Ministry of Energy and Mineral Resources
in the Republic of Indonesia

The Study for Promoting Practical Demand Side Management Program in Indonesia

Final Report
Summary

February 2012

Japan International Cooperation Agency
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Abbreviations

AC	Air Conditioner
AESIEAP	Association of the Electricity Supply Industry of East Asia and the Western Pacific
APP	Asia-Pacific Partnership Program on Clean Development and Climate
APEC	Asia-Pacific Economic Cooperation
BAU	Business as Usual
BPMBEI	Laboratory for Quality Testing of Export and Import Goods
BPPT	Agency for Assessment and Application of Technology
BRESL	Barrier Removal to the Cost-Effective Development and Implementation of Energy Efficiency Standards and Labeling Project
B4T	Quality Management System Certification Institution
CC	Coordination Committee
CFL	Compact Fluorescent Lamp
CLASP	Collaborative Labeling and Appliance Standards Programme
CO_2	Carbon Dioxide
COP	Co-efficient of Performance
C/P	Counterparts (MEMR and PLN)
DB	Database
DPP	Day Peak Period
DSM	Demand Side Management
ECCJ	The Energy Conservation Center, Japan
EE	Energy Efficiency
EE&C	Energy Efficiency Improvement & Conservation
EELP	Energy Efficiency Loan Program
EMI	PT. Energy Management Indonesia
GW	Gigawatt
HSD	High Speed Diesel Oil
IEA	International Energy Agency
IEC	International Electro Technical Commission
IL	Incandescent Lamp
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
ISO	International Organization for Standardization
JASEW	Japanese Business Alliance for Smart Energy Worldwide
JEMA	The Japan Electrical Manufacturer's Association
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
JRAIA	The Japan Refrigeration and Air Conditioning Industry Association
KAN	National Accreditation Body
LED	Light Emitting Diode
LIPI	Indonesian Institute of Science
MEMR	Ministry of Energy and Mineral Resources
MEPS	Minimum Energy Performance Standard
METI	Ministry of Economy, Trade and Industry
MOF	Ministry of Finance
MOI	Ministry of Industry
MRA	Mutual Recognition Arrangement (Agreement)
MW	Megawatt
NPO	Non Profit Organization
ODA	Official Development Assistance

OECD	Organization for Economic Co-operation and Development
OPP	Off Peak Period
PF	Power Factor
PIP	Pusat Investasi Pemerintah (Government Investment Unit)
PLN	Perusahaan Listik Negara (State Electricity Company)
PLTA	Pusat Listrik Tenaga Air （Hydro Power Plant）
PLTD	Pusat Listrik Tenaga Diesel (Diesel Power Plant)
PLTG	Pusat Listrik Tenaga Gas (Gas Turbine Power Plant)
PLTGU	Pusat Listik Tenaga Gas & Uap (Combined Cycle Power Plant)
PLTP	Pusat Listrik Tenaga Panas Bumi (Geothermal Power Plant)
PLTU	Pusat Listrik Tenaga Uap (Steam Power Plant)
PP	Peak Period
RUPTL	Rencana Usaha Penyediaan Tenaga Listrik) (The Electrical Power Supply Business Plan)
S/L	Standards & Labeling
SME	Small Medium Enterprises
SNI	Indonesian National Standard
TDL	Tarif Dasar Listrik (Basic Tariff of Electricity)
TOE	Ton of Oil Equivalent
TOU	Time of Use
TSL	Two-step Loan
TV	Television
TWG	Technical Working Group
UNDP	United Nations Development Program
UNFCCC	U.N. Framework Convention on Climate Change
VAT	Value-added Tax

Chapter 1 Introduction

This report consists of four chapters, and Chapter 1 focuses on the background and outline of this study, Chapter 2 on the analysis result of present state, Chapter 3 on the proposals, and Chapter 4 on the estimation of effect by the introduction of proposed measures.

In this chapter, the background, purpose, structure, and major activities in this study are described. And at the end of this chapter, main technical terms used in this report are explained.

1.1 Background of the Study

In spite of the world financial crisis, Republic of Indonesia (hereinafter to as "Indonesia"), is estimated to achieve over 8% annual energy consumption growth. Here, the stringency of the electricity supply and demand becomes a big concern.

Along with securing the energy sources, strengthening Energy Efficiency Improvement and Conservation (Hereinafter to as "EE&C") is one of the highest priorities in Indonesia.

Focusing on the electricity use, it is strongly expected to implement effective measures for the load leveling to answer the electricity supply shortage in the evening. Besides Indonesia is facing the problem of increasing governmental subsidy to balance between the electricity price and the generation cost, which exceeds the price. The annual electricity subsidy becomes Rp.50 - 70 trillion. And it is impossible for the government to afford more subsidies.

In order to realize the subsidy reduction and load leveling, the rational use of electricity in the commercial, business, and residential sectors, whose electricity consumptions are increasing rapidly, is becoming the top priority issue of the government. Under these conditions, Indonesian government asked JICA to support the promotion of a rational use on electricity. Replying the request, this study was carried out.

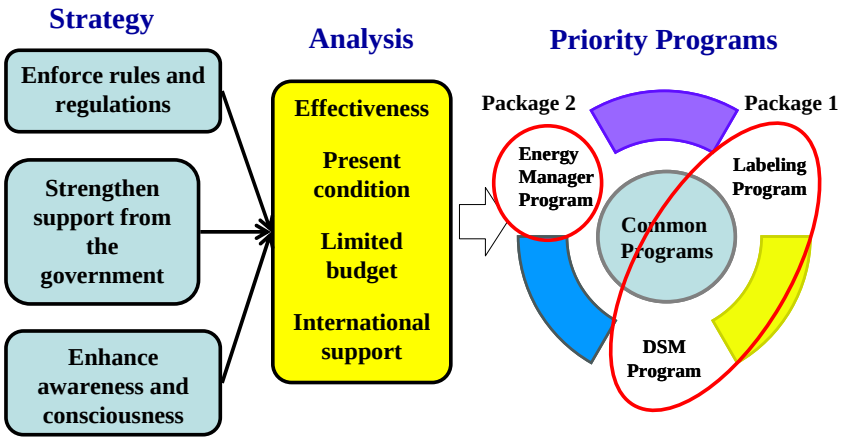
1.2 Purpose of the Study

This study, "The Study for Promoting Practical Demand Side Management (hereinafter to as "DSM") Program", was implemented in order to accelerate the activity for electricity conservation and peak-cut and/or -shift in Indonesia. Through the investigation on electricity consumption and present conditions for EE&C in commercial, business, and residential sectors in Indonesia, the followings were implemented.

a) To support establishing a functional electricity tariff system and Energy Efficiency (hereinafter to as "EE") labeling program
b) To propose effective incentive programs for promoting EE&C
c) To estimate the effect of the introduction of the above mentioned EE&C measures

It is quite effective to promote EE labeling program, which can contribute the peak cut and reduction of electricity being led by MEMR, along with PLN's DSM program to improve its' financial condition. (See Figure 1.2-1) Throughout the study the Study Team made efforts to enhance the

capacity of staffs of C/P1, Ministry of Energy and Mineral Resources (hereinafter to as "MEMR"), Perusahaan Listik Negara (hereinafter to as "PLN"), and relevant organizations.



Source: J-Power/JICA Report

Figure 1.2-1 Priority Programs Proposed in the Previous JICA Study

1.3 Structure of the Report

The structure of the report is described in Figure 1.3-1.

[1] C/P means Counterparts, MEMR and PLN

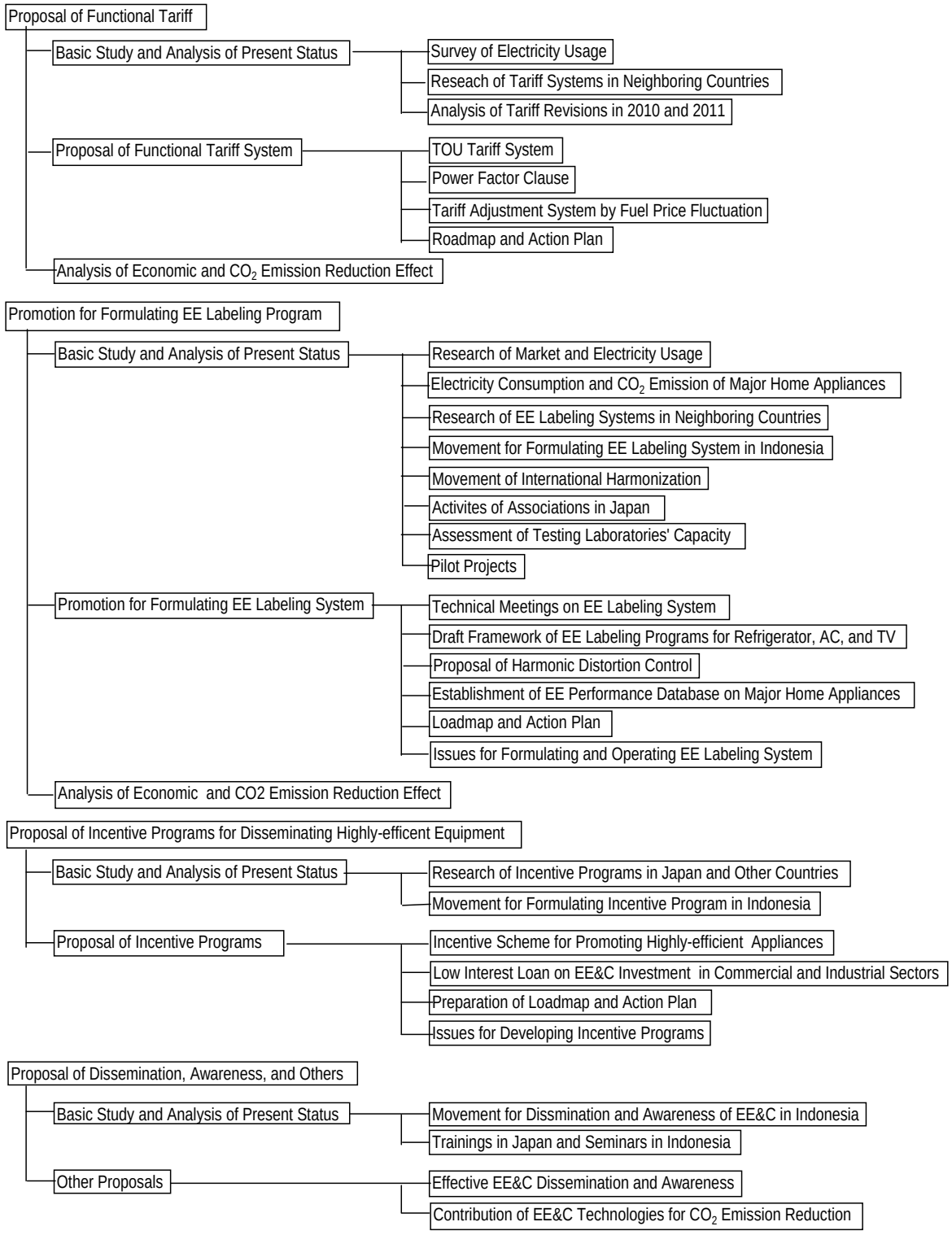


Figure 1.3-1 Structure of the Report

1.4 Major Activities and Achievements in the Study Period

Major activities and achievements in the study period are shown in Table 1.4-1.

Table 1.4-1 Major Activities and Achievements of the Study

Item	Major Activities and Achievements
Common	➢ 1st CC (Coordination Committee); April, 2010 ➢ 1st Workshop; April, 2010 ➢ Seminars of climate change remedies and carbon market in Indonesia University for students and in MEMR for government officers and industry participants; April, 2010 ➢ 2nd CC; July, 2010 ➢ 3rd CC; October, 2010 ➢ 4th CC; December, 2010 ➢ 2nd Workshop; February, 2011 ➢ Seminar of Brazilian experiences on EE&C, RE, and ESCO development; February, 2011 ➢ Presentation in the AESIEAP 2011 CEO Conference on i) Japan's DSM measures and ii) international activities for the reduction of CO_2 emission and key findings in the JICA DSM Study; October 2011 ➢ 3rd Workshop; November, 2011
Tariff system	➢ Analyzing the tariff revision in July 2010 and in April 2011 ➢ Introduction to and information exchange with PLN on the neighboring countries' tariff system ➢ On-site survey of electricity tariff system in five areas ➢ Proposal of and discussion on recommended tariff system plans
Labeling program	➢ Market research of home appliances ➢ Information exchange with the Jakarta Japan Club (JJC) and Japanese makers ➢ Information exchange with METI, JEMA, JRAIA, JASEW, etc. ➢ Estimation of electricity consumption and CO_2 emission on the major home appliances (refrigerators, ACs, TVs, and lightings) in the Jawa-Bali region ➢ Surveys on EE labeling program in other countries, such as Singapore/Malaysia (May, 2011) and Thailand (July, 2011) ➢ Survey on movement of the international standards for EE measurement, such as ISO and IEC ➢ Survey on testing facilities including Sucofindo, BPPT, LIPI, and BPMBEI ➢ Discussion with BRESL team, UNDP, and METI ➢ 1st Technical Meeting on the EE labeling program; December, 2010 ➢ 2nd Technical Meeting on the EE labeling program; February, 2011 ➢ 3rd Technical Meeting on the EE labeling program; July, 2011 ➢ 4th Technical Meeting on the EE labeling program; November, 2011 ➢ Preparation of prototype database for highly-efficient equipment and transfer to MEMR; November, 2011
Pilot project	➢ Assembly of CFL simulation board ➢ Implementation and analysis of the CFL field distribution pilot project ➢ Implementation and analysis of the AC field pilot project (BPPT's office and households) ➢ Problem presentation on the influence by harmonic distortion in the Power Quality Benchmark Workshop; December, 2011
Incentive program	➢ Research on international cooperation agencies' and NPOs' activities for EE&C ➢ Surveys on financial programs for promoting EE&C in other countries, such as Thailand and Malaysia; September, 2011 ➢ Confirmation of the former Indonesian experience for EE&C finance; CFL distribution program by PLN

Item	Major Activities and Achievements
	➢ Information gathering and hearing about the options of finance system for EE&C from the related organizations ➢ Hearing from PIP, Eximbank, Bank Mandiri, etc. about the interest and experiences for EE&C finance ➢ Feasibility study to formulate EE&C loan in industrial and commercial sectors ➢ Hearing of market strategies and equipment performance from Japanese and domestic suppliers of EE&C equipment ➢ Development of the EE&C equipment list
Estimation of economic and CO_2 emission reduction effect	➢ Current state and problem of CO_2 emission factor for electricity ➢ Analysis of economic effect ➢ Analysis of estimation of CO_2 emission reduction effect
Dissemination, awareness, and others	➢ Consciousness research in Jakarta and remote islands ➢ EE&C Training in Japan for 10 high class officers; August, 2010 ➢ EE&C Training in Japan for 11 working class officers; July, 2011 ➢ Seminar on the DSM in Japan after the Great East Japan Earthquake

1.5 Main Technical Terms

The main technical terms used in this report are as follows.

