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In the Republic of Indonesia

The Study for Promoting Practical Demand Side Management Program

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Finance Report

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ABBREVIATIONS

AC	Air Conditioner
ADB	Asian Development Bank
AFD	Agence Française de Développement (French Development Agency)
AMDAL	Analisis Mengenai Dampak Lingkungan (Environmental Impact Assessment)
Baht	Thai Baht (Currency Unit)
BEI	Bank Ekspor Indonesia (Indonesia Eximbank)
BEMS	Building Energy Management System
BI	Bank Indonesia
BI Rate	Bank Indoneisa Rate
BNI	Bank Negara Indonesia
BNSP	Badan Standar Nasional Pendidikan (National Education Standards Board)
BOE	Barrel of Oil Equivalent
BPK	Badan Pemeriksa Keuangan (Government Audit Board)
BPP	Cost of Supply
CAR	Capital Adequacy Ratio
CFL	Compact Fluorescent Lamp
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
COP	Co-efficient of Performance
CRI	Color Rendition Index
DCS	Distributed Control System
DEDE	Department of Alternative Energy Development and Efficiency (Ministry of Energy, Thailand)
DFI	Development Financial Institution
DGREEC	General Directorate of New Renewable Energy and Energy Conservation
DSM	Demand Side Management
ECC	Energy Conservation Center
ECCJ	The Energy Conservation Center, Japan
EE&C	Energy Efficiency Improvement & Conservation
EMI	PT. Energy Management Indonesia
ENCON Fund	Energy Conservation Fund (Thailand)
ESCO	Energy Service Company
EUR	Euro
FEMS	Factory Energy Management System
FI	Financial Institution
FSI	Financial Stability Index
GHG	Green House Gas
GTFS	Green Technology Financing Scheme
GW	Gigawatt
HAKE	Himpunan Ahli Konservasi Energi (Energy Conservation Specialist Association)
HF	High Frequency
IDR	Indonesian Rupiah
IEA	International Energy Agency
IEC	International Electrotechnical Commission
IL	Incandescent Lamp
ISO	International Organization for Standardization
IT	Information Technology
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
KfW	Kreditanstalt für Wiederaufbau (Germany)

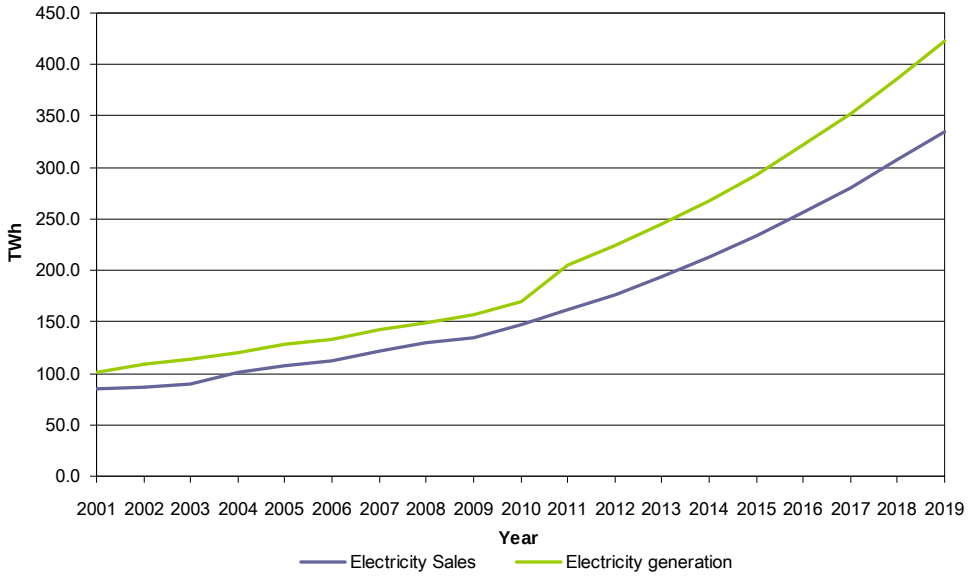
LED	Light Emission Diode
LIBOR	London Inter-Bank Offered Rate
LPG	Liquefied Petroleum Gas
MEGTW	Ministry of Energy, Green Technology and Water (Malaysia)
MEMR	Ministry of Energy and Mineral Resources
MOE	Ministry of Environment
MOF	Ministry of Finance
MW	Megawatt
NEDO	New Energy and Industrial Technology Development Organization
NPL	Non Performing Loans
NPO	Non-profit Organization
ODA	Official Development Assistance
PF	Power Factor
PFI	Participating Financial Institution
PIP	Pusat Investasi Pemerintah (Government Investment Unit, Ministry of Finance)
PLN	Perusahaan Listik Negara (State Electricity Company)
PM	Permanent Magnet
PMU	Project Management Unit
PPHLN	Pengelolaan Pinjaman Hibah Luar Negeri (Foreign Loan and Grant Management, Ministry of Finance)
R&D	Research and Development
RM	Ringgit Malaysia (Currency Unit)
Rp	Indonesia Rupiah (Currency Unit)
RUPTL	Rencana Usaha Penyediaan Tenaga Listrik (The Electrical Power Supply Business Plan)
SBI	Bank Indonesia Certificate
SME	Small and Medium Enterprise
SOB	State-Owned Bank
TOE	Ton of Oil Equivalent
TSL	Two Step Loan
UKL	Upaya Pengelolaan Lingkungan (Environmental Management Effort)
UPL	Upaya Pemantauan Lingkungan (Environmental Monitoring Effort)
US	United States
USD	US Dollar
VVVF	Variable Voltage Variable Frequency
WB	World Bank

Chapter 1 The Environment Surrounding the Incentive Program for Energy Efficiency and Conservation

In the Final Report of "The Study for Promoting Practical Demand Side Management Program in Indonesia", the incentive program was examined mainly for the electric appliances. While the dominant target for this incentive program will be the residential sector, promotion of energy efficiency and conservation (EE&C) in the commercial/industrial sectors is also important and the incentive program for these sectors was needed to be examined in details. Therefore, this report mainly focuses on the incentive program for the commercial and industrial sectors.

1.1 Electricity Demand and Supply in Indonesia

In Indonesia, the electricity demand is growing rapidly together with the economic growth and it is forecasted to grow until 2019 and reaches to 334.4TWh in 2019 according to RUPTL 2010-2019. In order to satisfy this strong demand growth, the country is under the severe pressure to increase the electricity supply. While the expansion of power supply capacity is one way of the solutions, the electricity demand can be controlled from the improvement of energy efficiency. Through this process, part of the cost to expand the power generation capacity can be saved as well.



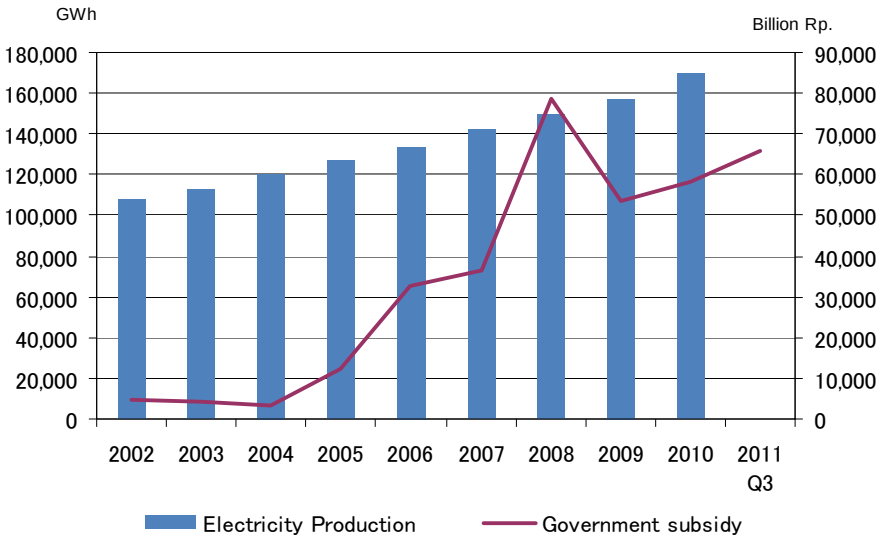
Source: RUPTL 2011-2019 for Forecast (2011-2019), Actual (2001-2010) for PLN statistics 2009, 2010

Figure 1.1-1 Electricity Sales and Supply (Actual for 2010-2010, Forecast for 2011-2019)

While the increase of electricity supply is essential to meet the demand, the increase of the subsidy for electricity supply is also unavoidable along with it under the current tariff structure. As of October in 2011, 65.7 trillion Rp. is allocated to PLN as the government subsidy[1] and it exceeds the subsidy paid

[1] PLN consolidated financial statements for the nine month periods ended September 30, 2011 and 2010 (Unaudited)

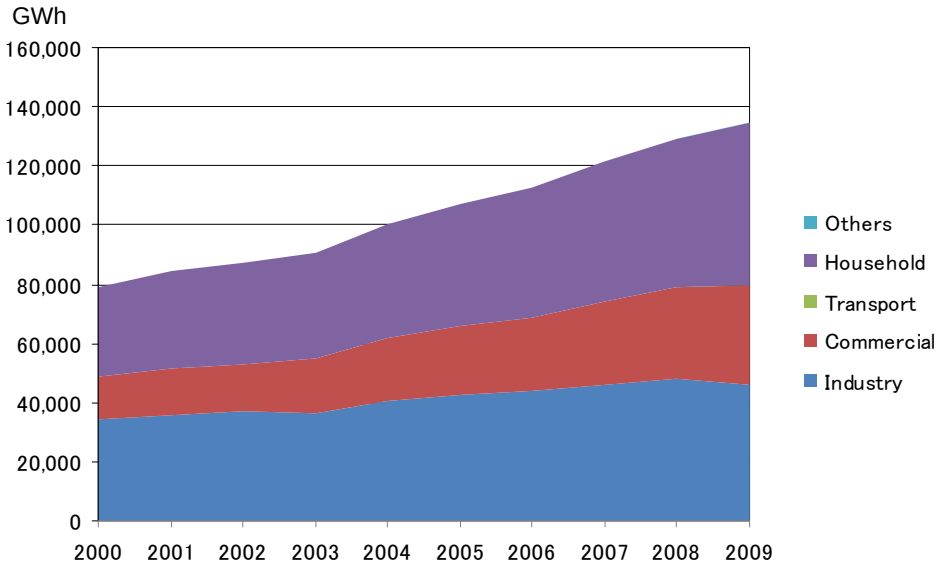
to PLN in 2010. In this case, the subsidy in 2011 will likely exceed the highest amount of 78.6 trillion Rp. in 2008 which is the highest in the recent years. Indonesian government is making the great efforts to increase the tariff, but the other measures to control the demand will be of great help to avoid the subsidy increase.



