish "TV Labeling Committee" comprising of scholars of acknowledged erudition and experience, manufacturers, importers, retailers, and consumer associations, etc.
- The committee shall review method of measuring energy efficiency and labeling criteria. The results

and recommendations shall be reported to the government.

(Market research)

- The government shall conduct market research on TV including energy efficiency of products and their sales data respectively. The results of research shall be reported to TV Labeling Committee.

(Administration)

- The government shall monitor the operating program. When it finds non-conformance, the government shall expose the manufacturers and eliminate faulty labels.
- The government shall promote manufacturers to join the program.

9. ISSUES

- Testing facilities and instruments shall be in accordance with the requirement of the standards such as ISO, JIS which specify measurement method of energy efficiency.
- If there is a big difference between the results of government verification test and manufacturer’s tests, measurement procedures and accuracies might be the point of dispute. Therefore, verification tests must be carried out accurately.

10. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Interpretation of the technical requirements of the standards for measurement method such as ISO, JIS and instruction for the tests may be needed.

11. INDICATORS FOR OBJECTIVES

- Energy efficiency of TV shall be categorized in types, sizes, and transfer of sales.

12. BUDGET DETAILS	Total USD	
Administration Cost (Remuneration, Consignment fee) (Annual)		103,000
➢ MEMR Remuneration 1.0MM/year×@3,000USD＝3,000USD/year	* 7	
➢ Consignment of test ; 20 sample/year×500USD＝10,000USD/year	* 7	
➢ Market research ; 3,000USD in 2011 and 2014 each	* 2	
➢ Expense for committees ; 3,000USD in 2011 and 2014 each	* 2	
Facility (Construction and maintenance)		0
➢ Construction ; included in consignment fee of test		
➢ Maintenance and calibration ; included in consignment fee of test		
Investment Capital		0
Grant and Donation		
Total (2009 - 2015)		103,000

ACTION PLAN - Labeling Program No. 2

1. TITLE	Implementation of the Labeling program on Refrigerator
2. LOCATION	Nation wide
3. IMPLEMENTING AGENCIES	MEMR, Accredited Testing Laboratory, Label Certification Body
4. TARGET / PARTICIPANTS	Manufacturers, Importers, Traders, Retailers, Consumers, etc.
5. OBJECTIVES	Labeling program shall be applied on household refrigerator
6. EXPECTED EFFECTS	Spread of high efficiency refrigerators
7. IMPLEMENTATION SCHEDULE & ANNUAL BUDGET	2009-2015, Total 173,000USD

	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Fixing measurement method and labeling criteria	▼							
Issue of ministerial decree		▼						
Introduction of testing facilities		▼						
Application of the Label		▨	▨	▨	▨	▨	▨	▨
Sampling and Testing			▨	▨	▨	▨	▨	▨
Market research				▼			▼	
Committee, Review of labeling criteria				▼			▼	
Annual budget（1,000USD）		23	23	29	23	23	29	23

8. DESCRIPTION

(Preparation of ordinance and standards)

- Stipulating the roles of manufacturers, importers, retailers and the government
- Fixing the measurement method for energy efficiency (Daily electricity consumption) and labeling criteria

(Energy efficiency test / Introduction and maintenance of testing facility)

- Manufacturers shall conduct tests and submit data to Label Certification Body.
- Label Certification Body shall issue Energy efficiency labels to the manufacturers.
- The government shall conduct sampling tests for the verification of the data submitted by the manufacturers. (The government will leave the tests to the accredited testing laboratories.)
- Accredited Testing Laboratories shall be provided with the testing facilities needed for testing and measuring “Annual energy consumption” as the energy efficiency of refrigerators. (Laboratories such as P3TEK, BPPT, B4T, PLN-LITBANG and PT. Scofind can be nominated.)
- Around 20 products shall be tested.
- If the laboratories have an indoor space of approximately 5m x 5m, new building for test room is not required. Air conditioners which can keep the temperature of test room at tightly 25˚C, data logger and thermocouples which can measure 20 points or more are necessary. Annual calibration of the measurement instruments is required.

(Refrigerator Labeling Committee)

- The government shall establish “Refrigerator Labeling Committee” comprising of scholars of acknowledged erudition and experience, manufacturers, importers, retailers, and consumers associations etc.

- The committee shall review method for measuring energy efficiency and labeling criteria. The results and recommendations shall be reported to the government.

(Market research)

- The government shall conduct market research on refrigerators including energy efficiency of products and their sales data respectively. The results of research shall be reported to Refrigerator Labeling Committee.

(Administration)

- The government shall monitor the operating program. When it finds non-conformance, the government shall expose the manufacturers and eliminate faulty labels.
- The government shall promote manufacturers to join the program.

9. ISSUES

- Testing facilities and instruments shall be in accordance with the requirements of the standards such as ISO, JIS which specify measurement method of energy efficiency.
- If there is big difference between the results of government verification test and manufacturer's tests, measurement procedures and accuracies might be the point of dispute. Therefore, verification tests must be carried out accurately.

10. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Interpretation of the technical requirements of the standards for measurement method such as ISO, JIS and instruction for the tests may be needed.

11. INDICATORS FOR OBJECTIVES

- Energy efficiency of refrigerators shall be categorized in types, sizes, and transfer of sales.