(1) Power Factor

Power Factor (hereinafter to as “PF”) is defined as the ratio of the real power flowing to the load over the apparent power in the circuit and is a dimensionless number between 0 and 1. High PF means high real power ratio for the apparent power. Real power is the capacity of the circuit for performing work in a particular time. Apparent power is the product of the current and voltage of the circuit. Part of re-active power, which is not consumed in the circuit (i.e. re-active power) becomes distribution loss. (See Figure 1.5-1) Improvement of PF also contributes the reduction of distribution loss to utilities.

PF can be managed by controlling the phase difference between voltage and current. A lot of equipments have inductive characteristics, (current waveform lagging the voltage). In order to adjust the lagging (i.e. increase PF), condensers are usually being installed. Besides some equipments have capacitive characteristics (current phase leading the voltage).

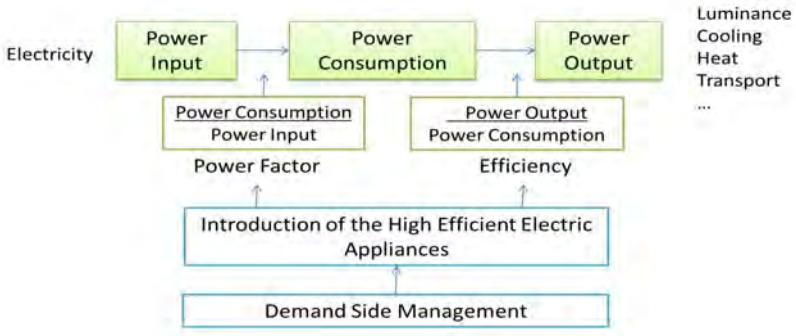
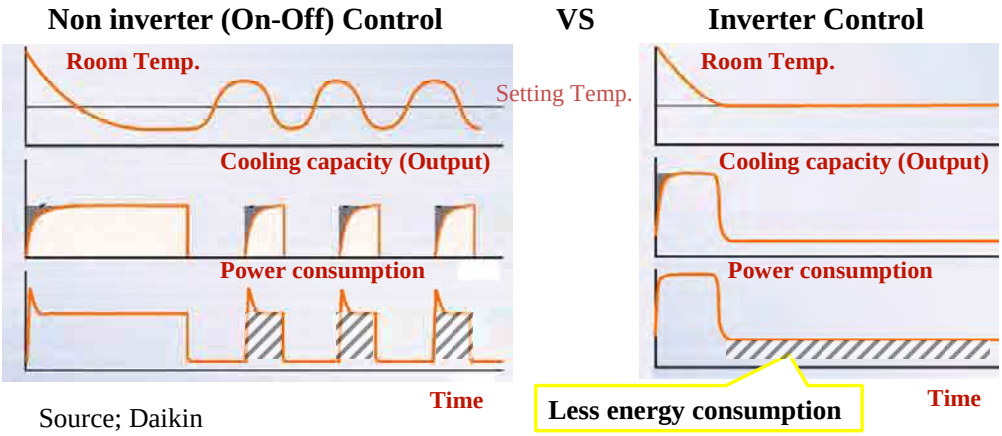


Figure 1.5-1 Concept of Power Factor

(2) Inverter

Inverter technology is applied to increase the efficiency of partial load operation equipment in liquid control. Especially for ACs with inverters, the efficiency of partial load operation is higher than that of 100% load operation. It means that for the cooling (or heating) demand, which is lower than the AC capacity, inverter ACs' efficiency is higher that of traditional ON/ OFF control ACs. In addition compared with traditional ON/ OFF control, inverter control can achieve a smooth operation. (See Figure 1.5-2) In total the electricity consumption can be saved by introducing inverter.



Source; Daikin

Figure 1.5-2 Concept of Inverter

(3) COP

Co-efficient of performance (hereinafter to as "COP") is a scale meaning energy efficiency. It is calculated as cooling (heating) capacity (kW) divided by input electricity (kW) (dimensionless). Higher COP means higher efficiency. In western countries Energy Efficiency Ratio (hereinafter to as "EER") is used instead of COP. COP1.0 is equals to EER3.4.

Chapter 2 Present Status

In this chapter the basic information needed to create functional proposals in Chapter 3 is summarized. Researches on the current Indonesian status were conducted through the cooperation with C/P and the sub-contract to local consultants. The outline of investigated result is described below.

2.1 Basic Survey

The electricity usage in residential and commercial sectors was investigated by the sampling survey. The results are as follows. (Sub-contract to PT. Energy Management Indonesia (hereinafter to as "EMI"))

a) It is assumed that the electricity consumption of three major appliances, television (hereinafter to as "TV"), refrigerator, and air conditioner (hereinafter to as "AC"), occupies about 50 % of total electricity consumption in households. (See Figure 2.1-1 and Table 2.1-1)
b) Along with the increase of living standards, the upsizing of appliances will advance.
c) The penetration ratio of Compact Fluorescent Lamp (hereinafter to as "CFL") is almost 100% of households, and electricity consumption by CFL is estimated over 70% of lighting electricity consumption. And CFLs are supposed to be contributing to reduce the evening electricity demand. MEMR puts on the first priority to start national EE labeling program with CFL, securing its quality. The effectiveness of the strategy focusing on CFL was clarified by this survey.
d) In the commercial sector, electricity consumption of ACs is estimated to be almost 50% of the total electricity consumption in buildings. It became obvious that the main target of EE&C in the commercial sector is ACs.

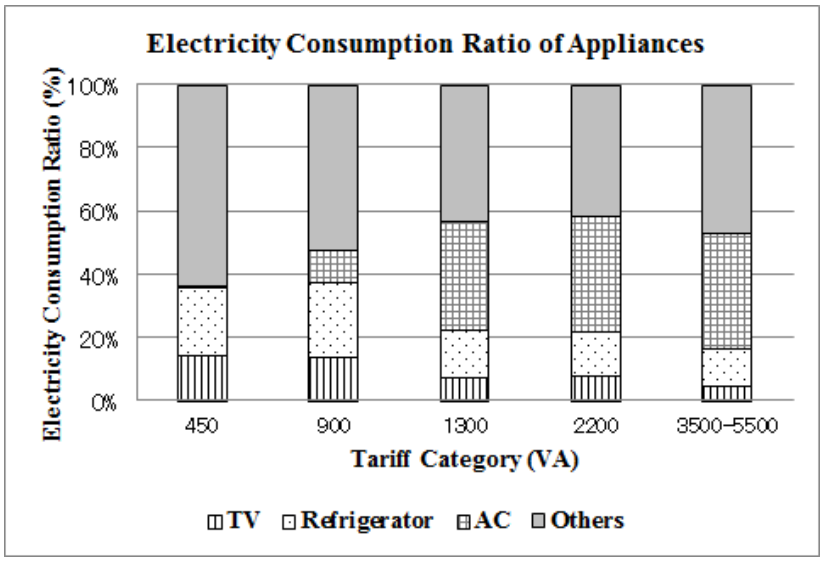


Figure 2.1-1 Electricity Consumption Ratios of Three Major Appliances for Total in Households by Tariff Category

Table 2.1-1 Comparison of Electricity Consumption of Home Appliances by Region (Survey in 2010)

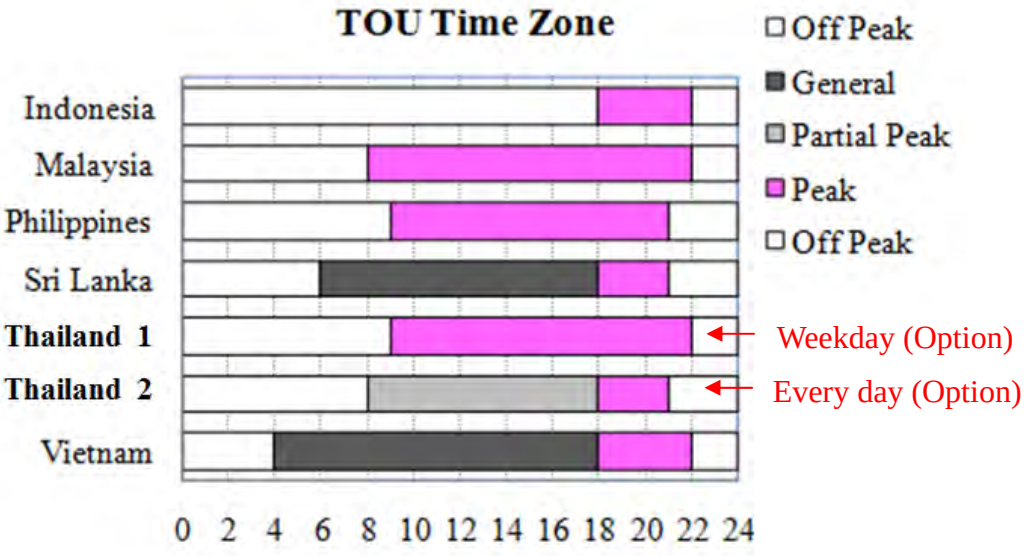
No.	City (Number of Study Targets)	Electricity Consumption Rates of Home Appliances for Total in Household (%)													
		Lighting	Refrigerator	TV	AC	Wash Machine	Rice Cooker	Dispenser	Elect. Kitchen	Water Pump	Computer	Water Heater	Elect. Iron	Fan	Others
1	Jakarta (48)	13.1%	17.9%	12.3%	19.0%	2.4%	9.3%	0.6%	0.0%	12.8%	0.6%	0.2%	5.7%	5.1%	0.9%
2	Palembang (50)	18.2%	22.4%	11.5%	10.5%	3.1%	11.7%	1.9%	0.0%	3.5%	2.7%	0.1%	6.3%	6.7%	1.3%
3	Balikpapan (52)	14.8%	21.4%	15.4%	22.4%	3.1%	5.6%	2.4%	0.1%	1.4%	3.2%	0.0%	5.3%	3.9%	1.0%
4	Manado (50)	14.7%	16.4%	15.1%	19.7%	1.9%	8.0%	6.3%	0.2%	6.0%	3.1%	0.1%	5.5%	1.9%	1.1%
5	Denpasar (46)	20.0%	18.3%	9.4%	16.0%	3.5%	11.5%	2.5%	0.0%	5.3%	2.3%	1.3%	6.9%	1.9%	1.1%
All		16.1%	19.5%	13.2%	17.2%	2.8%	9.5%	2.6%	0.1%	5.6%	2.4%	0.2%	5.9%	3.9%	1.1%

2.2 Electricity Tariff

Neighboring countries' tariff was investigated. Major findings are as follows.

a) Compared with the neighboring countries Indonesian tariff level is still lower.

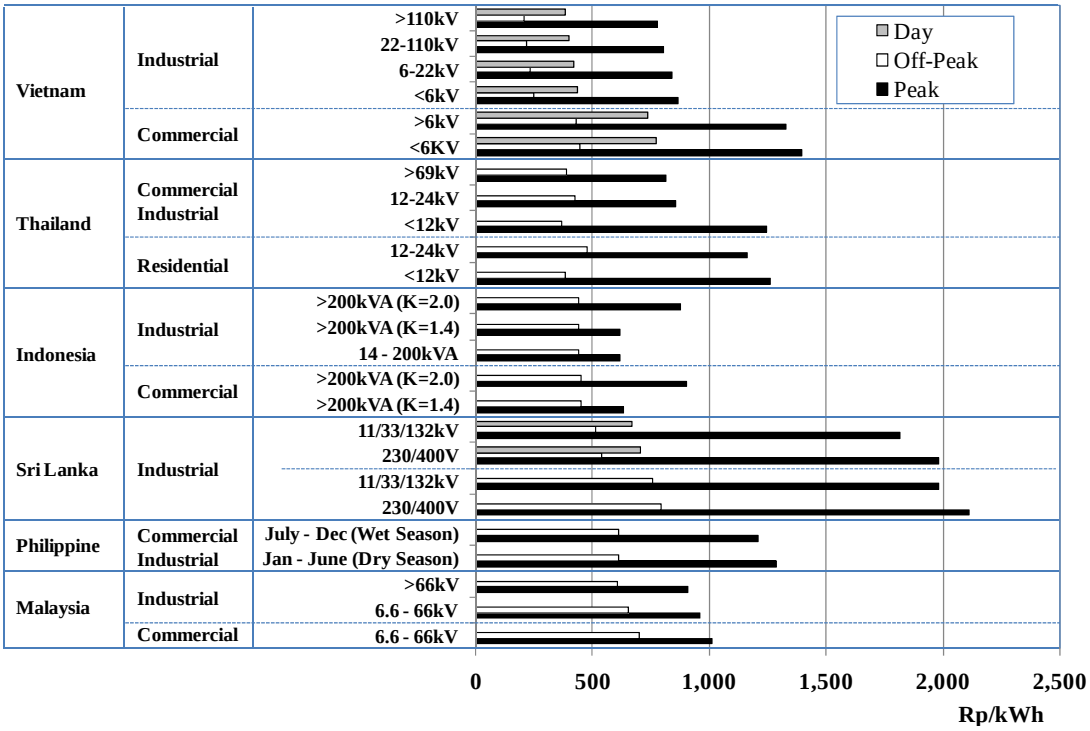
b) Countries except Indonesia have introduced day time tariff, which tariff level is the highest or second highest in a day, in addition to evening time tariff,. (See Figure 2.2-1)



Source: Products of the Study Team based on tariff tables of each country

Figure 2.2-1 TOU Time Zone by Country

c) The difference between peak and off-peak tariff in Indonesia is the smallest as compared with neighboring countries'. It is concerned that TOU tariff system does not function to promote peak-shift and –cut.（See Figure 2.2-2）

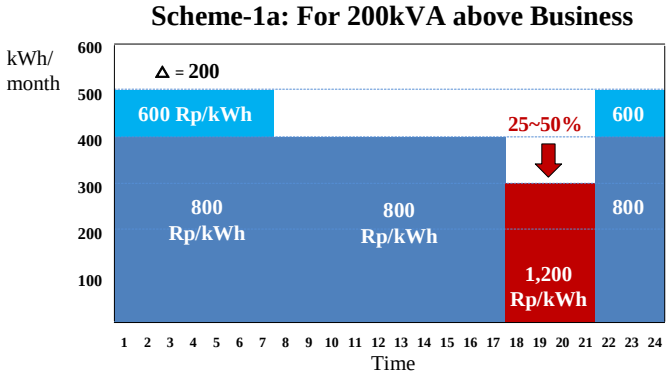


Source: Products of the Study Team based on tariff tables of each country

Figure 2.2-2 International Comparison of TOU Tariff

d) In some countries PF incentive scheme has been introduced.