Source: PLN statistics

Figure 1.1-2 Electricity Production and Government Subsidy

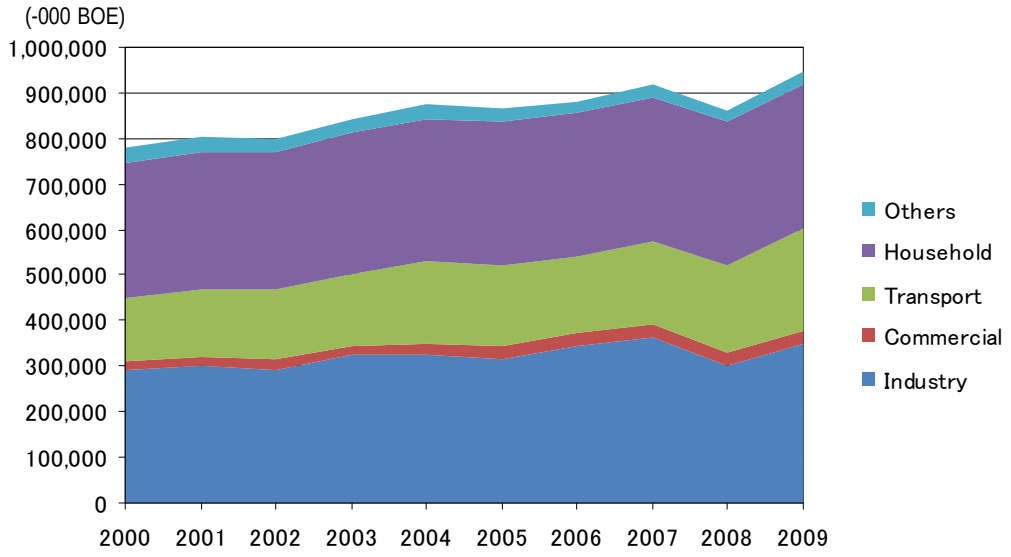
For the past 10 years, the increase of electricity consumption was mainly led by industry, commercial and household sector as illustrated in the graph. In 2009, the industry and commercial sectors consume approximately 60% of the total electricity consumption. Furthermore, it is growing at 3.46% and 9.65% on average for the industrial and commercial sectors, respectively.



Source: 2010 Handbook of Energy & Economic statistics of Indonesia, MEMR

Figure 1.1-3 Electricity Consumption by Segment

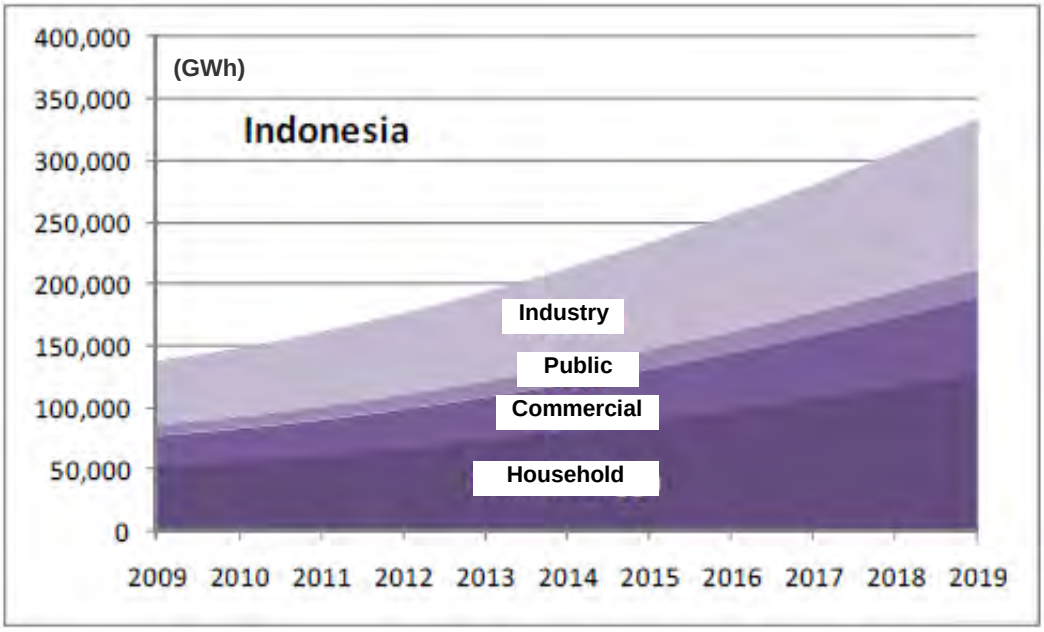
The picture by segment for overall energy consumption is similar as that for electricity consumption, except that the transportation sector appears as the great consumers for energy.



Source: 2010 Handbook of Energy & Economic statistics of Indonesia, MEMR

Figure 1.1-4 Energy Consumption by Segment

In terms of the electricity demand in the future, all segments (industry, public, commercial and household) are projected to be increased according to RUPTL. Among that, industry and commercial sectors remain to be approximately 55-60% of the demand in 2019.



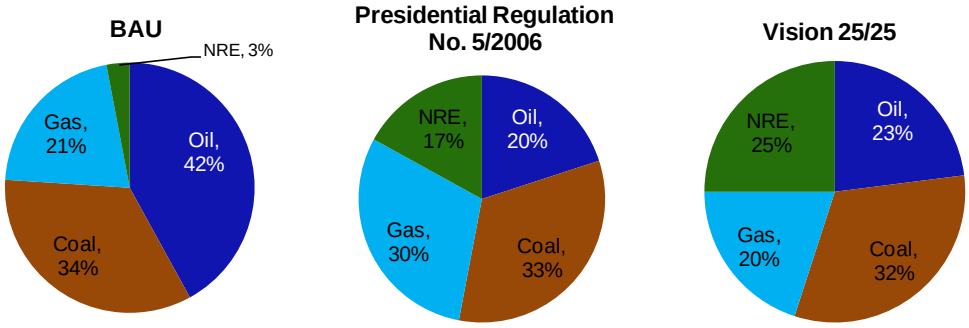
Source: RUPTL 2010-2019

Figure 1.1-5 Projected Electricity Sales PLN Year 2010-2019

Considering the past trend of electricity/energy consumption and electricity sales projection, it will be beneficial for EE&C measures to target at industrial, commercial and transport sectors.

1.2 The Energy Policy in Indonesia and Energy Efficiency and Conservation

As discussed in the previous section briefly and JICA study of "The Study for Promoting Practical Demand Side Management Program in Indonesia", energy efficiency is the critical issue for Indonesia. To tackle this, Indonesian government published VISI 25/25 to show the target to promote energy efficiency and increase energy efficiency. As for the target for the renewable energy increase, the fossil based energy is reduced to 75% from 97% (the forecast of the business as usual) and the new and renewable energy use is increased to 25% from 3% (the forecast of the business as usual) by 2025[2]. The composition is shown in the following graphs.

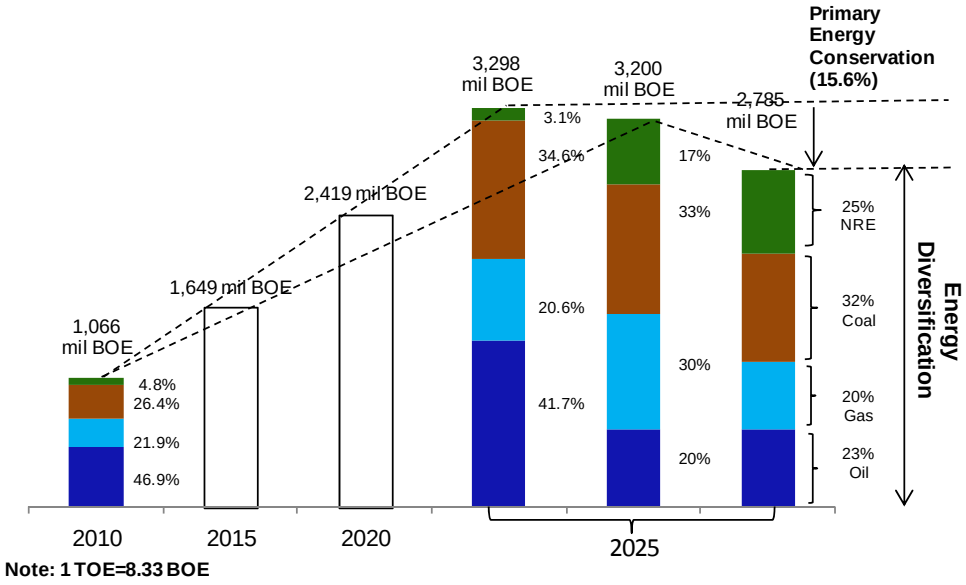


Source: MEMR,2011 Nov.

Figure 1.2-1 Energy Mix Forecast and Target in Indonesia in 2025

At the same time, VISI 25/25 also illustrates the target for energy conservation. According to this, the primary energy conservation is expected to be reduced by 15% compared with the business as usual by 2025.

[2] In 2010, the fossil based energy and new and renewable energy are 95.2% and 4.8%, respectively.



Source: MEMR,2011 Nov.

Figure 1.2-2 Energy Consumption and Energy Mix Target by 2025

In order to achieve this target, the responsibility of the central/local government, companies and citizens to promote EE&C is described in "Law on Energy (UU30/2007)" on Energy. Based on this Law, Regulation (PP70/2009) was issued. In this regulation, the following is stipulated:

(a) Responsibility of the central/local government and the public
(b) Implementation of energy conservation
(c) Standard and labeling
(d) Ease of doing business, incentives & disincentive
(e) Evaluation and monitoring

As the implementing regulation of (b), MEMR Regulations (PP13/2010 and PP14/2010) were issued for establishment of energy manager competency standard in industrial and building sectors, respectively. Based on these regulations, HAKE (Himpunan Ahli Konservasi Energi, Energy Conservation Specialist Association) was accredited by BNSP as one of the institutions to certify energy managers[3] and the first certification exam is expected to be conducted in 2012

In addition, according to (d), the central or local government will provide incentives for designated energy management factories and buildings, which consume more than 6000 toe of energy annually, and domestic manufacturers for EE&C equipment, if they achieve EE&C targets within the specific period. As the possible incentive modality, tax, reduction low interest loans and bearing the cost for energy audits by the government are mentioned. Further details will be stipulated in other Ministerial regulations. The low interest loan for EE&C discussed in this report can be considered as the pilot project of this incentive mechanism.

[3] So far, HAKE is the only accredited institution to certify as of October 2011.

In parallel, the government is conducting "Partnership program on energy conservation" in order to encourage industries and buildings to conduct energy efficiency measures by providing free energy audit services from 2003 to 2010. Through the post-monitoring of this program, financing for energy conservation investment was the obstacle for the companies to implement the recommendations based on the energy audit when these recommendations are costly.

Considering the environment above, the establishment of the incentive program to promote energy efficiency in the industry/commercial sectors is strongly expected.