12. BUDGET DETAILS	Total USD	
Administration Cost (Remuneration, Consignment fee) (Annual)		173,000
➢ MEMR Remuneration 1.0MM/year×@3,000USD＝3,000USD/year	* 7	
➢ Consignment of test ; 20 sample/year×1,000USD＝20,000USD/year	* 7	
➢ Market research ; 3,000USD in 2011 and 2014 each	* 2	
➢ Expense for committees ; 3,000USD in 2011 and 2014 each	* 2	
Facility (Construction and maintenance)		0
➢ Construction ; included in consignment fee of test		
➢ Maintenance and calibration ; included in consignment fee of test		
Investment Capital		0
Grant and Donation		0
Total (2009 - 2015)		173,000

ACTION PLAN - Labeling Program No. 3

1. TITLE	Implementation of the Labeling program on Air conditioners
2. LOCATION	Nation wide
3. IMPLEMENTING AGENCIES	MEMR, Accredited Testing Laboratory, Label Certification Body
4. TARGET / PARTICIPANTS	Manufacturers, Importers, Traders, Retailers, Consumers, etc.
5. OBJECTIVES	Labeling program shall be applied on household air conditioners
6. EXPECTED EFFECTS	Spread of high efficiency air conditioners

7. IMPLEMENTATION SCHEDULE & ANNUAL BUDGET 2009-2015, Total 330,000USD

	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Fixing measurement method and labeling criteria	▼						
Issue of ministerial decree		▼					
Introduction of testing facilities	▼						
Application of the Label		▨	▨	▨	▨	▨	▨
Sampling and Testing		▨	▨	▨	▨	▨	▨
Market research				▼			▼
Committee, Review of labeling criteria	▼			▼			▼
Annual budget（1,000USD）		53	53	59	53	53	59

8. DESCRIPTION

(Preparation of ordinance and standards)

- Stipulating the roles of manufacturers, importers, retailers and the government
- Fixing the measurement method for energy efficiency (COP or EER)
- Fixing the labeling criteria considering high energy efficiency of the inverter type products
- Introduction of MEPS (Minimum Energy Performance Standard) in order to eliminate low efficiency products.

(Energy efficiency test / Introduction and maintenance of testing facility)

- Manufacturers shall conduct tests and submit data to Label Certification Body.
- Label Certification Body shall issue Energy efficiency labels to the manufacturers.
- The government shall conduct sampling tests for the verification of the data submitted by the manufacturers. (The government will leave the test to the accredited testing laboratories.)
- BPPT is only one laboratory which can conduct energy efficiency measurement tests in Indonesia. (Testing facility has been under construction in Sep. 2008. Testing capability and accuracy shall be verified after the completion.)
- Around 20 products shall be tested.

(Air conditioner Labeling Committee)

- The government shall establish “Air conditioner Labeling Committee” comprising of scholars of acknowledged erudition and experience, manufacturers, importers, retailers and consumer associations etc.
- The committee shall review measurement method for energy efficiency and labeling criteria. The results and recommendations shall be reported to the government.

(Market research)

- The government shall conduct market research on air conditioner including energy efficiency of products and their sales data respectively. The results of research shall be reported to Air conditioner Labeling Committee.

(Administration)

- The government shall monitor the operating program. When it finds non-conformance, the government shall expose the manufacturers and eliminate faulty labels.
- The government shall promote manufacturers to join the program.

9. ISSUES

- Testing facility and instruments shall be in accordance with the requirements of the standards such as ISO, JIS which specify measurement method of energy efficiency.
- If there is big difference between the results of government verification tests and manufacturer’s tests, measurement procedures and accuracies might be the point of dispute. Therefore, verification tests must be carried out accurately.

10. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Interpretation for the technical requirements of the standards for measurement methods such as ISO, JIS and instruction at the test may be needed.
- Since test results of air conditioners tend to have large dispersion, experienced engineer shall join tests.

11. INDICATORS FOR OBJECTIVES

- COP or EER categorized in cooling capacity and transfer of sales
- Transfer of sales of inverter type products

12. BUDGET DETAILS	Total USD	
Administration Cost (Remuneration, Consignment fee) (Annual)		333,000
➢ MEMR Remuneration 1.0MM/year×@3,000USD＝3,000USD/year	* 6	
➢ Consignment of test ; 20 sample/year×2,500USD＝50,000USD/year	* 6	
➢ Market research ; 3,000USD	* 2	
➢ Expense for committees ; 3,000USD	* 2	
Facility (Construction and maintenance)		0
➢ Construction ; included in consignment fee of test		
➢ Maintenance and calibration ; included in consignment fee of test		
Investment Capital		0
Grant and Donation		0
Total (2009 - 2015)		333,000

ACTION PLAN - Labeling Program No. 4

1. TITLE	Implementation of the Labeling program on Fans
2. LOCATION	Nation wide
3. IMPLEMENTING AGENCIES	MEMR, Accredited Testing Laboratory, Label Certification Body
4. TARGET / PARTICIPANTS	Manufacturer, Importer, Trader, Retailer, Consumer, etc.
5. OBJECTIVES	Labeling program shall be applied on fan (floor stand type)
6. EXPECTED EFFECTS	Spread of high efficiency fan

7. IMPLEMENTATION SCHEDULE & ANNUAL BUDGET 2009-2015, Total 70,000USD

	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Fixing measurement method and labeling criteria	▼						
Issue of ministerial decree		▼					
Introduction of testing facilities							
Application of the Label							
		▨	▨	▨	▨	▨	▨
Sampling and Testing							
		▨	▨	▨	▨	▨	▨
Market research	▼			▼			
Committee, Review of labeling criteria	▼			▼			
Annual budget（1,000USD）	9	13	13	19	13	13	13

8. DESCRIPTION

(Preparation of ordinance and standards)

- Stipulating the roles of manufacturers, importers, retailers and the government.
- Fixing the measurement method for energy efficiency and labeling criteria.
- Energy savings shall be evaluated based on motor efficiency, additional functions such as “Energy save mode” because measurement of energy efficiency based on air flow such as air velocity and wind direction is thought to be very difficult.

(Energy efficiency test / Introduction and maintenance of testing facility)

- Manufacturers shall submit documents about motor efficiency and energy save function of the products to the Label Certification Body.
- Label Certification Body shall issue Energy efficiency labels to the manufacturers.
- The government shall conduct sampling tests for the verification of the data submitted by the manufacturers. (The government will leave the test to the accredited testing laboratories.)
- Small dynamometers shall be needed for the measurement of energy efficiency of motors equipped in the products.
- Around 20 products shall be tested.