The new tariff systems, which were introduced in July 2010 and April 2011, were analyzed. Especially the amended tariff, which encourages the shift of electricity consumption to off-peak time, in April 2011 is a reasonable measure taking in advance of the Study Team proposal. (See Figure 2.2-3)



Electricity Price for Scheme-1a Ex for tariff B-3 in PLT decrease 25~50%	Rp/kWh
Price in PLT	1,200
Price in OPLT-1	800
Price for Usage Decrease in OPLT-1	600
Price in OPLT-2	800

Source: PLN Documents 2011.07

Figure 2.2-3 Example of Promoting Electricity Load Shift into Night & Early Morning

2.3 Energy Efficiency Labeling Program

Market survey was conducted. And regarding the market share of home appliances, the largest share is occupied by Japanese manufacturers, the second largest share by Korean, and the third by domestic. (Subcontract to EMI)

The electricity consumption of lightings, TVs, ACs, and refrigerators in households in the Jawa-Bali region was estimated. (See Figure 2.3-1 and -2) (Subcontract to Asia Carbon） The results of the survey are followings.

a) The electricity consumption of these four appliances occupies 18.2% of the total electricity consumption in the Jawa-Bali region.

b) If 20% reduction of electricity consumption of these four appliances could be achieved, 3.6% of the total electricity consumption in the Jawa-Bali region would be supposed to be reduced.

c) In addition, CO_2 emission from these four appliances is estimated to be 18.7mil t-CO_2/y.

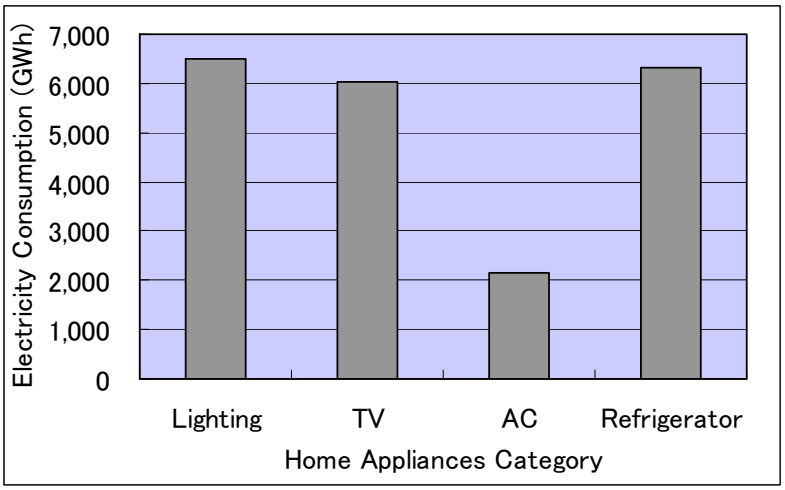


Figure 2.3-1 Electricity Consumption of Four Home Appliances in Jawa-Bali

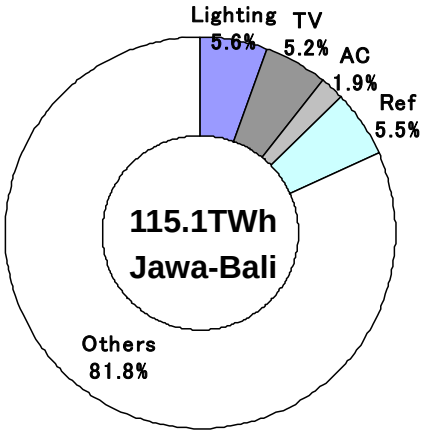


Figure 2.3-2 Electricity Consumption Ratio of Four Home Appliances for Total Electricity Consumption in Jawa-Bali

In addition, the following surveys and analyses were conducted.

a) The present status in the neighboring countries was investigated. (See Table2.3-1) Especially, for Singapore, Malaysia and Thailand, which have already introduced and are operating EE labeling programs, interview surveys were conducted. These countries are positive to collaborate with Indonesia in the operation of EE labeling program.

Table 2.3-1 Labeling Programs Applied in Asian Countries

Country		Refrigerator	AC	TV	Lighting
Indonesia					M (Oct. 2011)
Japan		V	V	V	V
China		M	M		M
Korea		M	M	M	M
Malaysia		M	M	V	M
Singapore	Comparison	M	M		
	MEPS	M (Sep. 2011)	M (Sep. 2011)		
Thailand	Comparison	V	V	V	V
	MEPS	M	M		
India		M	M (Inc. MEPS)	M	M
Australia		M	M	M	M

V; Voluntary M; Mandatory MEPS; Minimum Energy Performance Standard

b) Activities of relative organizations for formulating Labeling Program in Indonesia were summarized.

c) Current situation on the various movement for formulating an international standard of measurement methodology on energy efficiency, (harmonization of Standard and Labeling (hereinafter to as "S/L")), and Japanese organizations' movements were also summarized.（See Table 2.3-2）

Table 2.3-2 Movement of International S/L Harmonization

Item	Content
APEC 8th Conference on Standards and Conformance for Green Harmonization (in Sendai Japan)	➢ APEC's three sub-committees relating to EE&C and S/L were held joint meeting in Sep. 2010. Three sub-committees are followings. Sub-Committee on Standards and Conformance (SCSC) Expert Group on Energy Efficiency and Conservation (EGEE&C) Market Access Group NTB (Non Tariff Barrier) including energy efficiency standards has been discussed. Necessity of harmonization on EE indicators and measurement method has been recognized, but "APEC EE Label" was rejected. ➢ Linkage between ACs and smart grid was discussed in October 2011 in Seoul, LED lamp in November 2011 in Singapore, Testing method for ACs and highly-efficient transformers in November 2011.

Item	Content
ASEAN AHEEERR EE MRA	➢ AHEEERR (ASEAN Harmonized Electric ＆ Electronic Equipment Regulatory Regime） and EE MRA (Sectoral Mutual Recognition Arrangement for Electrical & Electronic Equipment） were held to discuss harmonization, standardization, and mutual recognition about display of safety and energy performance. Committee name is JSC EEE (Joint Sectoral Committee for Electric and Electronic Equipment) ➢ "Harmonization of Energy Efficiency Standards in Southeast Asia- Air Conditioner, Kick-off Meeting" is planned to be held in January 2012 in Jakarta
UNEP (United Nations Environment Programme)	➢ Dissemination workshop named "Harmonization of Energy Efficiency Standards in Southeast Asia for Air Conditioners and Refrigerators" was held in 17th Jan. 2011 in Kuala Lumpur. SEEA (Seasonal EER) was discussed as a new indicator for energy efficiency of AC.
APP (Asia-Pacific Partnership Program)	➢ APP has a regional meeting for global warming countermeasures. A committee of BATF (Building and Appliance Task Force) deals a theme "Harmonization of test procedures". Measurement method for highly-efficient products is discussed. Following is the target appliances and leader countries Motor, motor system and lighting; Australia AC; Korea Refrigerator; Japan Electronics; USA CFL; Australia and USA TV is included in "Electronic", but practical discussion has not yet been held. Besides the above theme, labeling program is talked in "Market transformation"
OECD	➢ OECD is also studying removal of NTB (Non Tariff Barrier) on EGS (Environment Goods and Service) same as APEC
CLASP (Collaborative Labeling and Appliance Standard Program)	➢ CLASP conducts researches on S/L and supports making labeling programs in several countries. It holds and operates website for worldwide information on labeling programs, but details of actual programs cannot be seen in the website.
ICA (International Copper Association)	➢ ICA participates and supports several international and regional S/L programs held by APEC, UNDP, UNEP, etc. ➢ ICA is supporting the efficiency improvement of copper heat exchanger and pipes of ACs and refrigerators ➢ Japanese member of ICA is from mining industries, not from electric appliance manufacturers

d) The capacity of governmental testing laboratories, which should take a quite important role in the operation of EE labeling program along with movement of S/L, was analyzed. It was pointed that there exist large issues for governmental testing laboratories, such as Indonesia Institute of Science (hereinafter to as "LIPI"), Quality Management System Certification

Institute (hereinafter to as “B4T”) and Agency for Assessment and Application of Technology (hereinafter to as “BPPT”), to secure appropriate measurement equipments, which meet the above mentioned international standard. The outlines of above issues are as follows.

➢ Refrigerator

The climate chamber of LIPI is larger than those of other testing laboratories. However it cannot clear the IEC/ISO standard, because the chamber was not introduced for conducting refrigerator tests, the air supply is set on the wall, and the velocity of the air supply is too fast to keep the minimum requirement of ambient air flow specified in IEC/ISO standard. Double floor and double ceiling, which can keep the ambient air velocity, are to be prepared, however the chamber height is not enough to add an additional floor and a ceiling.（See Figure 2.3-3）

Figure 2.3-3　Climate Chamber in LIPI

➢ AC

B4T and BPPT are expected to be as the testing laboratories.

In September 2011, B4T（in Bandung under MOI）introduced a cyclometric chamber. And it became possible to conduct an energy efficiency test.（See Figure 2.3-4）However in order to conduct a reliable test, another cyclometric chamber should be installed to realize the calibrated to each other.

BPPT is now constructing AC testing chamber. It must be necessary to improve air-tightness and heat-insulation in order to conduct accurate test as required by ISO standards.（See Figure 2.3-5）

Figure 2.3-4　Testing Chamber in B4T

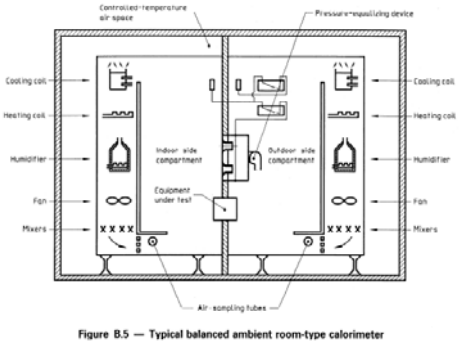


Figure 2.3-5 Testing Chamber in BPPT

➢ TV

Almost all laboratories can conduct EE measurement test on TVs, because special testing equipment is not needed for TV test.

2.4 Pilot Project

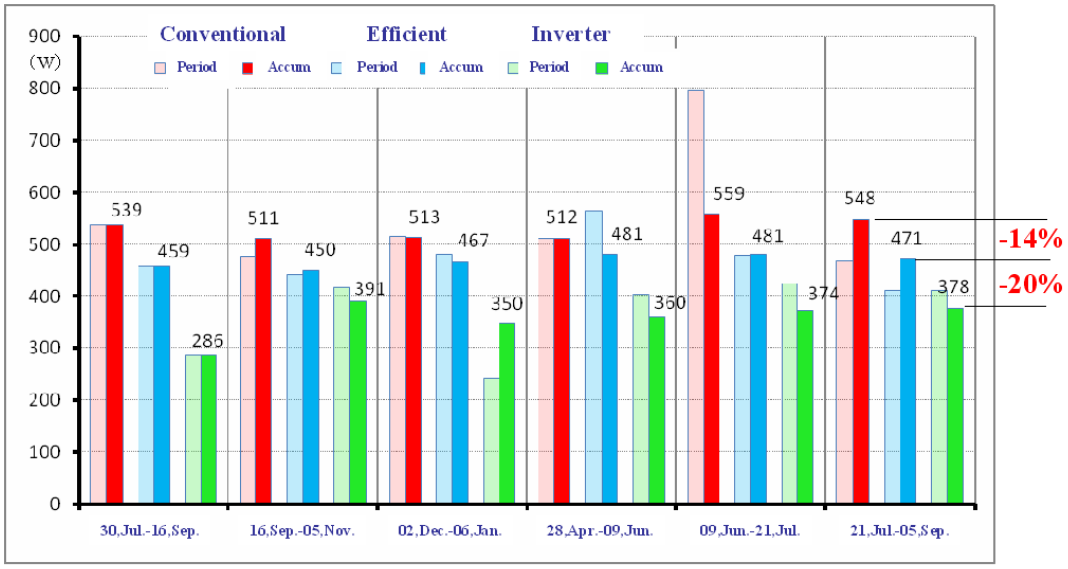
The results of pilot projects are described below. (Sub-contract to BPPT)

a) CFL simulation board was assembled to visualize the in-efficiency of low PF CFL as "difference of current" for consumers who are not familiar with technology. (See Figure 2.4-1)

Figure 2.4-1 Facade of Simulation Board

b) The field measurement for existing households was conducted. And the quite large voltage drop at the end of power distribution network was observed.

c) The field measurement test of ACs was conducted in living rooms in household and offices. And inverter technology was measured to be effective for offices, whose cooling demand is lower than ACs' capacity (i.e. non-inverter ACs repeat ON/OFF operation.) (See Figure2.4-2, -3, and -4)



Period: Average power consumption in each testing period

Accum: Average power consumption in total testing period

Figure 2.4-2 Averaged Electricity Consumption of ACs in Office

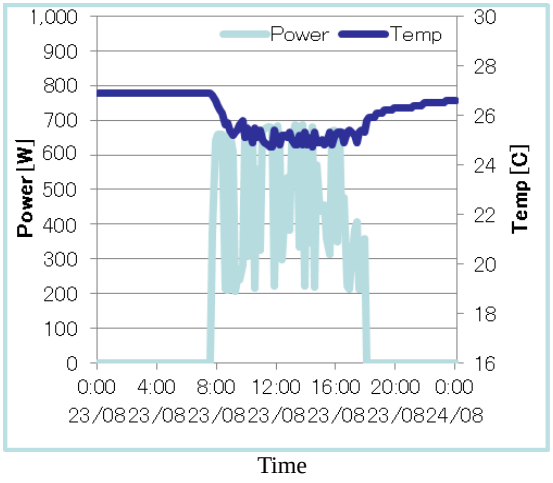


Figure 2.4-3 Electricity Consumption of High COP with Non-inverter Type AC

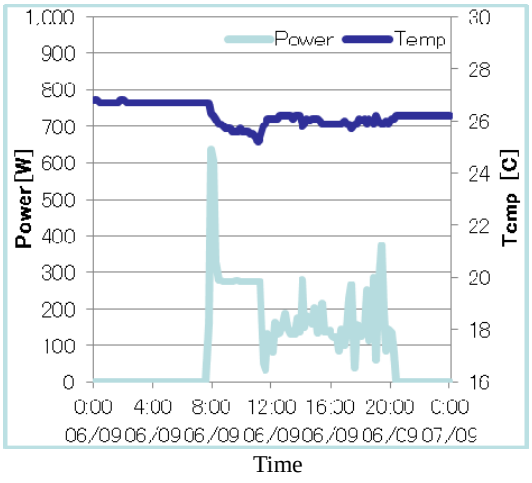


Figure 2.4-4 Electricity Consumption of High COP with Inverter Type AC

d) ACs in bedrooms and refrigerators, which are spreading rapidly in Indonesia, were also found being operated in fluent ON/OFF mode, i.e. their actual demand is lower than the appliances capacity. The potential of promoting EE&C by introducing inverter technology was considered to be large for them. (See Figure 2.4-5 and -6)