Chapter 2 Analysis for Proposed Low Interest Loan

2.1 Low Interest Loan Scheme

2.1.1 Policy Options to Promote Energy Efficiency and Conservation

As discussed in the previous Chapter, the establishment of the incentive program to promote EE&C is a pressing issue. In order to promote EE&C, several policy measures can be the options such as direct subsidies, credit guarantee, tax incentives and low interest loans. However, each of the options has advantages and disadvantages. Each option's characteristics are summarized in the Figure 2.1.1-1:

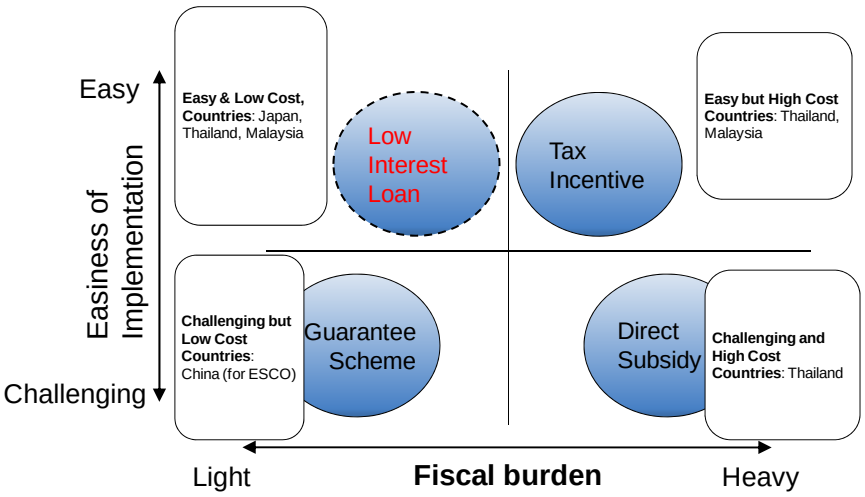


Figure 2.1.1-1 Characteristics of Policy Options to Promote EE&C

Among these options, "direct subsidy" is that the government provides cash subsidies to energy consumers for a portion of the investment cost for EE&C. On the other hand, "tax incentive" refers mainly to the investment tax allowance and accelerated depreciation. "Investment tax allowance" is that tax obligations will be reduced by a portion of the investment cost for EE&C. "Accelerated depreciation" is that the depreciation of the invested EE&C equipment will be accelerated in the tax treatment and the tax obligation will be postponed. These direct subsidy and tax incentive such as investment tax allowance will improve the expected return from the investment, so these options tend to be the strong appeal to the energy consumers in the industrial, commercial and transport sectors (hereinafter "end users"). However, the direct subsidy requires high fiscal burden for the government and it is politically challenging to be approved as the budget. In addition, the administrative burden including the measures to avoid the misuse of the policy instrument will be large. The tax incentive seems to be politically easier compared with the subsidy, as the tax incentive for the investment in renewable energy development is already in place in Indonesia, but this incentive scheme reduces the tax revenue for the government and the fiscal burden is relatively high.

The guarantee scheme and low interest loans are the financial measures unlike the fiscal measures such as the tax incentive and subsidies. The guarantee scheme is to provide the credit guarantee to the end users as credit enhancement, when the end users' credit on its own is not high enough to receive the loan from the banks (i.e. the end users will pay the premium to the guarantee institution. In case

that an end user fails to meet the financial obligations, the guarantee institutions will repay the end user's financial obligation on behalf of the end users.) This scheme is less costly compared with the tax incentive and direct subsidies, since the government incurs losses only when an end user fails to meet the financial obligation. However, compared with the other options, this scheme is the most complicated to design and operate (e.g. how to assess the end user's credit and setting of the premium depending on this assessment). On the other hand, the low interest loan can be implemented using the bank's existing processes, therefore the implementation is relatively simple. At the same time, there is the possibility that ODA loans (sovereign soft loans) can be utilized, and the fiscal burden for the government is much less compared with the other options: Suppose, for example, that the government extends the loan to banks without interest for this program, the cost to be borne by the government is only the interest portion unless the banks default. However, the disadvantage of this option is that the users of this program will be limited to enterprises which are capable of receiving the loan from the banks (small enterprises who cannot borrow from the banks is likely to be excluded).

These policy instruments are taken in various countries: For example, Thailand adopts the low interest loan, tax incentive and direct subsidies. Malaysia takes the low interest loan and tax incentive. The guarantee scheme is applied in China.

Considering the characteristics of each scheme above, the low interest loan is relatively easy to implement and less costly. Therefore, the low interest loan is desirable as the first measure to start the incentive schemes. As mentioned in the 1st paragraph of this page, there is a possibility to mobilize an ODA loan from JICA for this low interest loan scheme. The following Two Step Loan[4] (TSL) schemes (described in Section 2.1.2) are proposed when using the JICA loan, based on the existing financial institutions in Indonesia, their strength, the restriction by law and the other countries' experience[5]. (This supporting information will be discussed in Section 2.3 and the scheme itself is briefly introduced in this section.)

JICA's loan has various options in terms of the combination of repayment period, grace period and interest rates. Among these options, the terms and conditions of Climate Change ODA Loan is the most concessional though its application is subject to the approval from Japanese government and the relevance of the project to climate change mitigation issues. The terms and conditions of this Climate Change ODA Loan are as follows:

Table 2.1.1-1 Terms and Conditions for Climate Change ODA Loan

	Interest rate	Repayment years	Grace period
Standard	0.30%	40 years	10 years
Option 1	0.25%	30 years	10 years
Option 2	0.20%	20 years	6 years

Source: JICA website

[4] TSL means the scheme in which an intermediary financial institution on-lends the loan to end users, while this intermediary financial institution was also extended the loan for the specific purpose, typically from the government.

[5] The information of the TSL in Thailand and Malaysia are provided in Chapter 6.

In the following section, "Standard" option for Climate Change ODA Loan is assumed to simplify the discussions. (i.e. The loan denominated in JPY, the interest rate at 0.30% with the repayment of 40 years including 10 years grace period)

2.1.2 Technical Appraisal Method in Low Interest Loan Program and the Financial Scheme Using the TSL

(1) Technical Appraisal Method in Low Interest Loan Program

In this program, how to evaluate a sub-project (the loan to end users from the intermediary bank) in terms of contribution to energy efficiency is the challenge, since this evaluation is not the usual business for the financial institutions. At the same time, end users need immediate financing when their investment decisions for energy conservation are made. In this regard, while it is highly important to make sure that the purpose of the loan using this low interest loan is for energy efficiency, the method to check this eligibility in terms of the energy efficiency impact needs to be simple at the same time.

For this eligibility check, there are mainly two methods to assess the expected energy efficiency impact through the investment. One is using the EE&C equipment list approach and the other is based on the energy audit by the external entities such as ESCOs (Energy service companies).

a) EE&C equipment list approach

The EE&C equipment list is prepared in advance and updated as required. This list includes the equipment which is more energy efficient than the equipment which is commonly used in Indonesia. When a financial institution receives the loan application, the institution will check whether the equipment in the application is on the EE&C equipment list or not. This approach is simple, not time consuming and relatively easy to implement, so is used in India, Vietnam and Japan.

b) Energy audit approach

When improvement of energy efficiency is pursued in the project as whole, the technical appraisal, taking the manufacturing and/or business processes into consideration (i.e. not only for equipment), will be necessary (i.e. energy audit). This energy audit approach considering the project as a whole can expect higher energy efficiency than the equipment specific approach, but it is critical to ensure the quality of the parties who will conduct the energy audit. If the effects on the energy efficiency are confirmed as higher than the certain level in this eligibility check (e.g. 25% energy saving compared with the ordinary type), the project will be considered as eligible for the low interest loan. This approach was taken in Thailand and Malaysia.

Comparing these two approaches, "EE&C equipment list approach" is more suitable in Indonesia at present, since there are no mechanisms in Indonesia yet to distinguish the entities who can conduct energy audit to the international standard in order to ensure the quality of energy audit. In this regard, it is beneficial to start the program using the equipment list now,

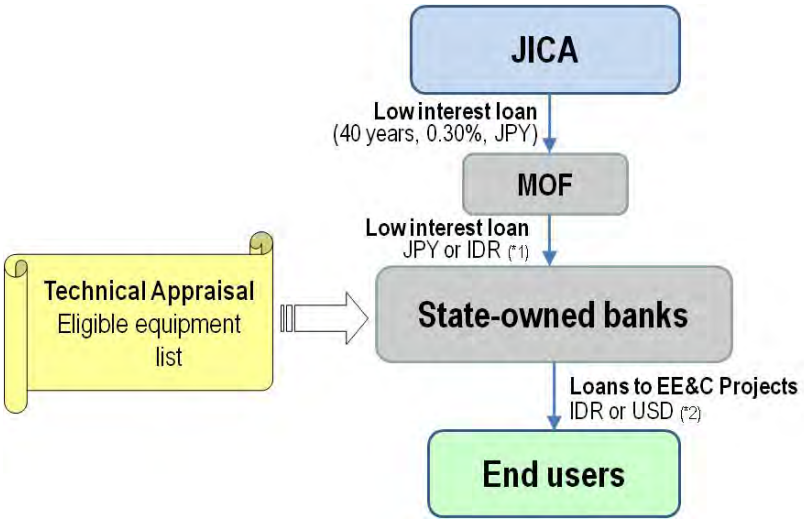
and “energy audit approach” will follow in the next phase after such a certification system for energy audit is established in Indonesia. Through this process, the impact on EE&C can be ensured from TSL. Therefore, the discussion from the following section will be based on the EE&C equipment list approach.

(2) Financial Scheme for TSL

In terms of the financial scheme, JICA loan could be of help to provide the low interest loans as mentioned in Section 2.1.1. Due to the regulation in Indonesia, ODA loan cannot be on-lent to wholly private banks from MOF, and the first-step intermediary financial institution to receive ODA loan from MOF will be limited to the state-owned banks (SOB) or PIP (Pusat Investasi Pemerintah, Government Investment Unit in English), which is part of MOF. Based on this constraint, the JICA Study Team focused on the following two financial schemes with the mobilization of JICA loan: a) through the state-owned banks and b) through PIP.

a) TSL scheme through the state-owned banks

The one of the scheme is that MOF on-lends the money directly to SOBs, and this SOBs will provide the loans to end users at lower interest rates than the usual commercial interest rates. In this option, the banks’ strong client base can be utilized. On the other hand, due to the regulation in Indonesia, ODA loan cannot be on-lent to the wholly private banks from MOF, SOB will be the one who will be the first recipient from MOF. However, the banks including SOB are reluctant to take the currency risk in case that ODA loan is on-lent in the original currency (JPY), and its hedge is expensive. These details of potential SOBs and terms and conditions of the loans are discussed in Section 2.3.



*1: This currency options are based on MOF Regulation No. 259/KMK.017./1993 which is under revision.

*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 2.1.2-1 TSL through the State-owned Banks

In this scheme, it is ideal if many banks participate in the program in order to cover as many potential end users as possible. However, it is likely to be difficult to reach to the consensus about the details of the scheme, when many banks are participating and asked to reflect their options. In this regard, starting the program with the single strong bank as pilot and increasing the participating banks in the future will be more realistic. However, this single bank needs to have the high market share in the target sector such as industrial, commercial and transport sectors, since this type of the bank will be easier to find the potential clients who are interested in EE&C investment.