(Fan Labeling Committee)

- The government shall establish “Fan Labeling Committee” comprising of scholars of acknowledged erudition and experience, manufacturers, importers, retailers and consumer associations etc.
- The committee shall review measurement methods for energy efficiency and labeling criteria. The results and recommendations shall be reported to the government.

(Market research)

- The government shall conduct market research on fan including energy efficiency of products and their sales data respectively. The results of research shall be reported to Fan Labeling Committee.

(Administration)

- The government shall monitor the operating program. When it finds non-conformance, the government shall expose the manufacturers and eliminate faulty labels.
- The government shall promote manufacturers to join the program.

9. ISSUES

- Some countries are trying to provide evaluation criteria for energy efficiency of fan based on air flow. These methods shall be researched.

10. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- There is no testing laboratory which can carry out measurement test for energy efficiency of motors in Sep. 2008. Therefore technical support may be needed if some laboratory attempts are made to conduct the tests.

11. INDICATORS FOR OBJECTIVES

- Sales transfer of “Energy save type” products.

12. BUDGET DETAILS	Total USD	
Administration Cost (Remuneration, Consignment fee) (Annual)		93,000
➢ MEMR Remuneration 1.0MM/year×@3,000USD＝3,000USD/year	* 7	
➢ Consignment of test ; 20 sample/year×500USD＝10,000USD/year	* 6	
➢ Market research ; 3,000USD in 2011 and 2014 each	* 2	
➢ Expense for committees ; 3,000USD in 2011 and 2014 each	* 2	
Facility (Construction and maintenance)		0
➢ Construction ; included in consignment fee of test		
➢ Maintenance and calibration ; included in consignment fee of test		
Investment Capital		0
Grant and Donation		
Total (2009 - 2015)		93,000

ACTION PLAN - Labeling Program No. 5

1. TITLE	Implementation of the Labeling program on Motor
2. LOCATION	Nation wide
3. IMPLEMENTING AGENCIES	MEMR, Accredited Testing Laboratory, Label Certification Body
4. TARGET / PARTICIPANTS	Manufacturer, Importer, Trader, Retailer, Consumer, etc.
5. OBJECTIVES	Labeling program shall be applied on industrial motors.
6. EXPECTED EFFECTS	Spread of high efficiency industrial motors

7. IMPLEMENTING SCHEDULE & ANNUAL BUDGET 2009-2015

	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Fixing measurement method and labeling criteria		▼					
Issue of ministerial decree			▼				
Introduction of testing facilities		▼					
Application of the Label				▨	▨	▨	▨
Sampling and Testing					▨	▨	▨
Market research		▼			▼		
Committee, Review of labeling criteria		▼			▼		
Annual budget（1,000USD）		9	3	13	19	13	13

8. DESCRIPTION

(Preparation of ordinance and standards)

- Stipulating the roles of manufacturer, importer, retailer and the government
- Fixing the measurement method of energy efficiency and labeling criteria

(Energy efficiency test / Introduction and maintenance of testing facility)

- Manufacturer shall conduct test and submit data to Label Certification Body.
- Label Certification Body shall issue Energy efficiency label to the manufacturer.
- The government shall conduct sampling test for the verification of the data submitted by the manufacturers. (The government will leave the test to the accredited testing laboratories.)
- Around 20 products shall be tested.

(Motor Labeling Committee)

- The government shall establish “Motor Labeling Committee” organized by scholar of acknowledged erudition and experience, manufacturer, importer, retailer, etc.
- The committee shall review measurement method of energy efficiency and labeling criteria. The result and recommendation shall be reported to the government.

(Market research)

- The government shall conduct market research on industrial motors including energy efficiency of product and sales data. The result of research shall be reported to Motor Labeling Committee.

(Administration)

- The government shall monitor the operating program. When it finds illegal activity, the government shall expose the manufacturer and eliminate unfair label.

- The government shall promote manufacturers to join the program.

9. ISSUES

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10. JUSTIFICATION OF TECHNICAL ASSISTANCE

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11. INDICATORS FOR OBJECTIVES

- Energy efficiency of industrial motors categorized in types and capacity, and transfer of sales

12. BUDGET DETAILS	Total USD	
Administration Cost (Remuneration, Consignment fee) (Annual)		70,000
➢ MEMR Remuneration 1.0MM/year×@3,000USD＝3,000USD/year	* 6	
➢ Consignment of test ; 20 sample/year×500USD＝10,000USD/year	* 4	
➢ Market research ; 3,000USD in 2011 and 2014 each	* 2	
➢ Expense for committees ; 3,000USD in 2011 and 2014 each	* 2	
Facility (Construction and maintenance)		0
➢ Construction ; included in consignment fee of test		
➢ Maintenance and calibration ; included in consignment fee of test		
Investment Capital		0
Grant and Donation		
Total (2009 - 2015)		70,000

ACTION PLAN - Labeling Program No. 6

1. TITLE	Implementation of the Labeling program on Rice cookers
2. LOCATION	Nation wide
3. IMPLEMENTING AGENCIES	MEMR, Accredited Testing Laboratory, Label Certification Body
4. TARGET / PARTICIPANTS	Manufacturers, Importers, Traders, Retailers, Consumers, etc.
5. OBJECTIVES	Labeling program shall be applied on rice cookers
6. EXPECTED EFFECTS	Spread of high efficiency rice cookers

7. IMPLEMENTATION SCHEDULE & ANNUAL BUDGET 2009-2015, Total 70,000USD

	2009	2010	2011	2012	2013	2014	2015
Fixing measurement method and labeling criteria		▼					
Issue of ministerial decree			▼				
Introduction of testing facilities							
Application of the Label			▨	▨	▨	▨	▨
Sampling and Testing				▨	▨	▨	▨
Market research		▼			▼		
Committee, Review of labeling criteria		▼			▼		
Annual budget（1,000USD）		9	3	13	19	13	13

8. DESCRIPTION

(Preparation of ordinance and standards)

- Stipulating the roles of manufacturer, importers, retailers and the government.
- Fixing the measurement methods for energy efficiency (Annual electricity consumption) and labeling criteria.