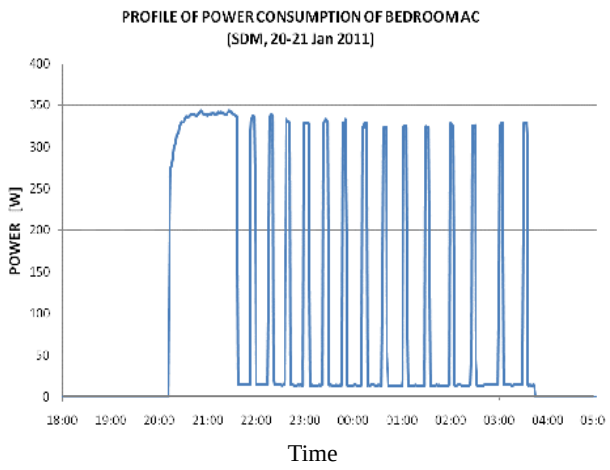


Figure 2.4-5 Electricity Consumption of Bed Room AC

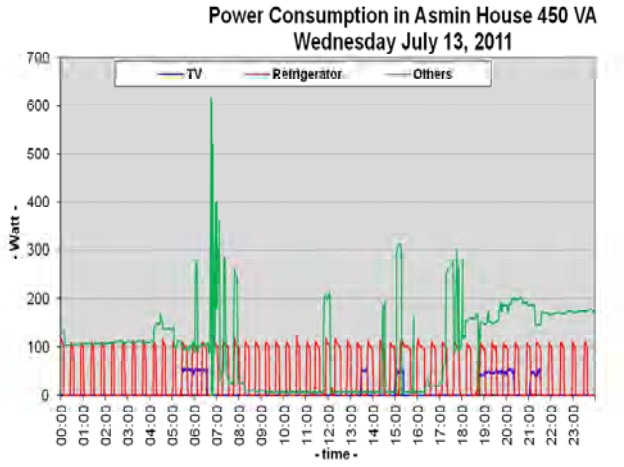
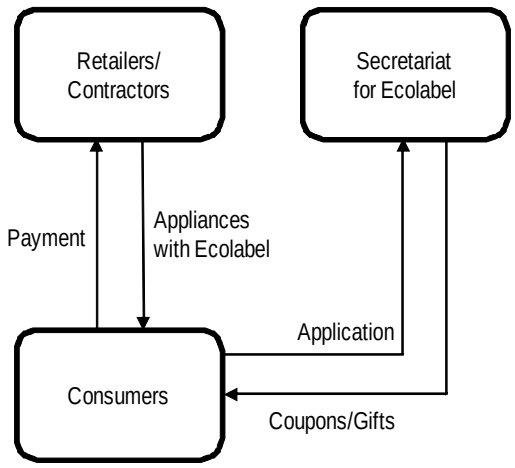


Figure 2.4-6 Refrigerator Operating Pattern

e) The penetration ratio of condensers in household, which can contribute to improve PF, is observed comparatively high. It is necessary to analyze the future risk of condenser accidents including burnt-out, caused by harmonics generated from inverters, which will be spread in Indonesia soon, and to maintain and control the quality of limiter.

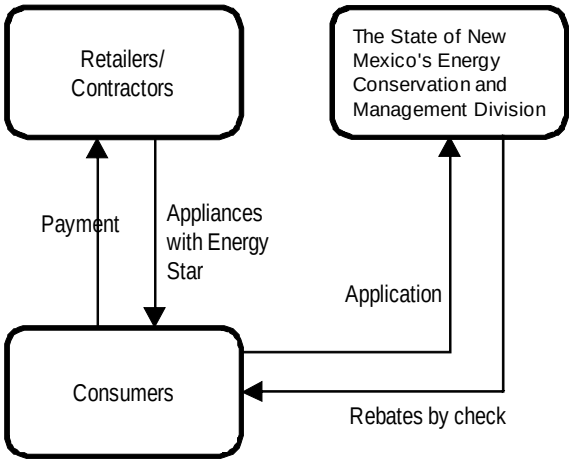
2.5 Incentive Program

Japanese and other countries' incentive programs for EE&C were investigated. And the outlines of typical incentive programs are shown in Figure 2.5-1 and -2. In addition, for Malaysia and Thailand, which have already introduced incentive programs, interview surveys were conducted. And it was confirmed that there are a lot of examples of incentive scheme for appliances, which are operated in accordance with EE labeling program. Also the activities to formulate incentive program by C/P and other international cooperation agencies were reviewed.



Source: Products by the Study Team based on the public information

Figure 2.5-1 Eco-point Program Using Eco-label (Japan)



Source: Products by the Study Team based on the public information

Figure 2.5-2 Rebate Program for Home Appliances with Energy Star (US)

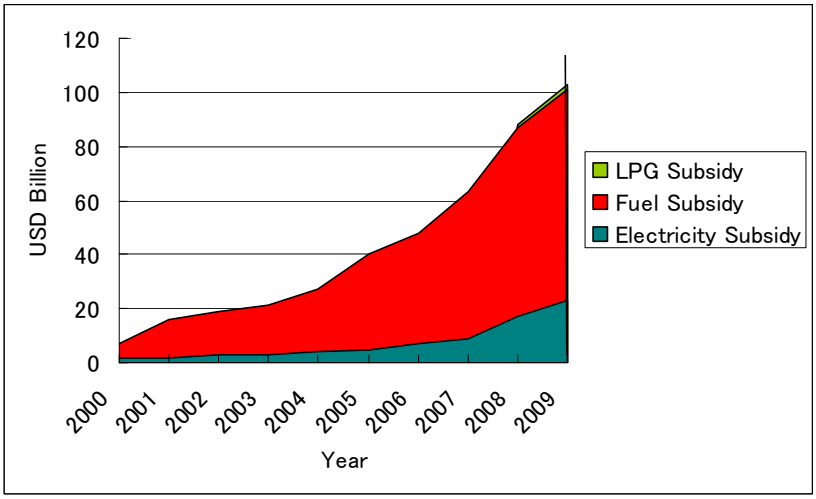
2.6 Dissmination, Awareness, and Others

The movement of dissemination and awareness for EE&C in Indonesia was investigated. And it was clarified that various activities have been carried out in Indonesia. However it is also confirmed that, except CFL dissemination and promotion program, the other programs has not led to EE&C activities of consumers.

And, during the study term, two seminars in Japan and several seminars focusing on specified themes were conducted. Through these seminars Japanese, Brazilian, and International movements for EE&C were shared with C/P.

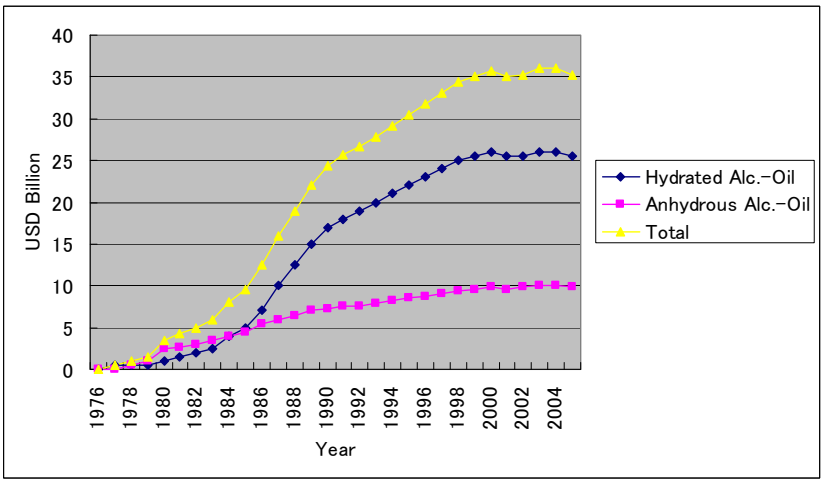
“Renewable Energy and EE&C in Brazil, past and now” was held on 17 February 2011 in MEMR, inviting the related governmental officials and industries.

The lecturer was Prof. Moreira, who was a lead author of IPCC and is one of the Study Team members. Although the population of Brazil and Indonesia is almost same, the implementation stage of renewable energy and EE&C in Brazil is quite ahead of Indonesia. And a lot of questions and answers were exchanged. Especially, the audience became uproar when it was claimed that energy subsidy in Indonesia is 100 billion USD during recent 10 years, on the other hand, energy subsidy in Brazil is 35 billion USD during resent 30 years. (See Figure 2.6-1and -2)



Source: Products of the Study Team based on the documents of MEMR

Figure 2.6-1 Accumulated Energy Subsidy for 10 years in Indonesia



Source: Products of the Study Team based on the documents of government officials in Brazil

Figure 2.6-2 Accumulated Energy Subsidy for 30 years in Brazil

Chapter 3 Key Points of Proposals

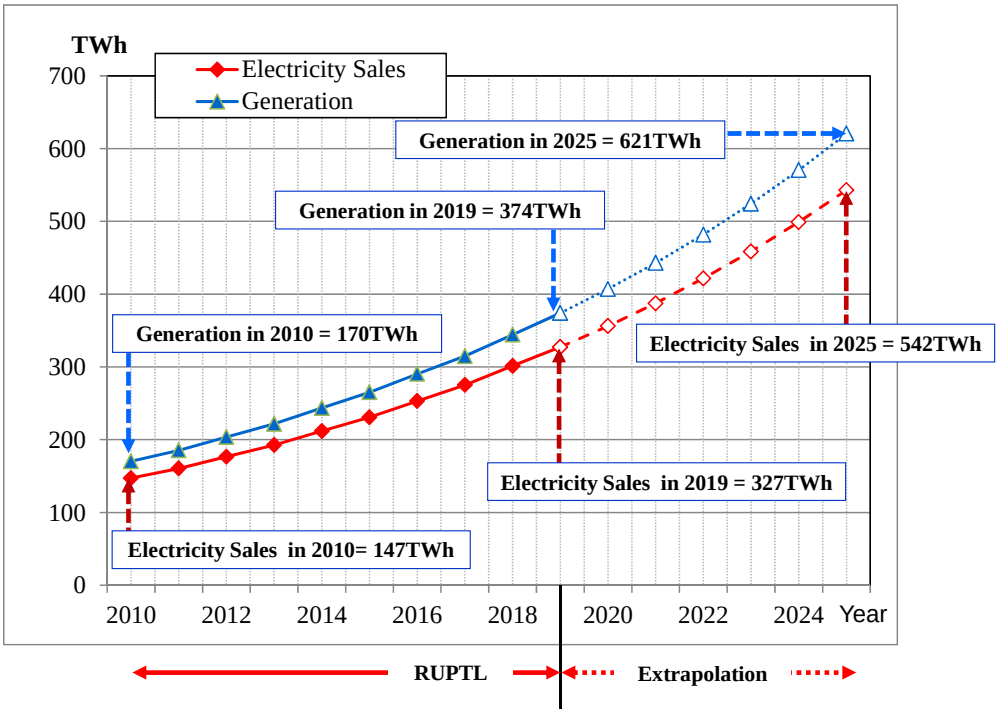
In this chapter, firstly the electricity demand estimation until 2025 including the peak demand and electricity consumption, which is the baseline for various proposals, is analyzed and explained. Secondly as core themes of this study, the proposals and study results of electricity tariff system and labeling program including incentive program for EE&C are described. Finally, dissemination, awareness, and other measures for promoting EE&C are proposed.

3.1 Baseline Scenario of Electricity Demand in 2025

The base lines of the future forecast of electricity demand until 2025, which is used in the estimation in Chapter 4, were defined by the extrapolation of the estimation until 2019 in Rencana Usaha Penyediaan Tenaga Listrik ("Electricity Supply Business Plan", hereinafter to as "RUPTL") 2010 by PLN.

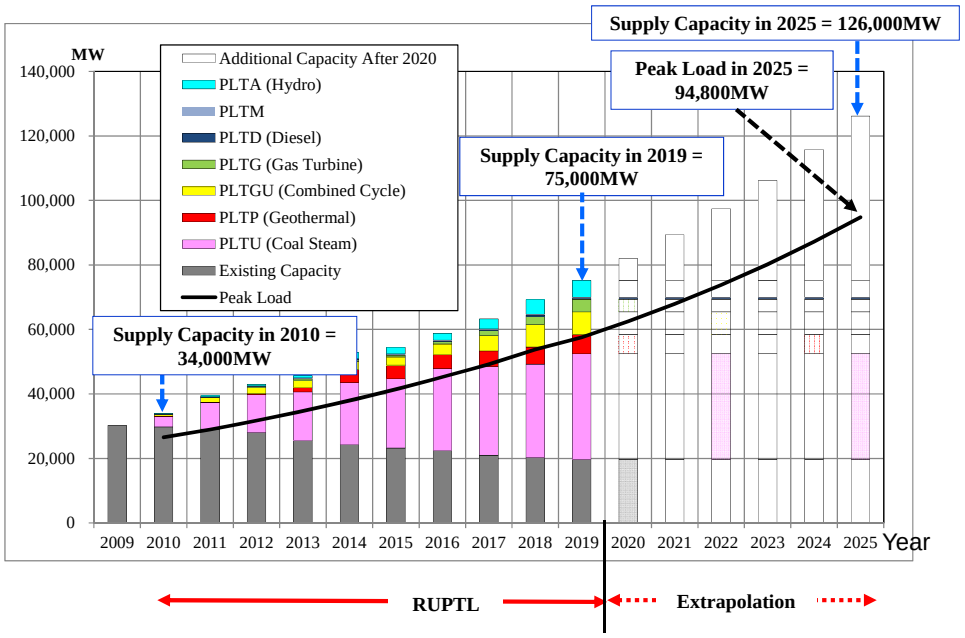
Three following major pictures are highlighted.

a) It is assumed that across the country electricity consumption will be 542TWh per year, and peak load will be 94.8GW in 2025, both 3.7 times of 2010. (See Figure 3.1-1 and -2)



Source: RUPTL 2010 (Extrapolated after 2020 by the Study Team)