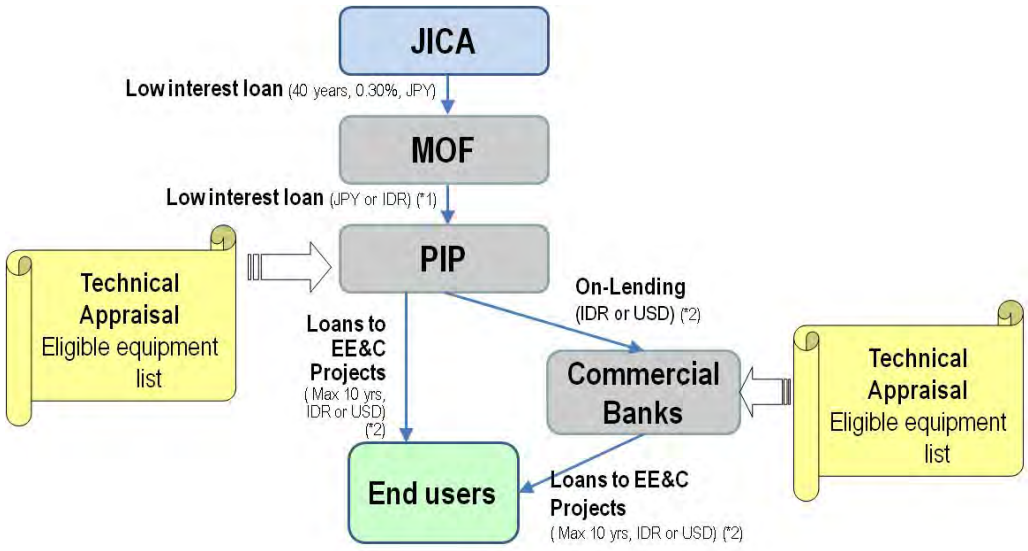
b) TSL scheme through PIP

One of the proposed schemes is through PIP. PIP was established in 2007 as the government investment unit under Ministry of Finance in Indonesia. As the modality, it is allowed to:

(i) Directly invest as equity participation or extend the loan, or

(ii) Invest in the securities traded in the market such as shares and debt securities.

The parties to which PIP may invest/extend the loans are private companies including financial institutions, local governments and state and local-owned enterprises. PIP's target sectors are infrastructure, clean technology and other sectors to provide economic and social benefits to improve the welfare of Indonesia. Considering these conditions, PIP can be the implementing agency for this program to extend the loan directly to the end users or to the banks which will extend the loans to the end users, as illustrated in the following diagram.



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

*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 2.1.2-2 TSL Scheme through PIP

The advantage of this scheme is that PIP has the possibility to take the currency risk on behalf of commercial banks. JICA loan is in JPY, while the financial needs in the financial institutions in Indonesia are either in Indonesia Rupiah (IDR) or USD. But as it is discussed in the previous section and Section 2.3, the commercial banks are reluctant to take the currency risk, and the currency risk hedge is costly and complicated. Therefore, if PIP, who is the public entity, can take the currency risk and extend the loan to commercial banks in IDR or USD at low cost, the following possibility for the commercial banks to extend loans to end users "at low interest rate" will increase. However, PIP does not have the experience of handling the currency risk or swap transactions. In this regard, the external advisory service to PIP in this field will be beneficial to implement the scheme. The terms of the loan to end users from MOF via the commercial banks are discussed in detail in Section 2.3.3.

2.2 Target and EE&C Potential for Low Interest Loan

2.2.1 Survey for EE&C Equipment List Approach

For implementation of the EE&C equipment list approach, the survey of EE&C equipment was conducted in Indonesia[6] and the EE&C equipment list was formulated. The EE&C equipment list, which was prepared through the survey, is attached in Appendix 1.

The criteria to select EE&C equipment for the EE&C equipment list are as follows;

a) Around 20% are proposed as EE&C goals of Indonesia and other East Asia countries[7] in the 5th EAS (East Asia Summit) Energy Ministers Meeting. In addition, 17.8% of EE&C potential in Indonesia is shown in the past JICA survey[8]. Based on the above, 20% of energy saving would be generally considered as the target for EE&C. Therefore, when the EE&C equipment list was drafted, the equipment, whose energy saving is 20% or more as compared with the conventional model, was selected as eligible EE&C equipment for EE&C list.

b) However, in general the energy saving rate is different from one type of equipment to another. The realistic energy saving rate in each category was decided, considering the current status of the equipment category, through discussion with related manufacturers.

c) And, the recovery of waste heat[9] enables to reduce the heat source equipment and/or improve the energy efficiency of the equipment, and the waste heat recovery is conductive to energy saving. Therefore, the waste heat recovery equipment was included in the EE&C equipment

[6] Regarding some Japanese companies which have factories and sales offices in Indonesia, the interview was also conducted in the head offices in Japan.

[7] As EE&C goal, Indonesia submits 1% per year of energy intensity reduction until 2025, Singapore submits 20% of energy intensity reduction by 2020, 35% by 2030 from 2005, and Thailand submits 15% of energy intensity reduction by 2020, 25% by 2030 from 2005 in the 5th EAS Energy Ministers Meeting. (see website of Asia Energy Efficiency and Conversation Collaboration Center, www.asiaeec-col.eccj.or.jp/dtb-policies/eegoals/index.html)

[8] Regarding the energy saving potential in buildings, 17.8% is shown as the reasonable energy conservation level in the report of Energy Audit Program Study, "Study on the Institutional Framework of Energy Efficiency and Conservation through Energy Audit and Roadmap for GHG Mitigation in the Republic of Indonesia, July 2010 "

[9] A certain amount of extra heat is generated in the process of using energy like electricity and fuel. This heat is called the waste heat.

list.

Regarding the target sectors, as described in Chapter 1, the industrial and the commercial sectors are important targets for promoting EE&C in Indonesia. The survey of EE&C equipment was conducted to focusing on these two sectors reflecting the present and near future Indonesian market conditions. The following sections describe the result of the survey on eligible EE&C equipment.

Besides, the transportation sector also consumes much of energy recently. Therefore, an additional survey for public bus and taxi services was conducted. The result of this survey is also reflected on the list.

2.2.2 Target Sectors, EE&C Volume, and Investment Amount

(1) Commercial Sector

1) Target Sectors, EE&C Volume, and Investment Amount

Buildings are the main target in the commercial sector. Typical equipment in buildings can be categorized into three groups (Table 2.2.2-1). The first group is equipment, which is installed in each room and/or each floor, for better workplace and living conditions, such as air conditioning equipment, lighting equipment and so on. The second group is equipment for utility, such as power receiving, power distribution, heat source, pump, fan, and so on. The equipment in the second group supplies power and heat to the equipment in the first group. The third group is the system, which controls and manages the equipment of above two groups.

Table 2.2.2-1 Equipment Grouping in Buildings

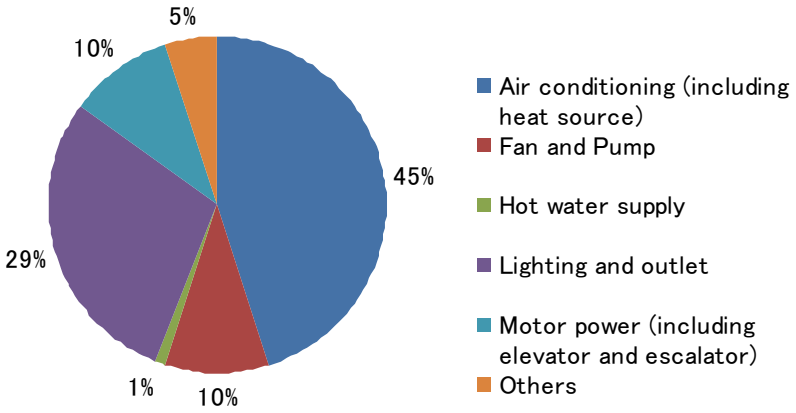
Group		Typical Equipment
1	Equipment for better workplace and living conditions	Air conditioning equipment, Lighting equipment, Elevator, Escalator, etc.
2	Equipment for utility	Power receiving, Power distribution, Heat source, Pump, Fan, etc.
3	Equipment for control and management	Building energy management system, Controller, Measurement system, etc.

a) Equipment for better workplace and living conditions;

The equipment is to adjust and maintain comfortable indoor conditions.

Power consumption share for the equipment in buildings, which the JICA Study Team prepared from the data by EMI, is shown in Figure 2.2.2-1. According to the Figure 2.2.2-1, the category of “air conditioning”, which includes heat source, occupies 45% of power consumption, “lighting and outlet” occupies 29%, and “motor power” which includes elevator and escalator, occupies 10%. The share of three categories is 84% of the total consumption. Although 84% includes share of heat sources and the other motor power, the total share of air conditioning equipment, lighting equipment, elevator and escalator without them is considered to be still large. Therefore, air conditioning equipment, lighting equipment, elevator and

escalator are still thought to be the major equipment in commercial sector.



Source: Prepared by JICA Study Team from Indonesian Statistics Body 2008

Figure 2.2.2-1 Power Consumption Share in Buildings

b) Equipment for utility

The equipment in this group transforms high voltage power and/or fuel, which are supplied from outside, to low voltage power and/or heat and supplies to the equipment in first group. The equipment, which is called energy-center, is required to have high conversion efficiency and high transportation efficiency.

Power receiving and power distribution are included in the category of “others” and heat sources are included in the category of “air conditioning” in Figure 2.2.2-1. Share of power consumption can not be shown by Figure 2.2.2-1. However, power receiving, power distribution, heat sources, pump, and fan are also the main equipment in commercial sector.

c) Equipment for control and management

This equipment consists of measurement devices in a machine room or each room and controllers in the control room. BEMS “Building Energy Management System” is the typical system in order to manage and control the equipment in two groups above mentioned a) and b). BEMS is most useful for promoting suitable energy management and EE&C. However,, it would be difficult for the EE&C equipment list approach to describe the quantitative definition of BEMS. For the judgment of BEMS, the energy audit approach would be needed. Therefore, in this survey, the BEMS selected in the EE&C equipment list was kept within the BEMS with typical devices and software.

As mentioned above, power receiving/distribution, air conditioning equipment, lighting equipment, heat sources, elevator/escalator, and building management system were selected as target sub-sectors.

Then, from interviews of more than 20 corporations in Indonesia and EMI’s survey to local factories and agents, the equipment category in target sub-sectors and the EE&C equipment in each category were selected in accordance with the criteria for selecting EE&C equipment described in Section 2.2.1.

As a result of this survey, the potential EE&C volume and the investment amount for TSL in commercial sector are estimated in Table 2.2.2-2.

Regarding the calculation of the potential EE&C volume; firstly, the energy saving volume of the typical EE&C equipment was calculated by comparing to the conventional type of the equipment, and secondly, the potential EE&C volume for the category was estimated from the energy saving volume of the typical EE&C equipment and its market share.

Regarding the calculation of the investment amount; it was estimated from the equipment cost of the typical EE&C equipment, its annual sales volume, and its market share.