(Energy efficiency test / Introduction and maintenance of testing facility)

- Manufacturers shall conduct tests and submit data to Label Certification Body.
- Label Certification Body shall issue Energy efficiency labels to the manufacturers.
- The government shall conduct sampling tests for the verification of the data submitted by the manufacturers. (The government will leave the test to the accredited testing laboratories.)
- Laboratories such as P3TEK, BPPT, B4T, PLN-LITBANG and PT. Scofind can be nominated as the Accredited Testing Laboratories.
- Around 20 products shall be tested.

(Rice Cooker Labeling Committee)

- The government shall establish “Rice Cooker Labeling Committee” comprising of scholars of acknowledged erudition and experience, manufacturers, importers, retailers and consumer associations etc.
- The committee shall review measurement methods for energy efficiency and labeling criteria. The results and recommendations shall be reported to the government.

(Market research)

- The government shall conduct market research on rice cooker including energy efficiency of products and their sales data respectively. The results of research shall be reported to Rice Cooker Labeling Committee.

(Administration)

- The government shall monitor the operating program. When it finds non-conformance, the government shall expose the manufacturers and eliminate faulty labels.
- The government shall promote manufacturers to join the program.

9. ISSUES

- If there is big difference between the results of government verification tests and manufacturer’s tests, measurement procedures and accuracies might be the point of dispute. Therefore, verification test must be carried out accurately.
- Measurement method for energy efficiency of rice cooker has been provided in Japan. This method can also be applied to the program in Indonesia, but difference in quality of rice between both the countries shall be considered.

10. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- None

11. INDICATORS FOR OBJECTIVES

- Energy efficiency of rice cookers shall be categorized in types, cooking capacity, and transfer of sales.

12. BUDGET DETAILS	Total USD	
Administration Cost (Remuneration, Consignment fee) (Annual)		70,000
➢ MEMR Remuneration 1.0MM/year×@3,000USD＝3,000USD/year	* 6	
➢ Consignment of test ; 20 sample/year×500USD＝10,000USD/year	* 4	
➢ Market research ; 3,000USD in 2011 and 2014 each	* 2	
➢ Expense for committees ; 3,000USD in 2011 and 2014 each	* 2	
Facility (Construction and maintenance)		0
➢ Construction ; included in consignment fee of test		
➢ Maintenance and calibration ; included in consignment fee of test		
Investment Capital		0
Grant and Donation		
Total (2009 - 2015)		70,000

ACTION PLAN - Labeling Program No. 7

1. TITLE	Implementation of the Labeling program on lighting fixtures
2. LOCATION	Nation wide
3. IMPLEMENTING AGENCIES	MEMR, Accredited Testing Laboratory, Label Certification Body
4. TARGET / PARTICIPANTS	Manufacturers, Importers, Traders, Retailers, Consumers, etc.
5. OBJECTIVES	Labeling program shall be applied on lighting fixtures
6. EXPECTED EFFECTS	Spread of high efficiency lighting

7. IMPLEMENTATION SCHEDULE & ANNUAL BUDGET 2009-2015, Total 120,000USD

	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Fixing measurement method and labeling criteria			▼				
Issue of ministerial decree				▼			
Introduction of testing facilities			▼				
Application of the Label	▨	▨	▨	▨	▨	▨	▨
Sampling and Testing		▨	▨	▨	▨	▨	▨
Market research			▼				▼
Committee, Review of labeling criteria			▼				▼
Annual budget（1,000USD）			6	18	18	18	24

8. DESCRIPTION

(Preparation of ordinance and standards)

- Stipulating the roles of manufacturers, importers, retailers and the government.
- Fixing the measurement method for energy efficiency (Lamp; Lumen/watt, Ballast; Rated optical output ratio) and labeling criteria.

(Energy efficiency test / Introduction and maintenance of testing facility)

- Manufacturers shall conduct tests and submit data to Label Certification Body.
- Label Certification Body shall issue Energy efficiency labels to the manufacturers.
- The government shall conduct sampling tests for the verification of the data submitted by the manufacturers. (The government will leave the test to the accredited testing laboratories.)
- P3TEK, BPPT, B4T, PLN-LITBANG and PT. Scofind can be nominated as accredited testing laboratories. These laboratories may be able to conduct energy efficiency measurement tests because they have integral spheres.
- Around 50 products shall be tested.

(Lighting Fixture Labeling Committee)

- The government shall establish “Lighting Fixture Labeling Committee” comprising of scholars of acknowledged erudition and experience, manufacturers, importers, retailers, and consumer associations etc.
- The committee shall review measurement method for energy efficiency and labeling criteria. The results and recommendations shall be reported to the government.

(Market research)

- The government shall conduct market research on lighting fixture including energy efficiency of products and their sales data respectively. The results of research shall be reported to Lighting Fixture Labeling Committee.

(Administration)

- The government shall monitor the operating program. When it finds non-conformance, the government shall expose the manufacturers and eliminate faulty labels.
- The government shall promote manufacturers to join the program.

9. ISSUES

- If there is big difference between the results of government verification tests and manufacturer’s tests, measurement procedures and accuracies might be the point of dispute. Therefore, verification tests must be carried out accurately.

10. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Technical support is not so necessary in the program because several laboratories have experience of measurement tests for energy efficiency of lamps and ballasts.

11. INDICATORS FOR OBJECTIVES

- Energy efficiency of lighting fixtures shall be categorized in types, sizes, and transfer of sales.