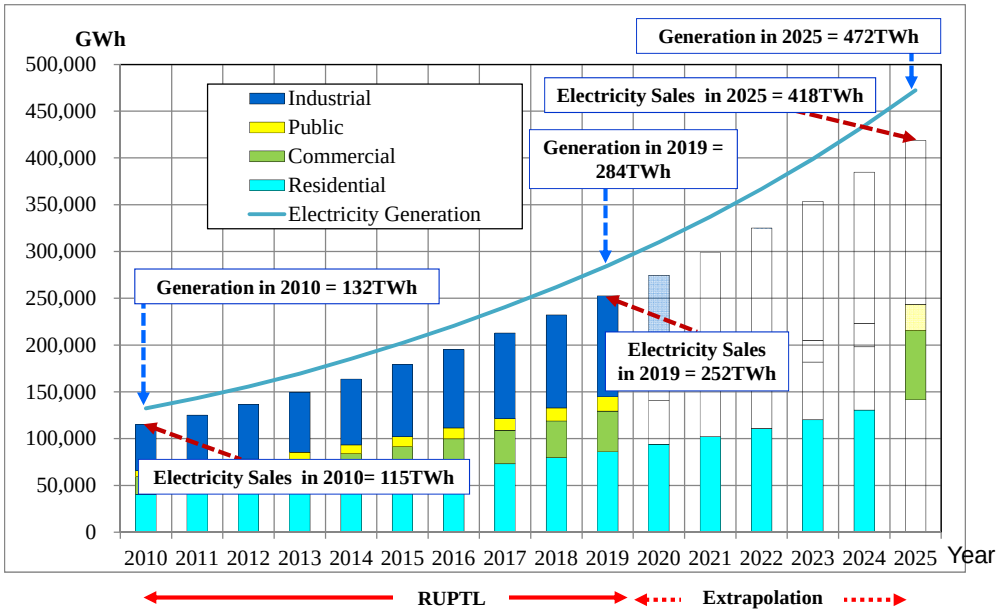
Figure 3.1-1 Forecast of Electricity Demand in Indonesia



Source: RUPTL 2010 (Extrapolated after 2020 by the Study Team)

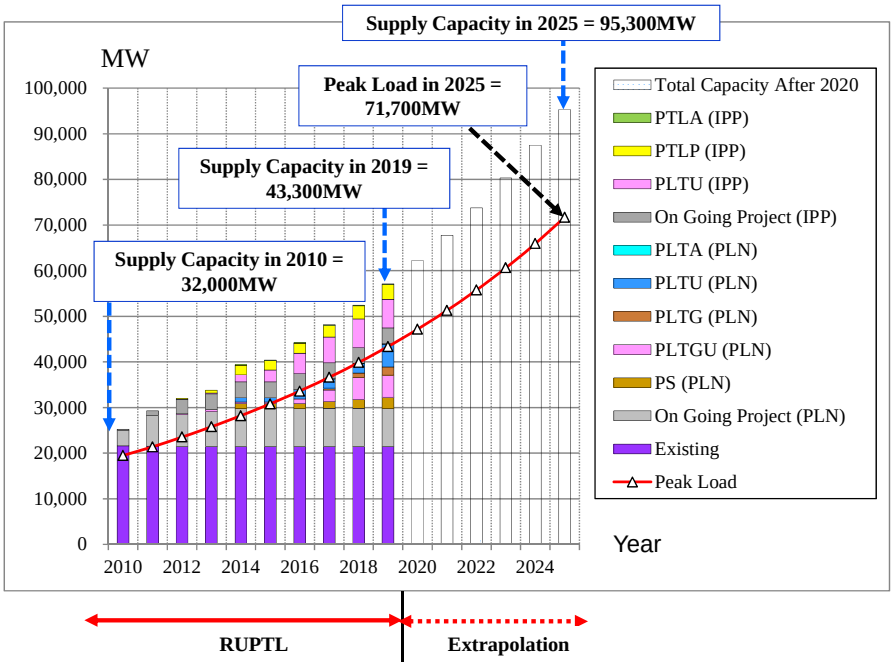
Figure 3.1-2 Forecast of Electricity Peak Demand and Supply Capacity in Indonesia

b) It is estimated that in the Jawa-Bali region electricity consumption will be 418TWh (3.6 times of 2010), and peak load will be 71.7GW (3.0 times of 2010) in 2025, (See Figure 3.1-3 and -4)



Source: RUPTL 2010 (Extrapolated after 2020 by the Study Team)

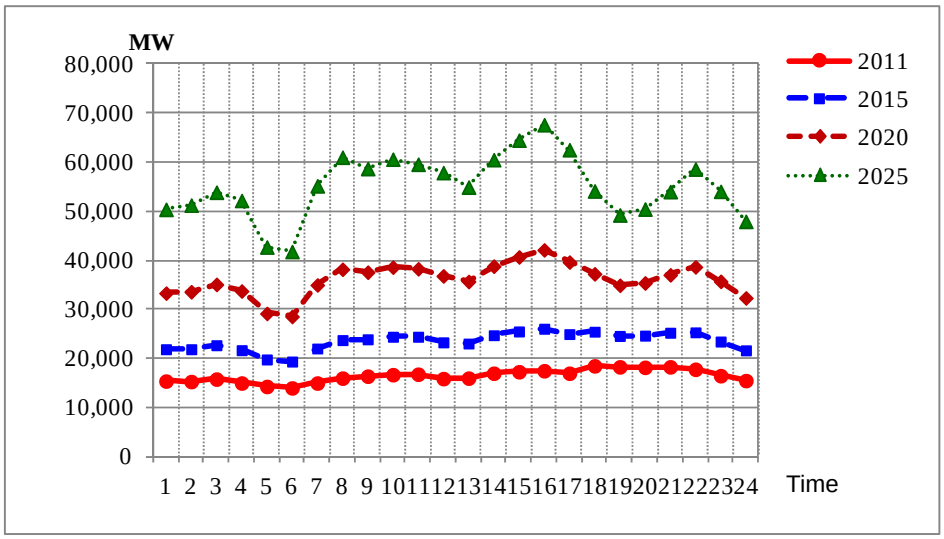
Figure 3.1-3 Forecast of Electricity Demand in Jawa-Bali



Source: RUPTL 2010 (Extrapolated after 2020 by the Study Team)

Figure 3.1-4 Forecast of Electricity Peak Demand and Capacity by Generation Type in Jawa-Bali

c) Electricity daily peak time of the Jawa-Bali region will be shifted from evening to daytime around 2015. (See Figure 3.1-5)



Source: Products of the Study Team based on PLN website data

Figure 3.1-5 Trend of Daily Load Curve in Jawa-Bali

3.2 Proposal of Functional Tariff System

As a countermeasure against the increasing the subsidy to electricity, Indonesian government and PLN are intend to increase electricity tariff gradually until 2015. Besides a lot of consumers and

associations are strongly opposing the tariff raise. Under these conflicts, not only one-sided tariff raise but also the tariff options to reduce the amount of raise by consumers' effort should be introduced. Incentive tariff systems for customers are proposed in addition to the existing disincentives oriented tariff. In concrete terms, following measures are proposed;

(1) Amendment of TOU Tariff System in the Jawa-Bali Region (New TOU Tariff System)

a) Setting 3 time zones to mitigate the coming daily peak; mid-night and early morning (discount), daytime (disincentive), evening (disincentive) (See Figure 3.2-1 and Table 3.2-1)

b) Widening the ratio of peak to off peak tariff (ranged from 2.5 to 5.0)

c) Expansion of target group for B2 and R3. (Number of consumers; 1.7%, electricity consumption; 61.3%)

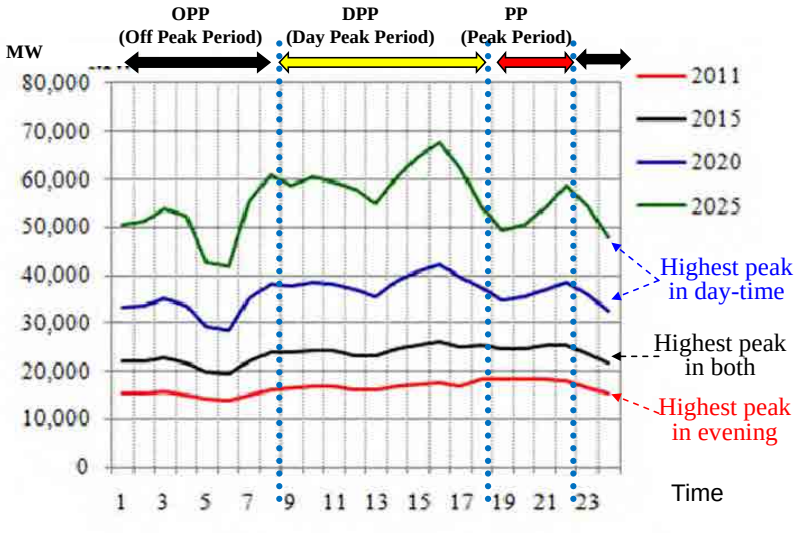


Figure 3.2-1 TOU Tariff Time Zone based on Daily Load Curve

Table 3.2-1 Time Zone of Peak/Off Peak and Setting TOU Tariff

	Time Zone	TOU Tariff (Rp/kWh)	Remark
OPP (Off Peak Period)	22:00-8:00	400 (Comparatively cheap)	Incentive
DPP (Day Peak Period)	8:00-16:00	1200	-
PP (Peak Period)	16:00-22:00	2000 (Comparatively expensive)	Disincentive

(2) Amendment of PF Clause (New PF Clause)

a) Increasing standard PF from 85% to 90%, promoting loss reduction.
PF improvement contributes to the loss reduction in transmission and distribution lines of PLN. Current power factor adjusting system has only disincentive clause, imposing penalty on reactive power as penalty. And there is no incentive clause.

b) Introduction of incentive clause for PF improvement; 2% discount for 1% increase

c) Expansion of target groups for B2 (Number of consumers; 1.3%, electricity consumption; 49.5%)

(3) Introduction of Tariff Adjustment System by Fuel Price Fluctuation

Based on the above mentioned cost analysis of Indonesian electricity, the Study Team proposes to apply Japanese style tariff adjustment system to Indonesia after 2015. The basic concept is as follows.

a) Three month time delay of adjustment (Example: Price of January to March applies to the adjustment price of June to August)
b) Plus and minus 5%: No tariff compensation
c) Decrease below 5%: Total compensation
d) Increase: Capping over 20% for avoiding rapid tariff raise for protecting consumers (See Figure 3.2-2)

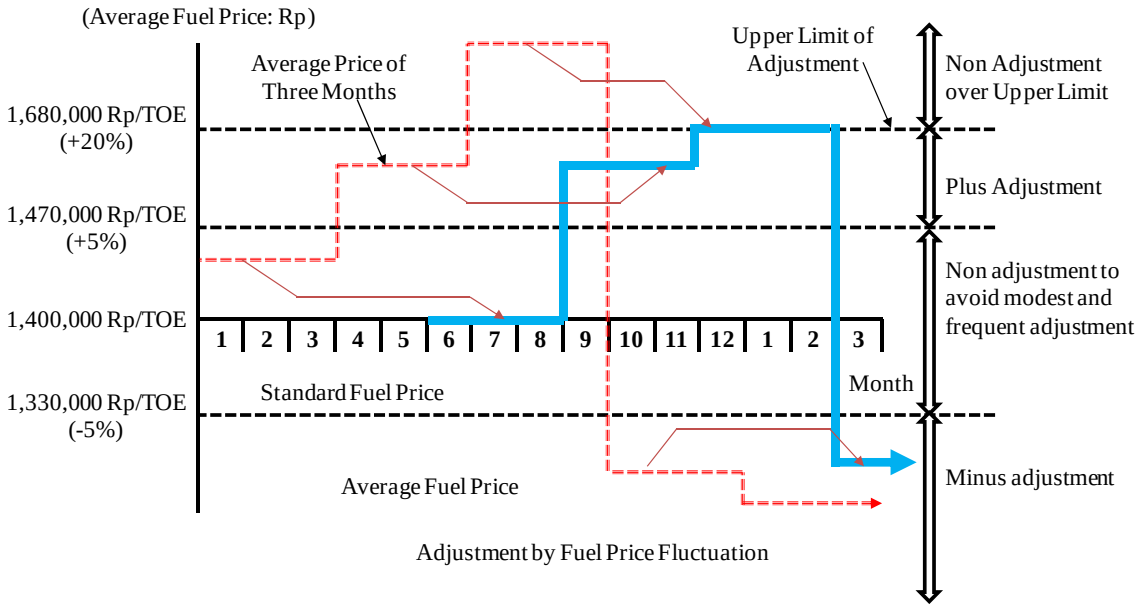


Figure 3.2-2 Indonesian Tariff Adjustment System by Fuel Price Fluctuation (Draft)

(4) Roadmap and Action Plan for Formulating Functional Tariff Systems

The outline of roadmap is shown in Table 3.2-2. The outline of action plans are shown in Table 3.2-3, -4, and -5.