As shown in Table 2.2.2-2, major energy consumption sub-sectors include air conditioning equipment, building management system, heat sources, and lighting equipment.

Table 2.2.2-2 Potential EE&C Volume and Investment Amount for TSL in Commercial Sector

No.	Equipment & Technology	EE&C Volume		Investment Amount (1,000USD)
		Power (MWh/year)	Oil (kl/year)	
1	Power Receiving and Distribution			
1.1	High Efficiency Transformer	5,792	0	15,085
	Sub Total	5,792	0	15,085
2	Air Conditioning Equipment			
2.1	Air Conditioner	527,280	0	209,394
2.2	Heat Transfer Unit	23,685	0	156,396
2.3	Fan and Pump with Inverter	339,768	0	81,344
	Sub Total	890,733	0	447,133
3	Lighting Equipment			
3.1	Fluorescent Lamps	62,180	0	69,981
3.2	LED (Light Emission Diode)	63,440	0	55,053
	Sub Total	126,620	0	125,034
4	Heat Sources			
4.1	Chilled Water	147,927	169	159,125
	Sub Total	147,927	169	159,125
5	Elevator and Escalator			
5.1	Elevator	1,487	0	85,271
5.2	Escalator	894	0	24,000
	Sub Total	2,381	0	109.271
6	Building Management System			
6.1	Management System	166,667	0	43,733
	Sub Total	166,667	0	43,733
Commercial Total		1,340,120	169	899,381

The potential EE&C volume by sub-sector is estimated in Figure 2.2.2-2 and the investment amounts by sub-sector are estimated in Figure 2.2.2-3. The result shows that air conditioning equipment and lighting equipment are major sub-sectors.

Total potential EE&C volume is 1,340,120MWh/year (4.0% of the electricity consumption (2009) in commercial sector of Indonesia). And the total investment amount is USD899,381,000/year. For the purpose of reference, the potential investment estimate for

Jakarta by the other methodology is discussed in Appendix 2.

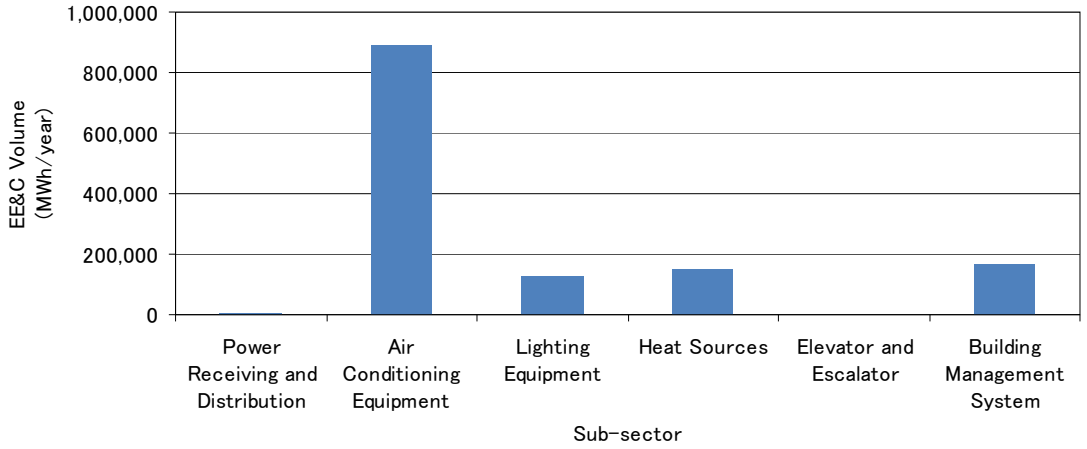


Figure 2.2.2-2 Potential EE&C Volume by Sub-sector

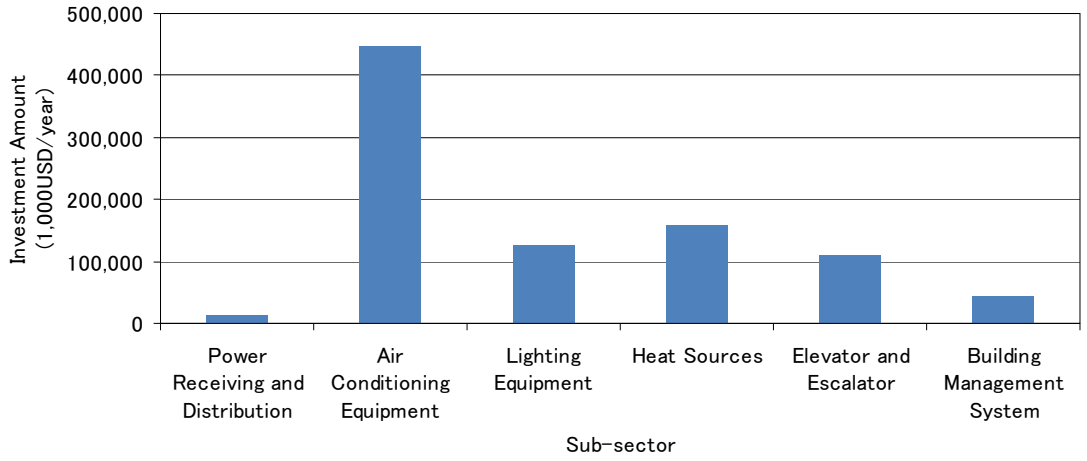


Figure 2.2.2-3 Potential Investment Amount by Sub-sector

2) CO_2 Emission Reduction

CO_2 emission reduction is calculated from fuel and electricity saving volume with CO_2 emission factor specified in Table 2.2.2-4. As a result of calculation for equipment which was selected through this survey, CO_2 emission reduction volume is 965,397 t-CO_2/year in commercial sector. CO_2 emission reduction by sub-sector is shown in Figure 2.2.2-4. CO_2 emission reduction by air conditioning equipment, heat sources, and lighting equipment is found to be significantly large.

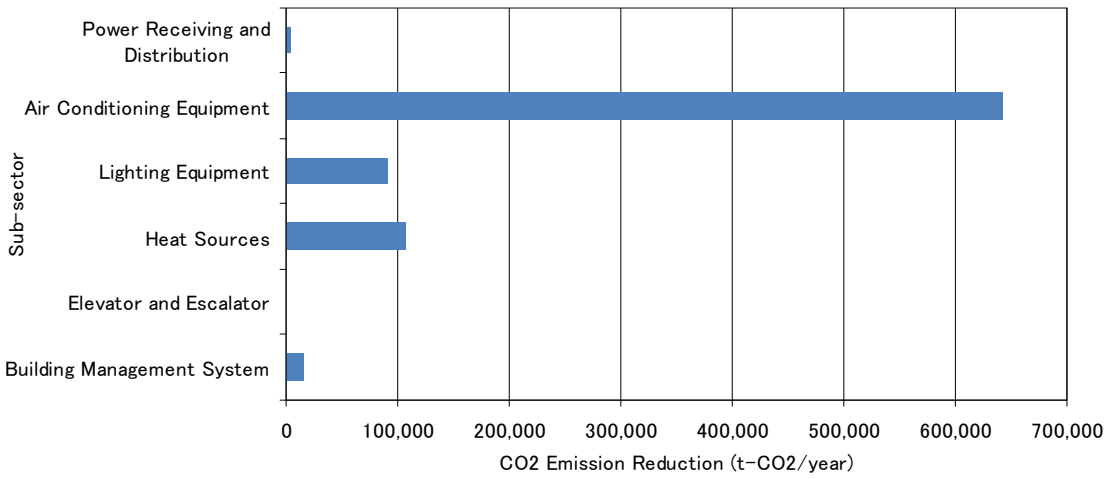


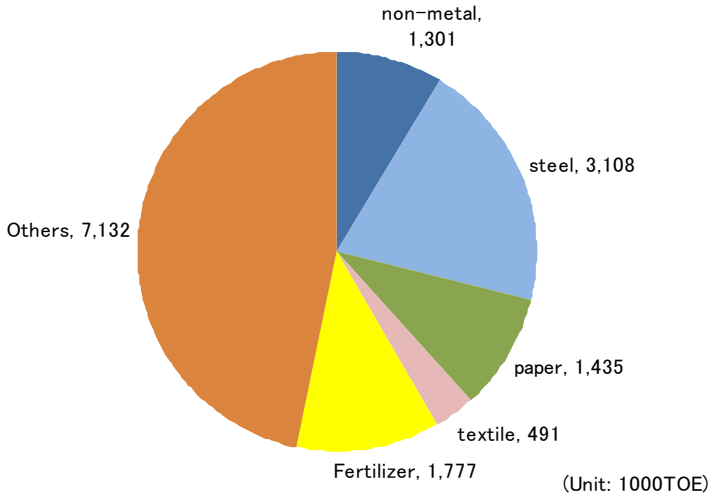
Figure 2.2.2-4 Potential CO_2 Emission Reduction by Sub-sector

(2) Industry Sector

1) Target Sectors, EE&C Volume, and Investment Amounts

Major energy consumption sub-sectors are steel-making, non-metal, paper & pulp, fertilizer, and textile industry as shown in Figure 2.2.2-5

The above energy intensive sub-sectors are selected for TSL target sectors except for fertilizer. The reason for omitting fertilizer industry is based on the difficulty of information disclosure due to secrecy of the production process.



Source: Road Map, Ministry of Industry

Figure 2.2.2-5 Fuel Consumption (Forecast 2015) by Sub-sector in Indonesia

As a result of the interview survey for the corporation and association in Indonesia and the past survey result of JICA and NEDO, potential EE&C volume and investment amount for TSL are estimated in Table 2.2.2-3.

Regarding the calculation of the potential EE&C volume, the energy saving volume of the EE&C equipment is calculated in comparison with the conventional type of the equipment, and the potential EE&C volume for the category is estimated from the energy saving volume and numbers of the EE&C equipment to be introduced.

Regarding the calculation of the investment amount, the investment amount is estimated from the equipment cost of the EE&C equipment to be introduced in a year and its' number.

Fuel and electricity saving volume per year is 56,433 TOE/year and 162,710 MWh/year respectively (Total of fuel and electricity saving is 0.15% of the energy consumption (2009) in industry sector of Indonesia). Investment amount is USD 149,350,000/year.