12. BUDGET DETAILS	Total USD	
Administration Cost (Remuneration, Consignment fee) (Annual)		84,000
➢ MEMR Remuneration 1.0MM/year×@3,000USD＝3,000USD/year	* 4	
➢ Consignment of test ; 50 sample/year×300USD＝15,000USD/year	* 4	
➢ Market research ; 3,000USD in 2011 and 2014 each	* 2	
➢ Expense for committees ; 3,000USD in 2011 and 2014 each	* 2	
Facility (Construction and maintenance)		0
➢ Construction ; included in consignment fee of test		
➢ Maintenance and calibration ; included in consignment fee of test		
Investment Capital		0
Grant and Donation		0
Total (2009 - 2015)		84,000

ACTION PLAN - Labeling Program No. 8

1. TITLE	Implementation of the Labeling program on Washing machines
2. LOCATION	Nation wide
3. IMPLEMENTING AGENCIES	MEMR, Accredited Testing Laboratory, Label Certification Body
4. TARGET / PARTICIPANTS	Manufacturers, Importers, Traders, Retailers, Consumers, etc.
5. OBJECTIVES	Labeling program shall be applied on household washing machines
6. EXPECTED EFFECTS	Spread of high efficiency household washing machines

7. IMPLEMENTATION SCHEDULE & ANNUAL BUDGET 2009-2015, Total 57,000USD

	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Fixing measurement method and labeling criteria			▼				
Issue of ministerial decree				▼			
Introduction of testing facilities			▼				
Application of the Label							
				▨	▨	▨	▨
Sampling and Testing							
					▨	▨	▨
Market research			▼			▼	
Committee, Review of labeling criteria			▼			▼	
Annual budget（1,000USD）			9	3	13	19	13

8. DESCRIPTION

(Preparation of ordinance and standards)

- Stipulating the roles of manufacturers, importers, retailers and the government.
- Fixing the measurement methods for energy efficiency and labeling criteria.
- Measurement methods for energy efficiency and labeling criteria shall be provided for the types such as single basin, double basin and drum type.

(Energy efficiency test / Introduction and maintenance of testing facility)

- Manufacturers shall conduct tests and submit data to Label Certification Body.
- Label Certification Body shall issue Energy efficiency labels to the manufacturers.
- The government shall conduct sampling tests for the verification of the data submitted by the manufacturers. (The government will leave the test to the accredited testing laboratories.)
- Around 20 products shall be tested.

(Washing machine Labeling Committee)

- The government shall establish “Washing Machine Committee” comprising of scholars of acknowledged erudition and experience, manufacturers, importers, retailers and consumer associations etc.
- The committee shall review measurement methods for energy efficiency and labeling criteria. The results and recommendations shall be reported to the government.

(Market research)

- The government shall conduct market research on household washing machine including energy efficiency of products and their sales data respectively. The results of research shall be reported to Washing Machine Labeling Committee.

(Administration)

- The government shall monitor the operating program. When it finds non-conformance, the government shall expose the manufacturers and eliminate faulty labels.
- The government shall promote manufacturers to join the program.

9. ISSUES

- JIS C 9606 “Washing machine” specifies washing performance test, de-detergent performance test and dewaterization test. Measurement method for energy efficiency may be provided based on this standard.

10. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Technical instruction of JIS C 9606 may be needed.

11. INDICATORS FOR OBJECTIVES

- Energy efficiency of household washing machines shall be categorized in types, washing capacity, and transfer of sales.

12. BUDGET DETAILS	Total USD	
Administration Cost (Remuneration, Consignment fee) (Annual)		57,000
➢ MEMR Remuneration 1.0MM/year×@3,000USD＝3,000USD/year	* 5	
➢ Consignment of test ; 20 sample/year×500USD＝10,000USD/year	* 3	
➢ Market research ; 3,000USD in 2011 and 2014 each	* 2	
➢ Expense for committees ; 3,000USD in 2011 and 2014 each	* 2	
Facility (Construction and maintenance)		0
➢ Construction ; included in consignment fee of test		
➢ Maintenance and calibration ; included in consignment fee of test		
Investment Capital		0
Grant and Donation		
Total (2009 - 2015)		57,000

ACTION PLAN - Labeling Program No. 9

1. TITLE	Database for energy efficiency of household appliances
2. LOCATION	Nation wide
3. IMPLEMENTING AGENCIES	MEMR, Clearinghouse
4. TARGET / PARTICIPANTS	Manufacturers, Importers, Consumers, etc.
5. OBJECTIVES	Consumers can grasp energy efficiency products on the market.
6. EXPECTED EFFECTS	Spread of high efficiency household appliances.

7. IMPLEMENTATION SCHEDULE & ANNUAL BUDGET 2009-2015, Total 101,000USD

	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Building of database			▼				
Market research			▼			▼	
Operation & maintenance			▨	▨	▨	▨	▨
Annual budget（1,000USD）			46	13	13	16	13

8. DESCRIPTION

(Building of the database)

- Database shall be constructed in the Clearinghouse.
- The Clearinghouse shall provide “Energy Saving Products Catalogue” on the homepage. “Energy Saving Products Catalogue” shall be made based on the database.
- Guideline for the operation of the database shall be issued by the Clearinghouse.

(Data input, renewal and edition)

- Data input, renewal and edition shall be done by the manufacturers who want to inform about the energy efficiency of their own products in the pages which are allocated to them by the Clearinghouse.

(Administration)

- The government shall monitor the operation of the database. When it finds non-conformance, the government shall expose the manufacturers and eliminate faulty data.
- The government shall promote manufacturers to join the program.

9. ISSUES

- Data input by manufacturers shall be charged because the database can used for product PR. The fee shall be fixed by the Clearinghouse.

10. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Database of ECCJ which is used for the data collection on energy efficiency for the management of energy efficiency label can be referred to build the database. Technical support by Japan may be available.

11. INDICATORS FOR OBJECTIVES

- Volume of input data
- Number of observers
- Number of manufacturers who join the database.