Table 3.2-2 Roadmap for Functional Tariff System (Outline)

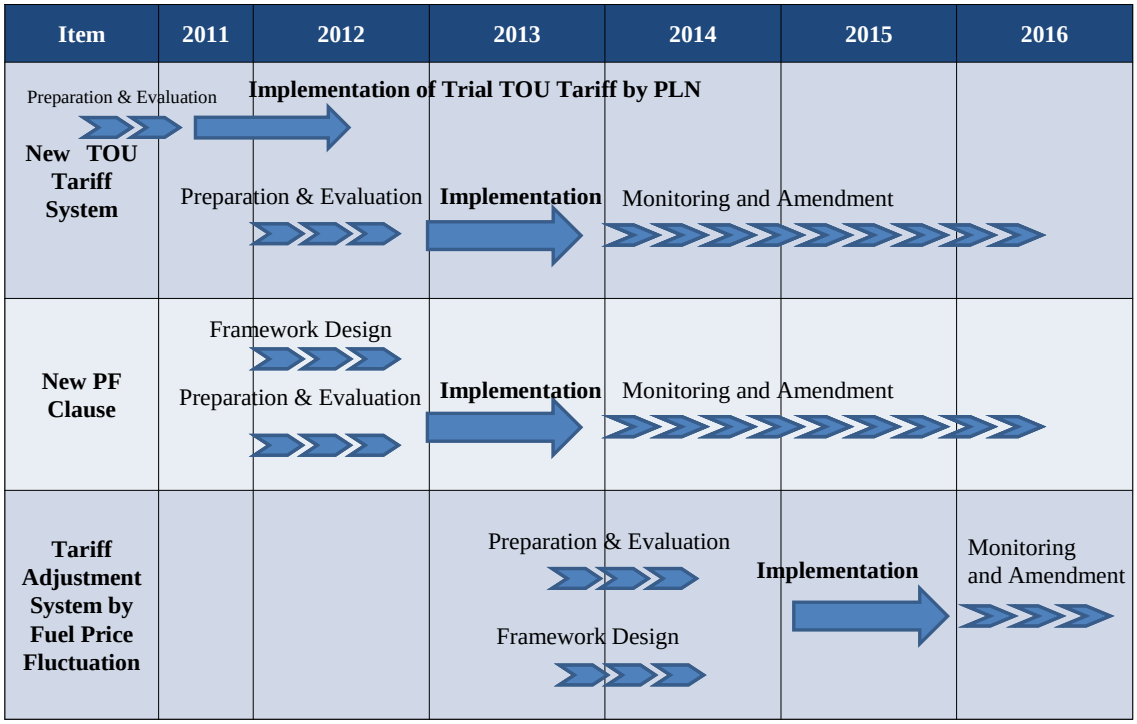


Table 3.2-3 Action Plan to Introduce New TOU Tariif Sysem in Jawa-Bali

Item	Organization	2012	2013	2014	2015	2016~
System Design	PLN	Preparation ➢Tariff Structure ➢Economics ➢Investment ➢Profit ➢Technology	➢Implementation	➢Evaluation and Monitoring		
	MEMR/PLN	➢Dispatching Overseas Delegation				
Law Revision	MENR	➢Provision of Law Revision ➢Approval by the Government	➢Minor Amendment	➢Minor Amendment		
Advertisement	MEMR/PLN	➢Advertisement of Incentive TOU Tariff				

Table 3.2-4 Action Plan to Introduce New PF Clause in Indonesia

Item	Organization	2012	2013	2014	2015	2016~
System Design	PLN	Preparation ➢Tariff Structure ➢Economics ➢Investment ➢Profit ➢Technology	➢Implementation	➢Evaluation and Monitoring		
	MEMR/PLN	➢Dispatching Overseas Delegation				
Law Revision	MENR	➢Provision of Law Revision ➢Approval by the Government	➢Minor Amendment	➢Minor Amendment		
Advertisement	MEMR/PLN	➢Advertisement of Incentive PF Tariff	➢Support for Consumers to improve PF	➢Support for Consumers to improve PF		

Table 3.2-5 Action Plan of Tariff Adjustment System by Fuel Price Fluctuation in Indonesia

Item	Organization	2012	2013 -2014	2015	2016~
System Design	PLN		Preparation ➢Tariff Structure ➢Economics ➢Accounting System ➢Profit ➢Technology	➢Implementation	➢Evaluation and Monitoring
	MEMR/PLN		➢Dispatching Overseas Delegation (Japan)		
Law Revision	MENR		➢Provision of Law Revision ➢Approval by the Government	➢Minor Amendment	
Advertisement	MEMR/PLN		➢Advertisement of Fuel Price Adjustment System		

3.3 Energy Efficiency Labeling Program

Throughout the study term, the Study Team led and supported the activities for formulating EE labeling program. Items of this study are described below. And the major results and proposals are described in (1) and afterwards.

a) Draft Framework of refrigerators, ACs, and TVs

The Study Team proposed to establish the Technical Meeting hosted by MEMR for formulating EE labeling program, and supported its operation. During the study term the Technical Meetings were held four times. And the Draft Framework of refrigerators, ACs, and TVs has

been summarized. Key points of Draft Framework are as follows.

- ➢ Flexible management of testing institution
- ➢ High energy efficiency of ACs with inverter
- ➢ Special consideration to local manufacturers (not too high standard. i.e. In the framework of ACs, not only criteria for inverter ACs, but also that for non-inverter ACs was adopted, in consideration of domestic manufacturers, who don't produce inverter ACs.)

b) Proposal of Controlling Harmonics

It is proposed to investigate the risk of accidents, which might be caused by the increasing harmonics induced by promoting inverter technology.

c) Establishment of EE Performance Database

A prototype of EE performance database for refrigerators, ACs and TVs was completed and transferred to MEMR. The prototype can contribute as the basis of data accumulation and analysis.

d) Roadmap and Action Plan

Roadmap and action plan for implementing EE labeling program were proposed. And the issues to formulate and operate EE labeling program were summarized.


Figure 3.3-1 Scene of Technical Meetings

(1) Draft Frameworks for EE labeling

Draft Frameworks of EE labeling for refrigerators, ACs, and TVs were approved in the Technical Meetings. Table 3.3-1 shows the structure of the frameworks and the outlines are described below.

Table 3.3-1 Contents of the Draft Frameworks

Framework	Contents
Part 1: General	■ Purpose of the document ■ Operation of the program ■ Definition of the terms ■ Roles of the stakeholders ■ Incentive and disincentive ■ Maintenance of the program (Review)
Part 2: Refrigerator	■ Scope of the product ■ EE Indicator and measurement method ■ Star rating criteria ■ Verification of EE data ■ Mandatory display
Part 3: AC	
Part 4: TV	

1) Draft Framework for refrigerators

The outline of Draft Framework for refrigerators is shown in Figure 3.3-2. Two categories (with/without freezer) are provided. Energy efficiency indicator for refrigerators is calculated by annual electricity consumption per inner volume. However this data is not described in Indonesian manufacturers' catalogues. In order to collect this data, the measurement method for electricity consumption and inner volume should be defined. And manufacturers must collect data based on the defined method.

Indonesian National Standard (hereinafter to as "SNI") is applied for the measurement of electricity consumption. Compared with International Organization for Standardization (hereinafter to as "ISO") and International Electro Technical Commission (hereinafter to as "IEC") standard, SNI is simpler (no need for preparing dummy load). ISO and IEC are applied for the calculation of inner volume.

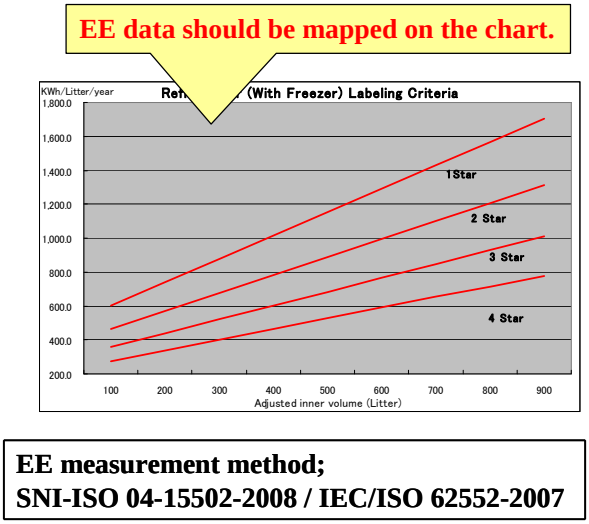
Electricity consumption criteria were decided without actual measured data, referring neighboring countries' schemes and some hearing from manufacturers in Indonesia. It will be needed to re-evaluate the criteria.

1. Refrigerator without freezer

Star rating	Formula
4 Star	≤ 3 Star x 0.77
3 Star	≤ 2 Star x 0.77
2 Star	≤ 1 Star x 0.77
1 Star	≤ 465 + 1.378 x V_{adj} x 1.15

2. Refrigerator with freezer

Star rating	Formula
4 Star	≤ 3 Star x 0.77
3 Star	≤ 2 Star x 0.77
2 Star	≤ 1 Star x 0.77
1 Star	≤ 465 + 1.378 x V_{adj} x 1.55



EE measurement method;
SNI-ISO 04-15502-2008 / IEC/ISO 62552-2007

Source: 4th Technical Meeting

Figure 3.3-2 Outline of Draft Framework for Refrigerators

2) Draft Framework for ACs

The outline of Draft Framework for ACs is shown in Figure 3.3-3. Referring Japanese and Singapore program, the superiority of inverter technology is applied. However not an unique evaluation method like Japan, but evaluation methods for inverter and non-inverter AC (two categories) were provided in parallel, reflecting Indonesian market condition. Advantage of inverter should be displayed being apart from the number of stars of EE labeling.

Energy efficiency of ACs with inverter is given by "COP weighted". Singapore has such evaluation method for ACs with inverter. (Malaysia also has a plan to introduce the same method)

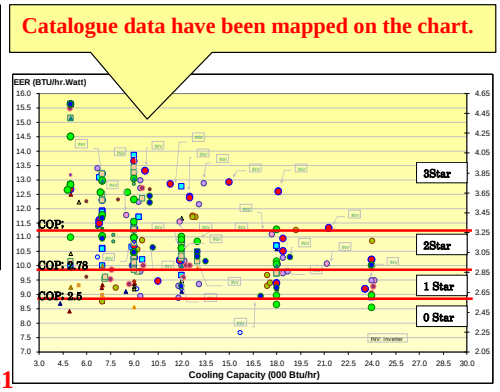
COP of ACs is described in the catalogue of manufacturers. By mapping the COP data on the chart, the number of stars of EE labeling for the product can be judged. However the measurement method is not clear in many products, cross checking (certification) by the governmental organization or third party testing laboratories should be needed.

SNI and ISO is applied for testing (SNI is similar to ISO)

	Inverter COP weighted	Non-inverter COP
4 Star	3.76 ≤ COP	3,05 ≤ COP
3 Star	3.34 ≤ COP < 3.76	2.92 ≤ COP < 3,05
2 Star	2.92 ≤ COP < 3.34	2,64 ≤ COP < 2.92
1 Star	2,64 ≤ COP < 2.92	2,50 ≤ COP < 2,64

COP weighted
= 0.4 x (COP full load) + 0.6 x (COP half load)

EE Measurement Method; SNI 19-6713-2002, ISO 5151



Source: 4th Technical Meeting

Figure 3.3-3 Outline of Draft Framework for ACs

3) Draft Framework for TVs

The outline of Draft Framework for TVs is shown in Figure 3.3-4. CRT TVs are still sold in the market. However they are categorized as out of the target of EE labeling, because LCD TVs are rapidly disseminating and many manufacturers decided to quit the production of CRT. Energy efficiency indicator for TVs is calculated by annual electricity consumption per screen area. In the calculation of annul electricity consumption, the average ON mode time per day should be decided. And in Indonesia, 8h/day was adopted. It is different by country (Japan; 4.5h, Malaysia; 5h, India; 6h). The accuracy should be reviewed, surveying the actual condition.

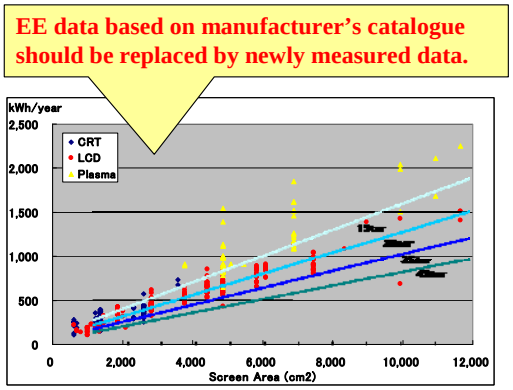
IEC standard, which is most popular in the countries introducing EE labeling for TVs, is applied for testing.

Star rating criteria

Rating	E; Annual Energy Consumption
4 Star	E < 65 + 0.047 * SA
3 Star	65 + 0.047 * SA < E < 82 + 0.058 * SA
2 Star	82 + 0.058 * SA < E < 102 + 0.073 * SA
1 Star	102 + 0.073 * SA < E < 128 + 0.091 * SA
0 Star	128 + 0.091 * SA < E

$$E = \frac{(P_o - \frac{PA}{4}) \times t1 + Ps \times t2}{1000} \times 365$$

E; Annual energy consumption (kWh/year)
Po; Power at ON mode (W)
Ps; Power at active standby mode (W)
PA; Energy saving function power reduction (W)
t1; ON mode time (8h/day)
t2; Active standby mode time (16h/day)



EE measurement method; IEC62301(2006), IEC62087(2008), SNI04-6958(2003)

Source: 4th Technical Meeting

Figure 3.3-4 Outline of Draft Framework for TVs

(2) Proposal of Controlling the Harmonics

The advantage of inverter technology for EE&C was confirmed. And the implementation will be

promoted in cooperation with the enforcement of EE labeling program. On the other hand, in current situation a lot of condensers are installed in houses in Indonesia. And as shown in Japanese case, inverter technology produces harmonics. And in the future it is concerned that harmonics causes the burnt-out of condensers.

In accordance with the current situation and concern, the following two countermeasures are suggested.

1) Implementation of Field Survey, Analysis, and Discussion of the harmonics

A workshop, which was hosted by BPPT, concerning the benchmark of electricity quality was held on 3 November 2011. There the result of filed surveys on the harmonics, and the approach by MEME and BPPT for it were presented. According to the workshop, it is not necessary to tackle the harmonics immediately; however continuous field survey and monitoring should be carried out.

2) Clarification of the Necessity of Establishing National Guideline and/or Regulation

Replying the result of the monitoring, it is important to formulate the national guideline and/or regulation for the harmonics like Japan. And it is needed to prepare the countermeasures in advance, because it will take a long time to settle the lots of target appliances, spread in existing households. In parallel it is effective to hold workshops and awareness events focusing on the harmonics.

(3) Establishment of EE Performance Database

As described above, accumulation and analysis of EE performance for target appliances are necessary for formulating EE labeling. Beside in Indonesia there is quite less data on this field. So this study intended to complete a prototype of EE performance database for refrigerators, ACs, and TVs, which can contribute as the basis of data accumulation and analysis.

This database was displayed in the 4th Technical Meeting and transferred to MEMR.

Basic specification of the product EE database is as shown in Table 3.3-2. Figure 3.3-5 shows the typical data form. Installed data covers the dominant appliances (refrigerators, ACs, and TVs), which are sold in Jakarta in 2011. By giving ID and pass word for manufacturers (managed by MEMR), manufacturers can maintain their own data. MEMR can check and process all data. End-users can get the information of the performance data of appliances through web-site.

It is expected that this database (prototype) should be maintained, up-dated periodically, and utilized by the government, manufacturers and end-users.