The fuel saving volume is converted to ton of oil equivalent (TOE), because the types of fuel are fuel oil, natural gas, and steam coal using in factories. The conversion factors of TOE and CO_2 emission are shown in Table 2.2.2-4

Table 2.2.2-3 Potential EE&C Volume and Investment Amount for TSL in Industry Sector

No.	Equipment & Technology	EE&C Volume		Investment Amount (1,000USD)
		Power (MWh/year)	Fuel (TOE/year)	
Industry				
7	Utility and Management			
7.1	Middle Voltage Inverter	84,000	0	2,624
7.2	Compressor	30,600	3,408	18,000
7.3	Process Control System	8,760	25,726	46,575
7.4	Steam Boiler and Hot Water Supplier	0	18,514	50,130
	Sub Total	123,360	47,648	117,329
8	Iron and Steel-making Industry			
8.1	Steel-making Process	0	1,312	630
8.2	Rolling Process	0	2,305	3,626
	Sub Total	0	3,617	4,256
9	Cement Industry			
9.1	Raw Material Process	9,072	0	6,564
9.2	Burning Process	28,944	0	8,297
	Sub Total	38,016	0	14,861
10	Textile Industry		60	
10.1	Dyeing and Finishing Equipment	164	177	1,626
	Sub Total	164	237	1,626
11	Industrial Furnace			
11.1	Aluminum Melting Furnace for Die Casting	0	1,296	1,575
11.2	Aluminum Melting and Transferring Equipment for Die Casting	0	2,592	5,248
	Sub Total	0	3,888	6,823
12	Thermal Insulation			
12.1	Rock Wool for Industrial Use	0	1,023	4,290
12.2	Insulation Blanket for Steam Line	0	20	15
12.3	Insulation Blanket for Plastic Injection Machine	1,170	0	150
	Sub Total	1,170	1,043	4,455
Industry Total		162,710	56,433	149,350

Table 2.2.2-4 Conversion Factor of Ton-oil-equivalent (TOE) and CO_2 Emission

Energy	BOE conversion		MJ*5	Mcal	TOE	CO_2 conversion	
	Unit					Unit	
Oil (kl) *1, *2	BOE*5/kl	6.608	38,462	9,188	0.9188	ton/kl	2.560
Kerosene (kl) *1, *3	BOE/kl	5.927	34,501	8,242	0.8242	ton/kl	2.489
Natural gas ($1000m^3N$) *1, *2	BOE/$1000m^3N$	6.346	36,940	8,825	0.8825	ton/$1000m^3N$	2.000
LPG (ton) *1, *2	BOE/ton	8.525	49,624	11,855	1.1855	ton/ton	2.698
Coal (ton) *1, *3	BOE/ton	4.277	24,896	5,948	0.5948	ton/ton	1.650
Electricity (MWh)	BOE/MWh	0.618	3,600	860	0.086	ton/MWh*4	0.720

Note: *1: University of Indonesia data, *2: Calculated by EMI, *3: Adopted in Japan,
*4: RUPTL PLN 2010-2019, *5: 1BOE=5,821MJ

Potential EE&C volume by sub-sector and equipment category is estimated in Figure 2.2.2-6 Fuel saving volume is large in factory process control system and steam boilers, and electricity saving volume is large in middle voltage inverters of 3000V to 6000V, equipment of cement industry and air compressors. The above large EE&C equipment is available in all the sub-sectors except for equipment of cement industry.

Potential investment amount for EE&C equipment is estimated in Figure 2.2.2-7. Investment amount is large in steam boiler, factory process control system, air compressor and equipment of cement industry.

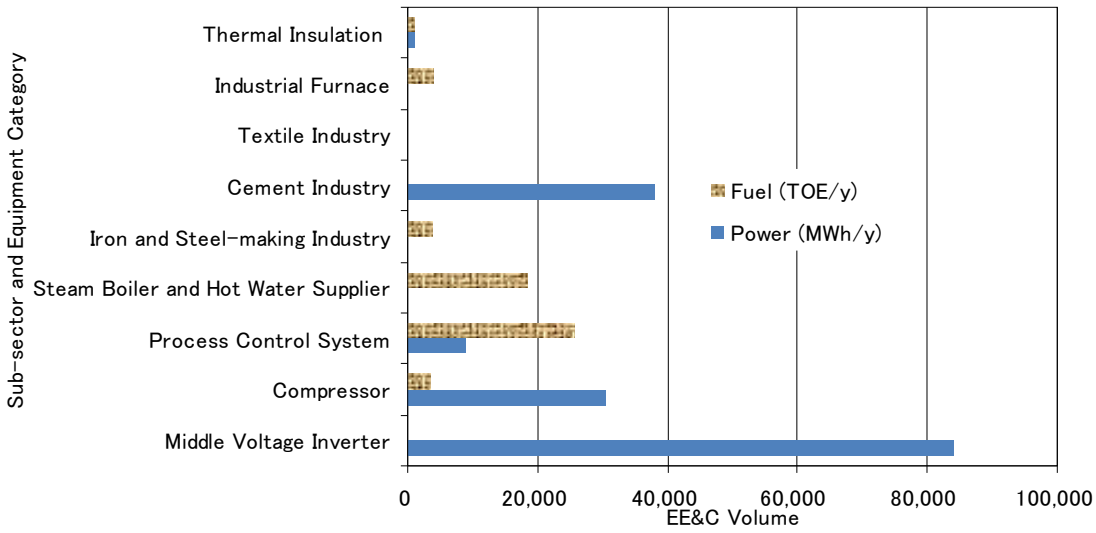


Figure 2.2.2-6 Potential EE&C Volume by Sub-sector and Equipment Category

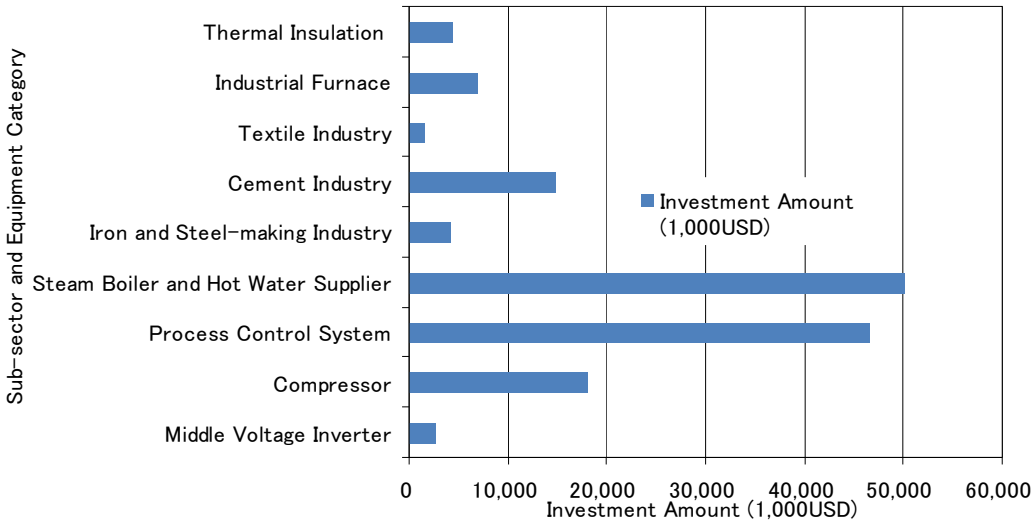


Figure 2.2.2-7 Potential Investment Amount by Sub-sector and Equipment Category

2) Potential CO_2 Emission Reduction

Potential CO_2 emission reduction is calculated from fuel and electricity saving volume with CO_2 emission factor specified in Table 2.2.2-4. As a result of calculation, CO_2 emission reduction is 268,870 t-CO_2/year in industry sector. CO_2 emission reduction by sub-sector is shown in Figure 2.2.2-8. CO_2 emission reduction by process control system, middle voltage inverter, steam boiler, and hot water supplier is found to be a lot.

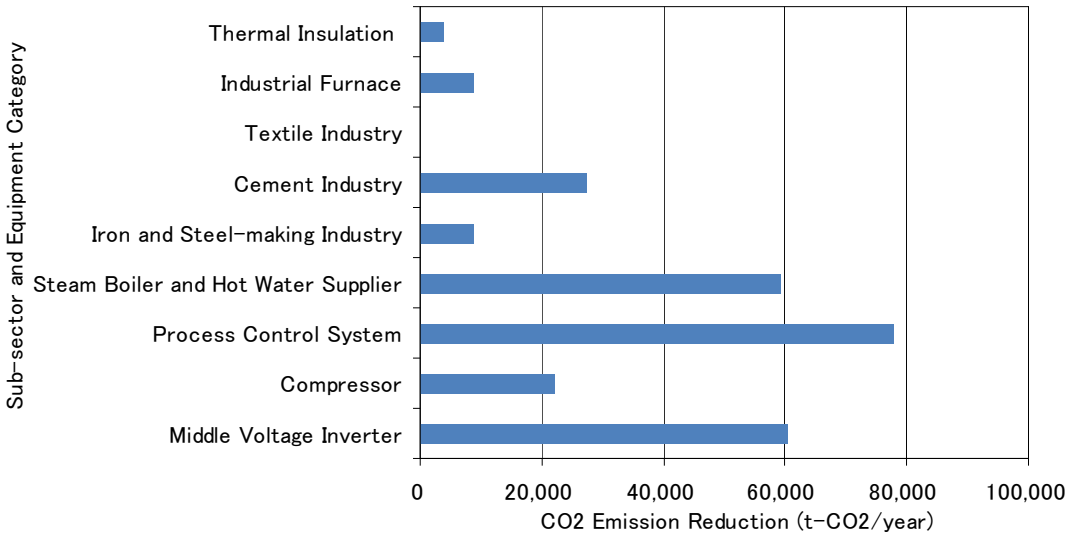


Figure 2.2.2-8 Potential CO_2 Emission Reduction by Sub-sector and Equipment Category

(3) Transportation Sector

1) Target Sector, Potential EE&C Volume, and Investment Amount

Transportation sector consists of cargo track, passenger car, taxi, bus, motor bicycle, ship, and air

plane in energy consuming area. As the result of the survey of cars for taxi and public bus, public buses are targeted due to introduction of articulated buses with CNG engines. Taxi cars were surveyed, but taxi companies don't have a plan to introduce hybrid cars or CNG engine cars yet. And car manufacturers have plans to produce CNG cars but not to implement the CNG car production due to the lack of gas charge stations in the cities and roads.

As a result of the survey in Indonesia, EE&C volume and investment amount for TSL in transportation sector are estimated in Table 2.2.2-5.

Regarding the calculation of the potential EE&C volume; the energy saving volume of the articulated bus of combined 2 trains is calculated in comparison with the single bus, and the potential EE&C volume is estimated from the energy saving volume and numbers of the articulated bus to be introduced.

Regarding the calculation of the investment amount; the investment amount is estimated from the equipment cost of the articulated bus to be introduced and its' number

Fuel and electricity saving volume per year is 552 TOE/year. Investment amount is USD21,500,000/year.

Table 2.2.2-5 Potential EE&C Volume and Investment Amount for TSL in Transportation Sector

No.	Equipment & Technology	EE&C Volume		Investment Amount (1,000USD)
		Power (MWh/year)	Fuel (TOE/year)	
Transportation				
13	Bus	0	552	21,500
Transportation Total		0	552	21,500

2) Potential CO_2 Emission Reduction

Potential CO_2 emission reduction by introduction of 50 articulated buses is 1,250 t-CO_2/year

2.2.3 Target EE&C Equipment

(1) Commercial Sector

EE&C equipment in sub-sectors was selected through the interview, observation and products brochures in manufacturers and sales agencies in Indonesia and Japan.