12. BUDGET DETAILS		Total USD	
	Administration Cost (Remuneration, Consignment fee) (Annual)		71,000
	➢ MEMR Remuneration 1.0MM/year×@3,000USD＝3,000USD/year	* 5	
	➢ Consignment for maintenance of DB ; 10,000USD/year	* 5	
	➢ Market research ; 3,000USD in 2010 and 2014 each	* 2	
	Facility (Construction and maintenance)		30,000
	➢ Construction of DB ; 30,000USD		
	Investment Capital		0
	Grant and Donation		
	Total (2009 - 2015)		101,000

ACTION PLAN - Labeling Program No. 10

1. TITLE	Public information of the Labeling programs
2. LOCATION	Nation wide
3. IMPLEMENTING AGENCIES	MEMR
4. TARGET / PARTICIPANTS	Manufacturers, Importers, Retailers, Consumers, etc.
5. OBJECTIVES	Business operators and people can understand the program and join it.
6. EXPECTED EFFECTS	Spread of high efficiency household appliances

7. IMPLEMENTATION SCHEDULE & ANNUAL BUDGET 2009-2015, Total 436,000USD

	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Preparation of pamphlet, poster, etc.	▼						
Print and distribution of pamphlet, etc.	▼	▼	▼	▼	▼	▼	▼
Preparation of TV commercial	▼						
On air of TV commercial	▼	▼	▼	▼			
Seminar	▼ ▼	▼ ▼	▼ ▼	▼ ▼			
Annual budget（1,000USD）	118	73	73	73	33	33	33

8. DESCRIPTION

(Preparation of information tool)

- For manufacturers, importers: Pamphlets introducing the programs, measurement methods of energy efficiency, labeling criteria, display specifications of labels and penalty for non-conformance.
- For traders and retailer: Pamphlets introducing the programs, measurement methods of energy efficiency, labeling criteria and tips for the interpretation of the programs to consumers.
- For consumers: Pamphlets, posters and TV commercials introducing energy cost of household appliances, advantage of high efficiency products and outline of the programs.

(Public information activity)

- For manufacturers, importers: Seminars shall be held.
- For traders and retailers: Seminars shall be held. Posters shall be put in electrical appliance shops.
- For consumers: TV commercials shall be on air. Posters shall be put in electrical appliance shops.

9. ISSUES

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10. JUSTIFICATION FOR TECHNICAL ASSISTANCE

-

11. INDICATORS FOR OBJECTIVES

- Number of manufacturer who join to the programs
- Number of people who joined to the seminars
- Proportion of the consumer who know about the programs

12. BUDGET DETAILS	Total USD	
Administration Cost (Remuneration, Consignment fee) (Annual)		436,000
➢ MEMR Remuneration 1.0MM/year×@3,000USD＝3,000USD/year	* 7year	
➢ Preparation of pamphlet ; @5,000USD	* 3type	
➢ Print and distribution of pamphlet ; 30,000USD/year	* 7year	
➢ Preparation of TV commercial ; 30,000USD		
➢ On air of TV commercial ; 30,000USD/year	* 4year	
➢ Seminar ; @5,000USD 2times / year	* 4year	
Facility (Construction and maintenance)		0
➢		
Investment Capital		0
Grant and Donation		
Total (2009 - 2015)		436,000

Action Plan - DSM No. 1

1.Title	Dissemination of high efficiency electric appliances
2. Location	Nationwide
3. IMPLEMENTING AGENCY	PLN（MEMR）
4. Target	Whole electricity users
5. Objectives	Promotion of replacement of current low efficiency electric appliances Purchase of high efficiency electric appliances when buying new appliances
6. Expected Effects	Electricity conservation: 29% (DSM Total) Peak reduction: 21% (DSM Total)
7. Budget	Total amount US$35 million (～2025)
8. Schedule	2009-2025

9. Content

【First Phase】（2009～2015）

- Selection of target appliances and securing financial resources
- Secure linkage between labeling programs
- Technological and economical feasibility study on dissemination models
- Pilot projects

【Second Phase】(2016～2020)

- Nationwide dissemination

【Third Phase】(2021～2025)

- Nationwide dissemination (Continued)

10. Themes

- Necessity of manufactures’ collaboration
- Formulate inter-organization structures
- CFL: Supporting PLN and government activity
- Pilot Fund: Application of various funds including JICA
- Integration with EC awareness activities
- Securing budget
- Accruing CDM credits

11. Necessity of Technological Support

- Technological and project management skills transfer
- AC: Study on applicability of Inverter AC and Japanese Top runner technologies
- Survey of foreign Experiences
- Chillers: Applicability of Ice Storage (Integration with TOU Tariff)

Action Plan - DSM No. 2

1. Program Name	Establishment of data collection and communication system for large customers
2. Location	Mainly large customers in Java Islands
3. Responsible Organization	PLN（MEMR）
4. Target Customers	Residential sector (R3: 70,000) → (R2: 35,000) Business sector (B3: 3,000) → (B2: 320,000) Industrial sector (I3 and I4: 8,000) → (I2: 25,000)
5. Objectives	Establishment of collaboration between PLN and customers for optimum supply and demand system of electricity
6. Expected Effects	Included in DSM 1 (Tariff)
7. Budget	Total amount US$10 million (～2025)
8. Schedule	2009-2015

9. Content

【First Phase】（2009～2015）

- Survey of metering technologies
- Communication methods
- Pilot installation by corporative large customers
- Installation in large customers

10. Themes

- Integration with EC awareness activities
- Securing budget

11. Necessity of Technological Support

- Technological transfer of Japanese meter manufacturers

Action Plan - DSM No. 3

1. Program Name	Tariff systems
2. Location	Nationwide
3. Responsible Organization	PLN（MEMR）
4. Target	Whole electricity users
5. Objectives	Establishment of fair and EC promotion type tariff system including fuel price compensation
6. Expected Effects	Included in DSM 1
7. Budget	Total amount US$ 0 million (～2025)
8. Schedule	2009-2020