Table 3.3-2 Basic Specification of EE Performance Database

Item	Content
Data uploading	➢ Manufacturers can directly access to the database and upload and/or replace data. (ID and pass word are prepared by MEMR)
Data	➢ Data supplier, Upload/replace date, Product name and type, Energy consumption, Rated power, Energy efficiency, Place of EE test, Tested data, EE measurement method, Accreditation of the laboratory, Star rating, etc.
Display (for MEMR administrator)	➢ All initial data and processed data
Display (for manufacturer and end-user)	➢ Usually, general information will be displayed. Specific information can be also displayed by optional method. (By inputting ID and pass word, manufacturers can maintain their own data)
Data processing (under consideration)	➢ Automatic data plotting on the data spread chart (for example; COP of ACs) ➢ Automatic energy consumption calculation, selecting type and giving condition of usage (Singapore and Australian site have such function)

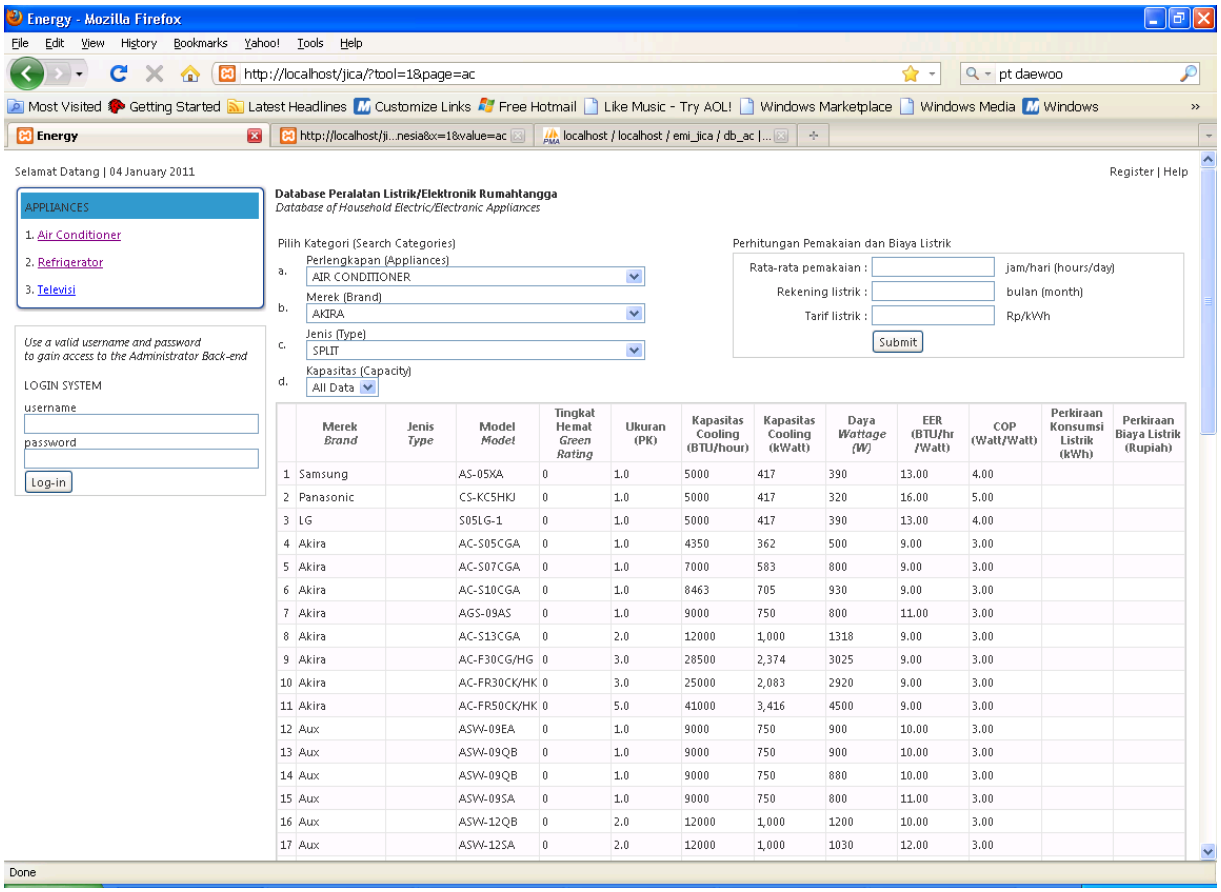


Figure 3.3-5 Typical Data Form of Products EE Database (AC)

(4) Roadmap and Action Plan for Implementing EE Labeling Program

Roadmap and action plan for implementing functional labeling programs for refrigerators, ACs, and TVs were proposed. And issues to be considered for formulating and operating EE labeling program were also summarized.

Table 3.3-3 shows the roadmap. After the implementation of labeling program, periodical monitoring, periodical amendment of labeling criteria, which reflects the improvement of appliance performance, expansion of target appliances and continuous maintenance of EE Database are strongly recommended.

Action plan, which describes the annual governmental budget estimate, is shown in Table 3.3-4. The estimate (draft) shows the direct cost for formulating EE labeling program, and doesn't include the labor cost.

Besides the following issues should be considered.

a) Getting the participation of much manufacturers with lower criteria at the beginning
b) Giving manufacturers' incentive for efficiency improvement

Table 3.3-3 Roadmap of EE Labeling Program

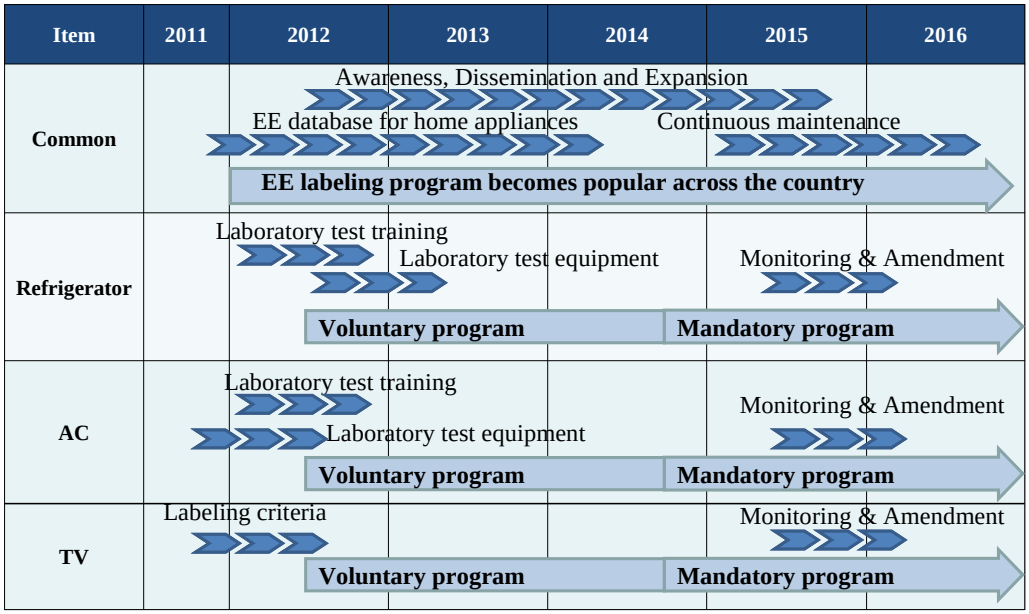


Table 3.3-4 Action Plan of EE Labeling Program

Item	Activity	Annual budget (USD)				
		2012	2013	2014	2015	2016～
Policy making	Committees, Workshops	Ref, AC, TV 10,000	Fan, Motor, Pump 10,000	Other 3,000	Other 3,000	Other 3,000
	Study mission for abroad	BRESL 10,000				
Dissemination	Media, For household, shops	Brochure, poster 10,000	Brochure, poster 10,000	Brochure, poster 5,000	Brochure, poster 5,000	Brochure, poster 5,000
Database	Making, maintenance	Installation 3,000	Maintenance 1,000	Maintenance 1,000	Maintenance 1,000	Maintenance 1,000
Review of labeling program	Market research, workshops				Ref, AC, TV 10,000	Fan, Motor, Pump 10,000
Capacity building of laboratories	Workshops	3,000	1,000	1,000	1,000	1,000
	Refrigerator test facility,	500,000	10,000	10,000	10,000	10,000
	Training	5,000				
	AC test facility,	1,000,000	10,000	10,000	10,000	10,000
	Training	5,000				
	TV test facility,	10,000	500	500	500	500
	Training	500				
	other		Fan 10,000	Motor 500,000		
Certification test of label	Bared by the manufacturers	0	0	0	0	0
total		1,556,500	52,500	530,500	40,500	40,500

3.4 Incentive Program

As discussed earlier, Indonesia provides the subsidy to electricity and the electricity tariff is kept low. This reduces the electricity consumer's incentive for EE&C and increases electricity consumption in the country. As a result, both of CO2 emission and electricity subsidy increase and this is in a vicious circle.（See Figure 3.4-1）

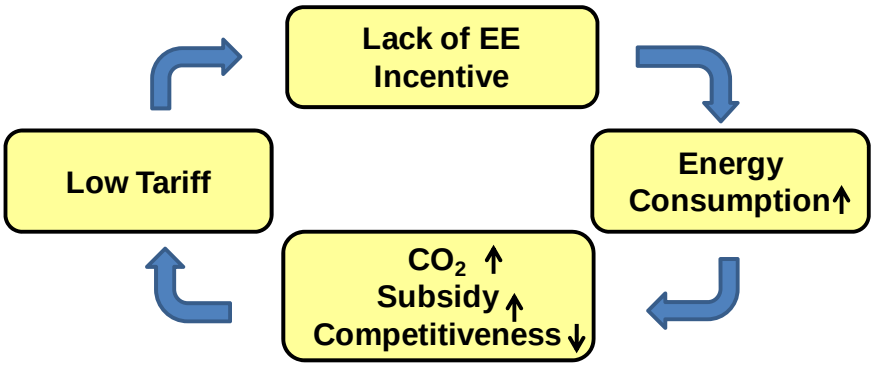


Figure 3.4-1 Vicious Circle due to Electricity Subsidy

On the other hand, in case that the incentive for EE&C is provided instead of electricity subsidy, electricity consumption is expected to be reduced in the country and this leads to the reduction of CO2 emission and electricity subsidy ultimately.

Therefore, the incentive provision for EE&C together with increase of electricity tariff is effective in Indonesia to get out of the current vicious circle.（See Figure 3.4-2）

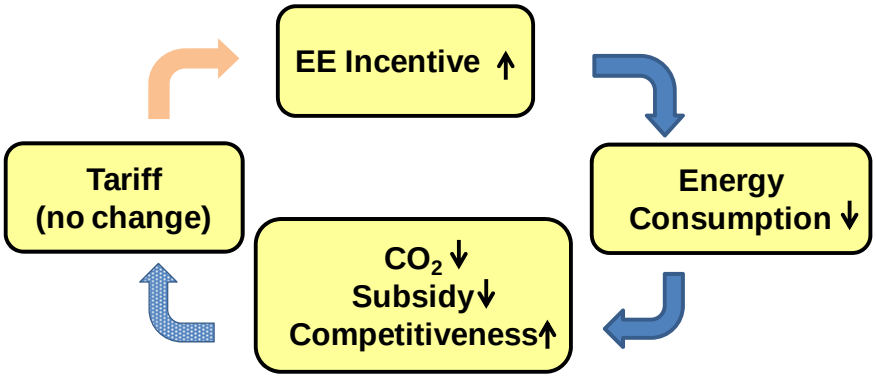


Figure 3.4-2 Exit from Vicious Circle by Incentive Provision for EE&C

As the incentive program for promoting highly-efficient home appliances and highly-efficient equipment in commercial and industrial sectors, the following schemes can be considered.

(1) Incentive Scheme to Promote Highly-efficient Home Appliances

As Incentive Schemes to Promote Highly-efficient Home Appliances, the following 3 schemes are proposed. （See Figure 3.4-3, -4, and -5）