In the practical selection of EE&C equipment in commercial sector, the following criteria were considered in addition to the criteria described in Section 2.2.1. The equipment is i) to be a product with reliable energy saving, ii) to be a product with reliable lifetime, and iii) to be a product sold or expected to be sold in Indonesia for the TSL target period

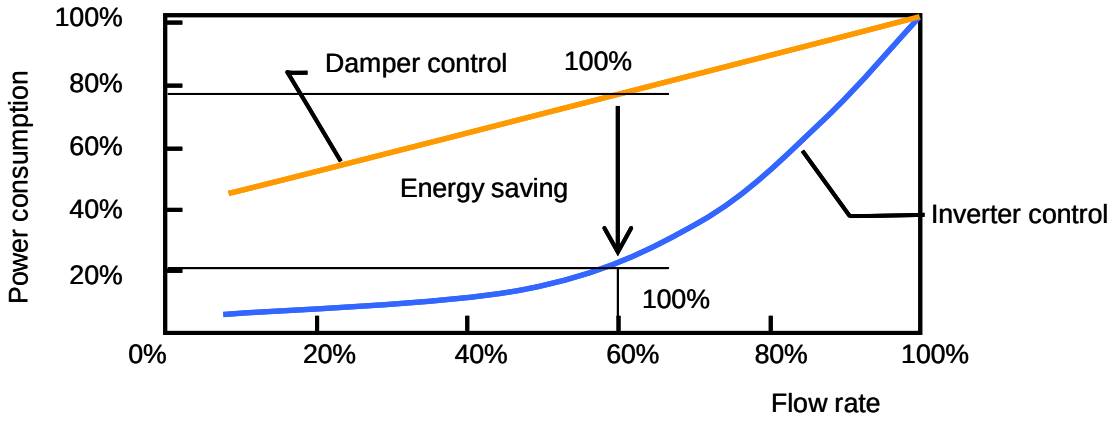
Market share of foreign manufactures is found to be quite larger than that of domestic manufactures. EE&C equipment in the equipment list is described below.

a) Power receiving and distribution

The load factor of transformers used in commercial buildings is generally low. Amorphous transformers deliver high performance compared with the conventional transformers under the operation of the low load factor and more than 20% energy saving is expected. Amorphous transformer is proven technology. And some Indonesian company plans to start production of amorphous transformers. Therefore, amorphous transformer is selected as the target EE&C equipment.

b) Air conditioning equipment

Air conditioner, heat transfer unit, and fan & pump are typical equipment in this sub-sector. The major EE&C technology is variable speed control with inverter. Motor control with inverter brings a great energy saving impact, especially for partial load operation of air conditioners, fans, or pump. As an example, power consumptions of damper control and inverter control under 60% of partial load are shown in Figure 2.2.3-1. The power consumption rate with damper control is 75% of the rated power consumption. On the other hand, the power consumption ratio with inverter control is 22%. Therefore, energy saving of inverter control, as compared with damper control, reaches to about 70 % in this case.



Source: ECCJ

Figure 2.2.3-1 Energy Saving by Damper Control and Inverter Control

Basically, air conditioner, heat transfer unit, pump, and fan with inverter control are selected as the target EE&C equipment. On the other hand, some non-inverter air conditioners with high energy efficiency are included in the EE&C labeling program, which is discussing in Indonesia. In that context, some non-inverter air conditioners, for which more than 20% energy saving is expected, are also selected as the target EE&C equipment.

c) Lighting equipment

It's well known that LED lighting, HF (High frequency) lighting, and electric ballast are equipment for high energy efficiency. Especially, Power consumption of LED, equivalent to 60W incandescent lamp, is less than 10W. And lighting equipment is easy to be selected as the

target equipment for the EE&C renovation at the first stage.

However, for some of equipment in this sub-sector, there are ones that break down or degrade easily regardless of the high early performance. Therefore, product life time or warrantee period are added in the specification of the EE&C equipment list. Especially, when selecting the equipment in this sub-sector, the above issue should be considered.

d) Heat sources

One major EE&C technology in this sub-sector is inverter control and sensitive ON/OFF control for the partial load condition. Centrifugal chiller, screw chiller, and air cooled chiller are typical equipment in this sub-sector and three types of chiller with these controls are selected as the target EE&C equipment. The former is usually installed in large buildings, and the latter two are equipped in middle class buildings.

Another major EE&C technology in this sub-sector is the waste heat resource recovery. As described in the previous section, Waste heat resource recovery is possible to reduce the heat source equipment and/or improve the energy efficiency of the equipment and the waste heat resource recovery is conductive to energy saving. Steam absorption chiller, Hot water absorption chiller, and adsorption chiller with the waste heat source recovery system are added in the target EE&C equipment.

e) Elevator and escalator

Regarding elevator and escalator, PM motor, gear direct driving, LED lamp and servicing system by computer are main devices for energy saving. And human detective sensor is used for escalators. Elevator and escalator with these devices and systems, for which more than 20% energy saving is expected, are selected as the target EE&C equipment.

f) Building energy management system (BEMS)

As described in Section 2.2.2, BEMS is most useful in promoting suitable energy management and EE&C. However, it would be difficult for the EE&C equipment list approach to describe the quantitative definition of BEMS. For the judgment of BEMS, the energy audit approach would be needed. Therefore, the BEMS selected in the EE&C equipment list was kept within the BEMS with typical devices and software described in the specification of the EE&C equipment list.

Judging from the potential EE&C volume and the investment amount, the most effective equipment in the EE&C equipment list are shown in Table 2.2.3-1. They are the best three categories in the EE&C equipment list which made by this survey. And the potential EE&C volume, the investment amount, and the efficiency are shown in Table 2.2.3-2.

Table 2.2.3-1 Typical Equipments in EE&C Equipment List

No.	Equipment	EE&C Basic Concept and Benefit	Specifications
2.1	Air Conditioner		
2.1.1	Split type air-conditioner with inverter	Energy saving to conventional: 50% Inverter controll	Rated COP: 3.3 or more Weighted COP (0.4×full load COP+0.6×50% load COP): 3.7 or more Inverter controll
2.1.2	Split type air-conditioner with non inverter	Energy saving to conventional: 30%	Rated COP: 3.1 or more
2.1.3	Variable refrigerant flow (VRF)	Energy saving to conventional: 50% Inverter controll	Rated COP: 2.9 or more Weighted COP (0.4×full load COP+0.6×50%load COP): 3.5 or more Inverter controll and PM motor
2.3	Fan and Pump with Inverter		
2.3.1	Low voltage inverter for fan and pump	Energy saving to conventional: 30% Inverter controll	Efficiency: 95% or more PM motor and inverter control Output frequency: 25 to 120Hz variable Life time: 7 years or more (ambient temp.40degree, load factor 100%)
3.2	LED (Light Emission Diode)		
3.2.1	Down light	Power saving to incandescent lamp: 80% Long life equipment	Life time: 40,000 hours or more Body & frame: Aluminum die cast

Table 2.2.3-2 Best Three Categories in EE&C Equipment List

Equipment & Technology	EE&C Volume (MWh/year)	Investment Amount (1,000USD)	Efficiency (kWh/kUSD)
Air Conditioner	527,280	209,394	2,518
Fan and Pump with Inverter	339,768	81,344	4,177
LED (Light Emission Diode)	63,440	55,053	1,152

(2) Industry Sector

From the interview survey for the manufactures, production factories, and association in Indonesia and the past survey result of JICA and NEDO, EE&C equipment, which should be developed or expanded in Indonesia, is selected as the target EE&C equipment.

Market share of foreign manufactures is found to be quite larger than that of domestic manufactures. EE&C equipment in the equipment list is described below.

a) Steel-making industry

Indonesian steel-making companies operate steel melting process of electric arc furnaces or induction furnaces and steel rolling process of steel rod and bar. Energy conservation technologies in steel making process are as follows:

a1. Ladle pre-heating unit with regenerative burner

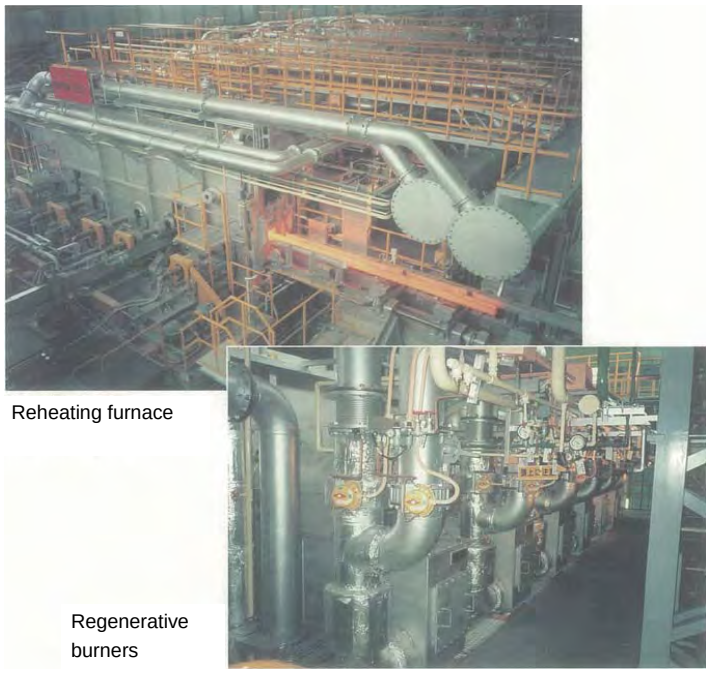
This heating unit is available in steel-making shops of electric arc furnaces and induction furnaces instead of a single port burner unit. The fuel consumption of this heating unit is 50% less than a single port burner because of recovery of high temperature exhaust gas of

burner by heat exchanger of regenerative burner. Any steel-making factories in Indonesia don't introduce this heating unit yet. Therefore this heating unit is effective to promote energy saving in steel-making shop in Indonesia.

a2. Regenerative burner unit for reheating furnace

This burner unit is available in steel slab and billet reheating furnace with natural gas combustion instead of single port burner with exhaust gas heat exchanger. Fuel consumption of this burner unit is 30% less than single port burner. The regenerative burner units are introduced in the most of rolling shops of steel making factories in Japan. The regenerative burner units have been installed in the reheating furnace in Gnung Garuda Steel Company in Indonesia in 2006 by the model project of NEDO, Japan. Some steel-making factories in Indonesia have a plan of introduction of regenerative burner at the relining of reheating furnaces.

The regenerative burner of reheating furnace is shown in Figure 2.2.3-2.