9. Content

【First Phase】（2009～2015）

- Total review of current tariff systems
- Support for increasing tariff by PLN and government for recovering costs
- Survey of Win-Win tariff system
- Introduction of fuel price compensation
- New tariff introduction (Load management, emergency and power factor improvement)

【Second Phase】(2016～2020)

- New tariff introduction (Load management, emergency and power factor improvement) (Continued)

10. Themes

- Flexibility for fuel price changes (Cost based tariff system)
- Elimination of political pressures
- Win-win tariff to be attractive both PLN and customers
- Time and seasonal tariff

11. Necessity of Technological Support

- Study of Japanese tariff system

Action Plan - DSM No. 4

1. Program Name	Energy analysis support system
2. Location	Mainly large customers in Java Islands
3. Responsible Organization	PLN（MEMR）
4. Target	Residential sector (R3: 70,000) → (R2: 35,000) Business sector (B3: 3,000) → (B2: 320,000) Industrial sector (I3 and I4: 8,000) → (I2: 25,000)
5. Objectives	Communication and collaboration between PLN and customers by service provision of PLN
6. Expected Effects	Included in DSM 1
7. Budget	Total amount US$ 10 million (～2025)
8. Schedule	2009-2025

9. Content

【First Phase】（2009～2015）

- Confirmation of Japanese utility collaboration
- Design of EASS
- Systems / programs development
- Audit implementation

【Second Phase】(2016～2020)

- Audit implementation (Continued)

10. Themes

- Establishment of communication system between PLN and customers
- Data collection and analysis

11. Necessity of Technological Support

- Study of Japanese EASS system

Action Plan - DSM No. 5

1. Program Name	Awareness for EC Promotion
2. Location	Nationwide
3. Responsible Organization	PLN（MEMR）
4. Target	Whole electricity users
5. Objectives	Awareness rising for energy conservation
6. Expected Effects	Included in DSM 1
7. Budget	Total amount US$ 25 million (～2025)
8. Schedule	2009-2025

9. Content

【First Phase】（2009～2015）

- Current activity survey
- Seminars
- Workshops
- TV Programs
- Education
- Booklets
- Implementation

【Second Phase】(2016～2020)

- Implementation (Continued)

10. Themes

- Securing budget
- Monitoring

11． Necessity of Technological Support

- Study of Japanese system

ACTION PLAN - Construction of an Energy Conservation Supporting Database

1. TITLE	Construction of an Energy Conservation Supporting Database
2. LOCATION	MEMR
3. IMPLEMENTING AGENCIES	MEMR
4. TARGET / PARTICIPANTS	Directorate General of Electricity and Energy Utilization, Center for Energy and Mineral Resources Data and Information of MEMR, and BPS
5. OBJECTIVES	A database is constructed with which the economy-wide energy efficiency can be calculated consistently with the calculation of energy efficiency at sector and sub-sector levels.
6. EXPECTED EFFECTS	• Consistency of energy consumption data at product level with those at sub-sector level to be achieved. • Consistency of the classification method of GDP statistics and that of energy statistics by sector and sub-sector to be achieved. • A statistics comprising of data of gross floor space and electricity consumption of buildings by sector, region, and intended purpose is developed, and hence the value of energy intensity measured by energy consumption per unit of floor space becomes available. • A table of conversion factors relevant to conversion between energy unit and BOE, as well as conversion between energy unit and CO_2 unit is compiled.

7. IMPLEMENTATION SCHEDULE & ANNUAL BUDGET 2009-2015

		2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
	・Alignment of energy consumption data	━	━					
	・Database maintenance			━	━	━	━	━
	・Alignment of classification methods			━				
	・Construction of a statistics comprising of data of floor space and electricity consumption of buildings by sector, region, and intended purpose	━	━					
	・Database maintenance			━	━	━	━	━
	・Compilation of a table of conversion factor	━						
	Annual Budget（1,000USD）	47	41	41	21	21	21	21

8. DESCRIPTION

【Alignment of Various Energy Consumption Data】

- Existing Indonesian energy statistics mainly consists of the following three types: (1) “Large and Medium Manufacturing Statistics”（BPS）, (2) “Energy” (Directorate General of Electricity and Energy Utilization of MEMR), (3) “Indonesian Energy & Economic Statistics” and “Handbook of Energy & Economic Statistics of Indonesia”（Center for Energy and Mineral Resources Data and Information of MEMR）. To address the problem of inconsistency among different statistics, a project team comprising of statistical officials from the Directorate General of Electricity and Energy Utilization of MEMR, Center for Energy and Mineral Resources Data and Information of MEMR and BPS will be set up and led by MEMR to discuss the issue of data consistency and to work out a proper solution.
- The work to develop an energy consumption statistics integrating consistently the energy consumption data from product level to sub-sector and sector level will be contracted out to the consultants, which is expected to be completed in two years, and the work of maintenance as well as further adjustment or improvement whenever necessary will continue until 2025.

【Alignment of Classification Methods Regarding GDP and Energy Consumption Statistics】

- Following the above-mentioned work, the project team will have discussions on the issues of consistency between the classification methods at sector and sub-sector level of GDP statistics as well as energy statistics.
- The work is to integrate the classification methods of GDP statistics and energy statistics to make possible the calculation of energy intensity by sector and sub-sector, or work towards defining clearly the two classification methods so as to make them referable to each other and enable the same kind of calculation, which will be outsourced to the consultants and is expected to take one year.

【Construction of a Statistics with Data of Floor Space and Electricity Consumption of Buildings】

- The project team will start developing a statistics which will cover the data of gross floor space of buildings all over the country classified by region, sector and intended purpose in cooperation with the government’s lead office and business associations in the sectors of construction and real estate which will be followed by the preparation of electricity consumption statistics by buildings in the same classification method with the help of PLN. This task will also be contracted out to the consultant for completion over a two year period.
- The work of maintenance as well as further adjustment or improvement to the database whenever necessary will continue until 2025.