a) Interest reduction scheme for credit card

b) VAT reduction scheme

c) Rebate scheme

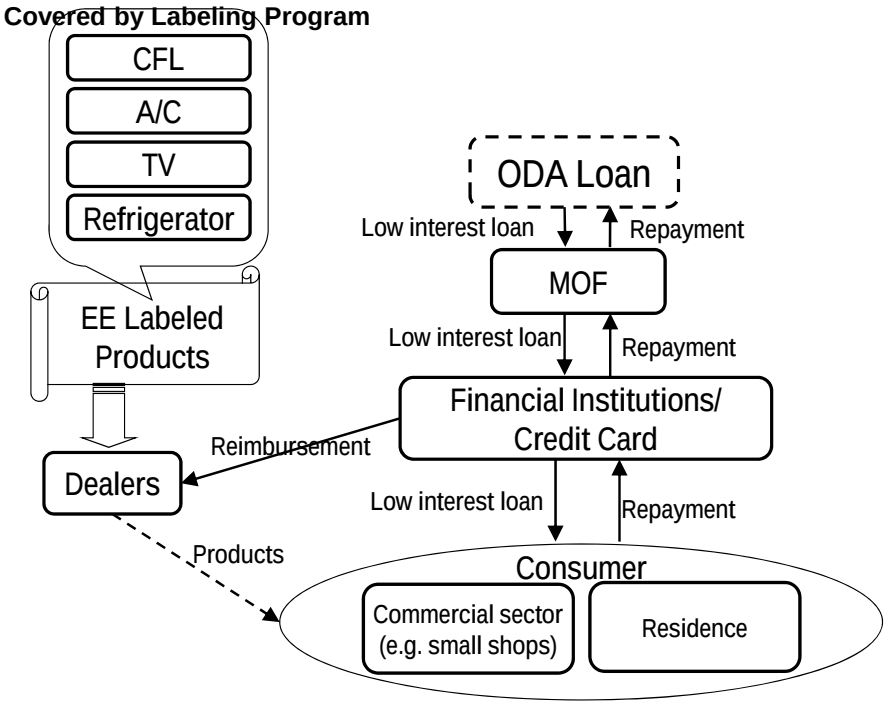


Figure 3.4-3 Interest Reduction Scheme for Credit Card

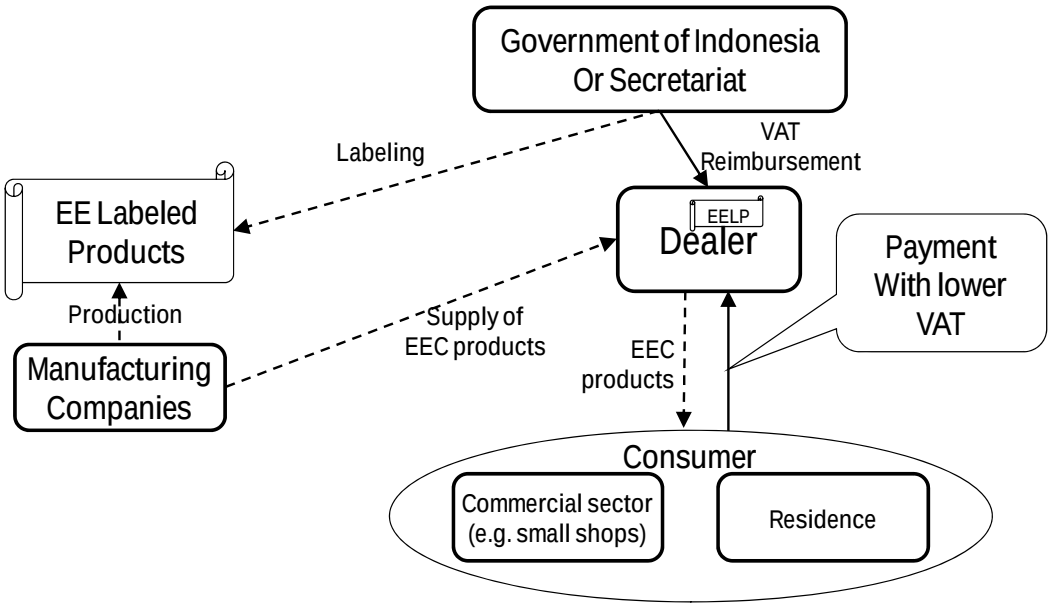


Figure 3.4-4 VAT Reduction Scheme

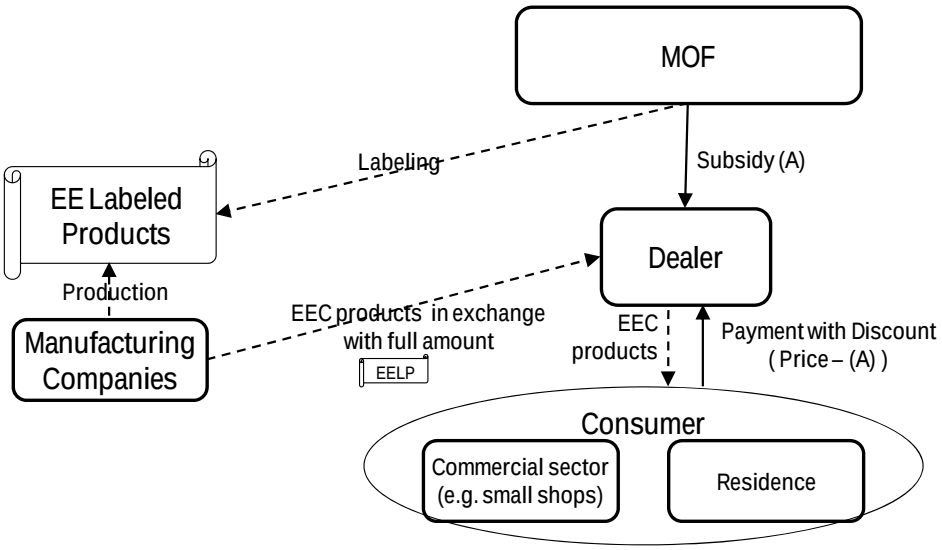


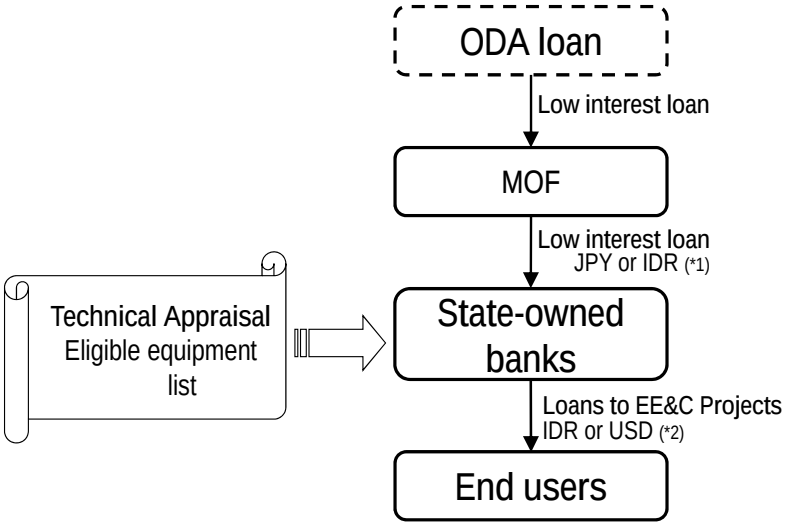
Figure 3.4-5 Rebate Scheme for Highly-Efficient Appliances（Example）

(2) Low Interest Loan for Investment for Energy Efficiency in Commercial and Industrial Sectors

Moreover, as incentive schemes to promote EE&C to commercial and industrial sectors by EE&C equipment list approach based on using ODA fund, the following 2 schemes are proposed.

a) Scheme utilizing State-Owned Banks (hereinafter to as "SOB") (See Figure 3.4-6)

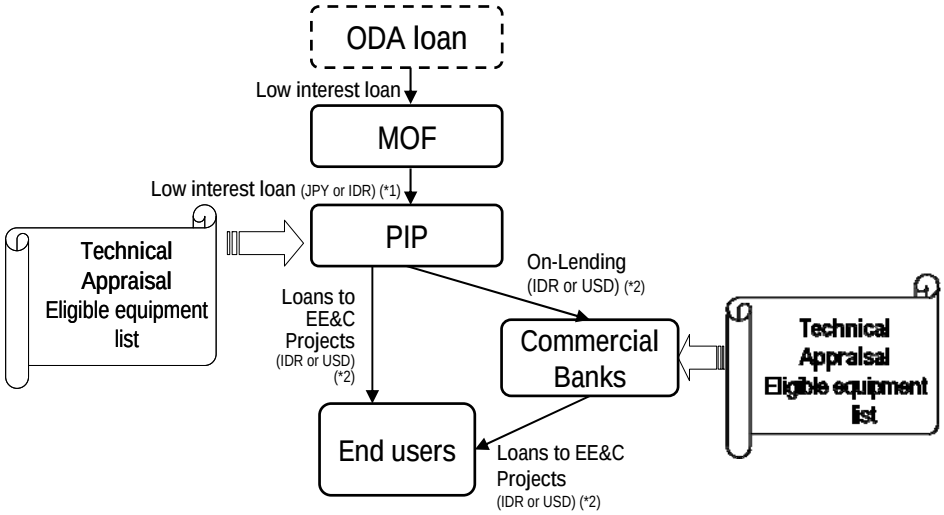
b) Scheme utilizing Government Investment Unit (hereinafter to as "PIP"), which belongs to Ministry of Finance (hereinafter to as "MOF") (See Figure 3.4-7)



*1: This currency options are based on MOF Regulation No. 259/KMK.017./1993, which is under revision. (JPY is in case of JICA loan.)

*2: These currency options are up to the decision by State-owned banks. IDR and USD are mentioned as an example in the chart, since they are the two major lending currencies from state-owned banks to the companies according to the interviews.

Figure 3.4-6 Low Interest Loan Scheme for EE&C Investment in Commercial and Industrial Sectors: Through the State-Owned Banks



*1: This currency options are based on the assumption that the money transfer from MOF to PIP using ODA loan can follow the conditions described in MOF Regulation No. 259/KMK.017./1993 which is under revision. (JPY is in case of JICA loan.)

*2: These currency options and maximum repayment period are up to the decision by PIP and commercial banks. IDR and USD are mentioned as an example in the chart, since they are the two major lending currencies used in Indonesia from the banks to companies according to the interviews.

Figure 3.4-7 Low Interest Loan Scheme for EE&C Investment in Commercial and Industrial Sectors: Through PIP

(3) Roadmap and Action Plan

In addition, roadmap and action plan for formulating incentive programs for energy efficiency were proposed. And issues to be considered for formulating incentive program were also summarized.

It is recommended that firstly the low interest loan scheme for commercial and industrial sectors should be implemented. And the incentive scheme for home appliances in accordance with EE labeling program should be implemented next.

It is useful to apply other countries' success cases, however reflecting the existing Indonesian financial condition, the implementation structure and timing should be clarified.

Table 3.4-1 shows roadmap and Table 3.4-2 shows action plan.

Table 3.4-1 Roadmap to Introduce Incentive Program for Energy Efficiency

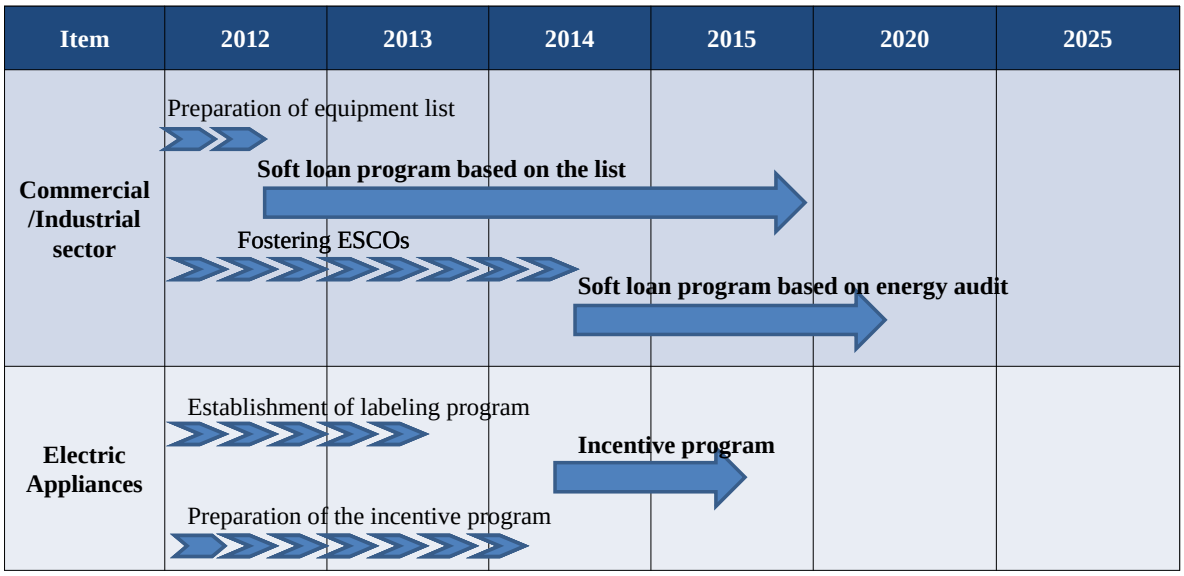


Table 3.4-2 Action Plan to Introduce Incentive Program for Energy Efficiency (For Appliances in Residential Sector)

Item	Organization / Activity	Annual budget (USD)				
		2012	2013	2014	2015	2016～
Establishment of the scheme (Department in charge of deciding the policy)	➢ Meetings for consensus formation (Eligibility of electrical appliances for incentives, the scheme to provide incentive and the incentive amount)	0	6,000	0	0	0
	➢ Development and renewal of the website (Monitoring of misuse)	0	20,000	20,000	20,000	20,000
	➢ To register the participating shops	0	6,000	10,000	4,000	0
Awareness campaign	(Department in charge of deciding the policy) ➢ Explain the program to shops and consumers through posters, brochures, newspaper/magazine and TV advertisement.	0	900,000	900,000	900,000	450,000
Revision of the program	(Department in charge of deciding the policy) ➢ Confirmation of the penetration of the program and its impact Revision of the program along with the revision of the labeling scheme (Conduct meetings for this purpose)	0	3,000	3,000	3,000	9,000

3.5 Proposal of Effective EE&C Dissemination, Awareness, and Others

As described in Chapter 2, various activities for dissemination and awareness of EE&C have been carried out in Indonesia. However they have not always led to EE&C activities of consumers.

Based on the survey result on electricity usage pattern in Indonesia, success case in Sri Lanka and the electricity saving experience in Japan after March 11th 2011, following three dissemination and awareness measures are proposed.

a) Implementation of EE&C dissemination and awareness program only focusing on power leveling, tariff system for EE&C, and electricity consuming home appliances (refrigerators, ACs, TVs, and lightings) (Synergy with governmental important policy)
b) Implementation of EE&C award program for priority sectors. The implementation cost of award program is comparatively small and it can lead and expand EE&C implementation in the same sector.
c) Formulation of everybody's participating EE&C program by target setting and information dissemination with governmental leadership

The earthquake and Tsunami of the Great East Japan Earthquake hit Japan directly on 11 March 2011. And due to the earth quake and devastating tsunami, approximately 40% of the total capacity of TEPCO power plant was shut down

In order to reduce electricity demand to meet the supply capacity after 3.11, Japanese government a) set target (minus 15% compared with 2010) and b) asked for consumers' cooperation c) by disclosing the electricity consumption pattern by each consumer category.

As a result, Japanese government was able to reduce the electricity demand by 15 %. From Japanese experience, applicable key factors for effective EE&C promotion in Indonesia are described below.

a) Government leadership to achieve EE&C
b) Information provision for EE&C implementation
c) Establishment of framework for everybody's participation

And from the global point of view, it is suggested that the contribution of EE&C is highly effective to the reduction of CO_2 emission in future.

Chapter 4 Estimation of Economic and CO_2 Emission Reduction Effect

The economic benefit, especially the reduction of subsidies to PLN, construction cost reduction on new power plants and CO_2 reduction in Indonesia were analyzed, when Indonesian government introduces the functional electricity tariff system and highly-efficient appliances promotion programs, such as an EE labeling program, and incentive measures proposed in this study. The outline is described as follows.

4.1 Analysis of Economic Effect

The estimated economic benefits for the functional tariff system (new TOU tariff system and new PF clause), which were proposed in Chapter3 are summarized in comparison with BAU in 2025 as follows;

Peak shift	3,290 – 9,869 GWh
	(0.6 - 1.8%of total electricity sales of Indonesia)
Reduction of electricity demand	1,145 - 3,434 GWh
	(0.2 - 0.6%of total electricity sales of Indonesia)
Capacity saving	3,000 - 9,000 MW
	(2.4 - 7.1% of the supply capacity of Indonesia)

The cumulative total values until 2025 are estimated as follows;

Cost reduction and increase of revenue	40 - 220 Trillion Rp
Deferred construction cost	30 - 100 Trillion Rp

Tariff adjustment system by fuel price fluctuation plays a very important role as a safety net for PLN revenue.

The estimated economic benefits for high efficient home appliances are summarized in comparison with BAU in 2025 in the Java-Bali region as follows;

Reduction of electricity demand	14,100 GWh (equivalent to 900 Billion Rp)
	(3.4%of electricity sales in the Jawa-Bali region)
Capacity saving	2,150 MW (equivalent to 25 Trillion Rp)
	(2.5% of supply capacity of the Jawa-Bali region)

4.2 Analysis of CO_2 Emission Reduction Effect

The estimated CO_2 emission reduction in 2025 is summarized as follows;

By new TOU tariff system and new PF clause	1 - 3 Million t- CO_2/y
By highly-efficient home appliances	10 Million t- CO_2/y