【Compilation of a table of conversion factor】

- The project team will have discussion based on the conversion table provided by the JICA team with an eye to rendering it into the one reflective of the realistic circumstances in Indonesia. This task is expected to be completed within the first year.

9. ISSUES

- Difficulty might arise for MEMR to take the leadership in aligning the classification methods of Energy statistics and GDP statistics. On such an occasion as this, it would be necessary to seek support from an organization superior to MEMR or even from the President.
- Existing statistics relevant to the floor space and electricity consumption of buildings by region, sector and intended purpose nation-wide might be poorly developed, which might result in the making the actual work of statistics development far more time-consuming and tiresome than expected.

10. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- Participation of a Japanese expert on Global energy economics and energy statistics and well informed of the energy statistics in Indonesia is needed to help the team develop an energy statistics of international standards for comparison with developed and neighboring countries, as well as to upgrade the knowledge and technical level of local counterparts in-charge of energy statistics.

11. INDICATORS FOR OBJECTIVES

- the degree of consistency between energy consumption data at product level and that of the sub-sector and sector level.
- the situation in which energy intensity by sector and sub-sector can be calculated.
- the situation in which energy consumption per floor space for various kinds of buildings can be

calculated

- submission of a table of energy and CO_2 conversion factors reflective of Indonesian reality

12. BUDGET DETAILS

(Unit：US$)

		2009	2010	2011	2012	2013	2014	2015
Administration Cost		5,000	5,000	5,000	5,000	5,000	5,000	5,000
Consultant Cost	Staff Cost	36,000	30,000	30,000	30,000	12,000	12,000	12,000
	Others	6,000	6,000	6,000	6,000	4,000	4,000	4,000
Total Cost		47,000	41,000	41,000	21,000	21,000	21,000	21,000

Note:1. Unit Price of Staff Cost: 1M/M＝$3,000

2. Others: Including relevant sundries and business trip expenses etc.

Investment Capital:

Non

Grant and Donation:

Non

Total（Over the period of 2009-2015）:

$213,000

ACTION PLAN - Formulation of an Energy Conservation and CO_2 reduction Master-plan

1. TITLE	Formulation of an Energy Conservation and CO_2 reduction Master-plan
2. LOCATION	MEMR
3. IMPLEMENTING AGENCIES	MEMR
4. TARGET / PARTICIPANTS	Directorate General of Electricity and Energy Utilization, Center for Energy and Mineral Resources Data and Information of MEMR, and BPS
5. OBJECTIVES	A feasible and verifiable Energy Conservation and CO_2 reduction Master-plan is formulated.
6. EXPECTED EFFECTS	• A guideline for the formulation of energy conservation and CO_2 reduction master-plan is established. • The goals of energy conservation and CO_2 reduction feasible and verifiable are set up. • A roadmap leading to the realization of these goals is formulated.

7. IMPLEMENTATION SCHEDULE & ANNUAL BUDGET 2009-2015

	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Making of a guideline for energy conservation and CO_2 reduction master-plan	▬	▬					
Setting of goals for energy conservation and CO_2 reduction			▬				
Formulation of a roadmap				▬			
Formulation of the master-plan and its annual readjustment				▬	▬	▬	▬
Annual Budget（1,000USD）	38	38	38	23	50	50	50

8. DESCRIPTION

【Study Group Activities Relevant to the Energy and CO_2 Reduction Master-plan Formulation 】

- A study group aiming at the formulation of Energy and CO_2 Reduction Master-plan will be established under the initiative of Directorate General of Electricity and Energy Utilization of MEMR.
- The study group will conduct a review of the existing energy conservation master-plan formulated by the Indonesian government.
- The energy conservation master-plan made by developed countries and other developing countries will also be reviewed.
- A guideline for the formulation of energy conservation and CO_2 reduction master-plan will be discussed and drawn up.

【Setting of Goals for Energy Conservation and CO_2 Reduction】

- The potential of energy conservation and CO_2 reduction by sector and sub-sector will be investigated closely.
- The goals for energy conservation and CO_2 reduction by sector and sub-sector in 2025年 will be set up.

【Formulation of A Roadmap leading to the Realization of the Goals】

- A roadmap leading to the realization of the goals by sector and sub-sector till 2025 will be formulated.

【Formulation of the Master-plan and Its Annual Readjustment】

- The work on the formulation of master-plan for energy conservation and CO_2 reduction will be completed.
- Readjustment of the master-plan will be conducted annually.

9. ISSUES

- Development of the Energy Conservation Supporting Database should be the precise.
- Necessity for the execution of this project should be fully realized by MEMR.

10. JUSTIFICATION FOR TECHNICAL ASSISTANCE

- The participation of a Japanese expert of energy economics well informed of the global good practices in the formulation of energy master-plan as well as energy conservation master-plan is needed.

11. INDICATORS FOR OBJECTIVES

- the deliverable of a guideline for the formulation of energy conservation and CO_2 reduction master-plan
- the goals for energy conservation and CO_2 reduction feasible and verifiable having been set up
- the roadmap leading to the realization of the goals having been formulated

12. BUDGET DETAILS

(Unit：US$)

		2009	2010	2011	2012	2013	2014	2015
Administration Cost		5,000	5,000	5,000	5,000	5,000	5,000	5,000
Consultant Cost	Staff Cost	30,000	30,000	30,000	15,000	0	0	0
	Others	3,000	3,000	3,000	3,000	0	0	0
Total Cost		38,000	38,000	38,000	23,000	5,000	5,000	5,000

Note:1. Unit Price of Staff Cost: 1M/M＝$3,000

2. Others: Including relevant sundries etc.

Investment Capital:

Non

Grant and Donation:

Non

Total（Over the period of 2009-2015）:

$152,000