Source: ECCJ

Figure 2.2.3-2 Regenerative Burner of Reheating Furnace

a3. Ceramic fiber lining of reheating furnace:

Ceramic fiber lining is available for high temperature industrial furnaces, because allowable service temperature is 1200 deg-C and heating-up hours are shorter than heat resistance brick and cast-able refractory due to small density. Especially this lining is effective in the furnace with batch operation for energy conservation. Energy consumption of high temperature furnace is saved by 10% by using ceramic fiber lining instead of heat resistance brick lining. Ceramic fiber lining is not introduced in reheating furnaces yet, but has big potential of introduction for reheating furnaces instead of brick lining in Indonesia.

b) Cement industry

Indonesia cement companies operate cement kiln with New Suspension Pre-heater (NSP), which are constructed with in 10 years. Their cement kiln introduced high productivity and high efficiency equipment. Energy conservation technologies in cement manufacturing process are as follows:

b1. Vertical roller mill for raw material process and finishing process

This roller mill is available for crushing process of coal, clay, limestone and cement clinker in raw material treatment process and finishing process instead of a ball mill for energy conservation. Vertical roller mill is operated without hot air for drying material by using heat generated in crushing process. The vertical roller mill has energy saving potential by 30% compared with a ball mill. Indonesian cement factories have installed several sets of vertical roller mills already and have a plan of introduction of vertical roller mills for increase of crushing and grinding capacity in the cement factory.

b2. Power generation plant with waste heat recovery of cement rotary kiln

Generated power in waste heat recovery system of cement rotary kiln covers 20% to 30% of consuming power in cement plant, which is electric power saving of 20% to 30%. Most of cement factories in Japan have installed the power generation plants with waste heat recovery of cement rotary kiln. The first plant of 8.5 MW has been operated in Padang Cement Company in Indonesia by the model project of NEDO, Japan in October 2011. Several cement companies have a plan to introduce this power generation plant. A power generation plant is shown in Figure 2.2.3-3.

Source: JICA Study Team

Figure 2.2.3-3 Power Generation Plant with Waste Heat Recovery System

c) Textile industry

Cloth dyeing process is energy intensive process in textile factories. Indonesian textile companies have changed fuel oil firing steam boilers to coal firing steam boilers due to reduction of fuel cost during oil price rising after 2000 instead of the introduction of energy efficient steam boilers. Dyeing process consumes much steam, water and electricity in a textile factory.

c1. High performance tenter

A tenter perform drying and flatness of cloth with heat and tension continuously after dyeing process. This high-performance tenter controls cloth speed, drying temperature and humidity with inverter and performs energy saving by 30% compare with a conventional type tenter. This tenter is effective to save energy and improve quality of cloth.

c2. Dyeing system with high efficient equipment

This system consists of liquid dyeing machines "Circular" with inverter control, high-performance tenters with inverter control, cloth dryers and steam condensate recovery system, and has performed energy saving by 65% in Daliatex Company in Bandung in 2008 by the model project of NEDO, Japan. This system is effective measures to promote EE&C in textile factories in Indonesia.

A dyeing machine and a tenter are shown in Figure 2.2.3-4.

Source: ECCJ

Figure 2.2.3-4 Liquid Dyeing Machine and Tenter

d) Industrial furnace

Among many kinds of industrial furnaces, aluminum melting furnace and transfer system for die cast are selected. A tower type of aluminum melting furnace saves fuel by 20% of reverberatory type of furnace due to less leakage of combustion gas and preheating of raw material by exhaust gas. The several aluminum melting furnaces and transfer systems are installed in manufacturing factories of automobile parts and digital camera parts and will be introduced in the manufacturing factories with the development of automobile industry in Indonesia.

Survey for high efficient industrial furnace was conducted in Indonesia by the JICA Study Team. As a result of survey, an aluminum melting furnace manufacturer makes an aluminum melting furnace as a copy of Japanese manufacturer's products. The Indonesian manufacturer doesn't disclose any data of thermal efficiency of the aluminum melting furnace.

e) Thermal insulation

Industrial factories use steam, high temperature liquid, heating furnace etc. Many steam

pipelines with broken heat insulation or non-insulation are found in the factory energy audit and observation by the JICA Study Team. Insulation material for high temperature piping and furnace wall is very effective to prevent with 90% of radiation and transfer heat loss. Dissemination of enforcement of heat insulation of steam piping and plastic injection machine is effective to promote EE&C in Indonesia.

Rock wool is heat insulation material of low price and the same insulation performance as glass wool and produced from domestic raw material in Indonesia.

Insulation blanket is used for steam valves and plastic injection heater cases to prevent from radiation heat loss, which are fabricated to fit the complicated shape of casing and easy to set and remove on the casing.

f) Utility and management

f1. Middle voltage inverter

Middle voltage inverter is developed for the motor of 3000V to 6000V and effective for fan and pump in the law load operation or variable speed operation. The performance of power saving of inverters is large as shown in Figure 2.2.3-1. Middle voltage inverters are applicable to exhaust gas fans of cement rotary kiln, water pump of city water center, chillers of chemical factories, air fans of dust collectors, chillers of air-conditioners of buildings and so on. Middle voltage inverters are not used in most of factories in Indonesia yet, but the inverters have possibility to be introduced in many factories according to energy audit by the JICA Study Team.

f2. Screw compressor with inverter

A screw type air compressor with inverter control and PM motor has electric power saving potential of 50% compared with non-inverter type and reciprocating type. The demand of screw type air compressors with inverter control is large in the replacement of existing air compressors and newly installation in factories.

f3. Process control system

This control system is developed for optimum use of utility and used to energy management system in factories.

Utilities optimization system is on-line operational guidance and/or on-line feedback control system and has energy saving potential of 5%.

Distributed control system (DCS) consists of operator station, engineering station and controller and has energy saving potential of 50%.

These systems contribute not only energy saving but also productivity improvement and products quality control. Demand of these systems is newly installed production line and modified production line in Indonesia.

f4. Small-sized once-through steam boiler and multiple installation system

This boiler is developed for a small size steam boiler under the regulation of pressure vessel

in Japan, and operated with automatic control of pressure and combustion in higher boiler efficiency of 95% than a flue tube steam boiler of 80% to 90%, and so the once-through boiler has energy saving potential of 10% compared with a flue tube boiler of 2 ton/h. The standard capacity of the boiler is 2 ton/h in generated steam.

Multiple installation system of small size boiler consists of 2 sets or more of small-size steam boilers and performs high boiler efficiency of 90% at 50% load operation same as 100% load operation and so the multiple installation system has energy saving potential of 20% compared with a flue tube boiler of 4 ton/h to 20 ton/h .

Demand of small-sized once-through steam boilers is food processing factories, building construction material factories, textile factories and so on in Indonesia.

Survey for high efficient steam boiler was conducted in Indonesia by the JICA study team. As a result of survey, a boiler manufacturer makes a fuel oil or natural gas fired flue tube boiler and a coal fired fluidized bed type steam boiler with boiler efficiency of 80% or less, but the manufacturer doesn't have a plan to develop high efficient small-sized once-through steam boiler.

f5. Hot water supplier and hot air supplier

This heating unit is operated with heat pump system by waste heat recovery. Heat source is the recovered waste heat instead of fuel combustion heat, and so consuming power is small for circulation and delivery water or air in the unit. Maximum temperature of generated hot air and hot water is 120 deg-C and 85 deg-C respectively. Demand of these heat suppliers is food processing factories and automobile painting dryer process in Indonesia.

(3) Transportation Sector

EE&C vehicle in bus sub-sector is selected through the interview and products brochures in bus manufacturers and bus operation company in Indonesia and Japan.

Target bus is an articulated bus which consists of 2 trains with CNG engine and is operated in TransJakarta Busway Company. An articulated bus is saving energy by 15% and reducing CO_2 emission more than a single train bus due to reduction of operating numbers of bus. TanasJakarta Busway Company has a plan of introduction of articulated buses of 44 buses in 2011 and 87 buses in 2012. Fuel saving is 552 TOE/year by introduction of 50 articulated buses.

2.3 Implementing Financial Institutions (State-owned Commercial Banks) and Financing Scheme

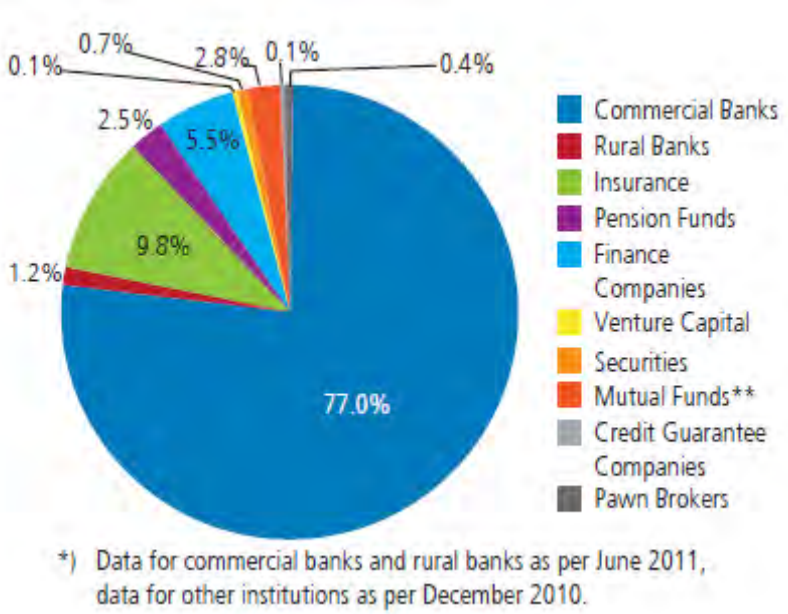
State-owned commercial banks are considered to be ideal implementing financial institution for two reasons.

First, regulation on procurement of foreign debts stipulates that the government of Indonesia can on-lend subsidiary loans only to state-owned and regional-state-owned enterprises. (See Section 2.1.2) Privately owned banks are good candidates for implementing institutions but their cost of funds

becomes more expensive as they cannot borrow directly from MOF. Privately owned commercial banks are to receive fund from JICA, the fund will have to first go through state-owned banks in the form of a three step loan. In this case, the cost of funds becomes higher as state banks charge their margins to cover costs.

The cost charged by state-owned banks in three step loans can be sizable. State-owned banks require return not only for administrative efforts, but also for the use of their capital to maintain capital adequacy ratio required by the prudential regulation. At the same time, state-owned banks have to take credit risks of implementing banks. In the case of energy efficient two-step-loan program provided by KfW of Germany, state owned banks charge approximately one percent of the lending amount when they on-lend to privately owned banks.

Secondly, commercial banks are dominant institutions in the financial system in Indonesia, accounting for approximately 80% of total financial assets in Indonesia, and large state-owned banks are ranked first, second, fourth and tenth in terms of asset size.



Source: Financial Stability Report No.17, Bank Indonesia, September 2011, page 25

Figure 2.3-1 Composition of Financial Institutions' Assets

Within banking sector, assets are heavily concentrated to four largest banks and three out of the four are state-owned banks. As the Table 2.3-1 below indicates, top 3 state-owned banks account for one third of total banking assets. The fourth state-owned commercial bank, BTN or PT Bank Tabungan Negara (Persero) Tbk, also ranks as 10th largest bank in Indonesia.

Table 2.3-1 Top 10 Banks in Terms of Total Assets as of August 2011

Ranking	Name	Share in total banking assets	Ownership
1	Bank Mandiri	13.59%	State
2	BRI	11.37%	State
3	Bank Central Asia	10.84%	Private
4	BNI	7.75%	State
5	Bank CIMB Niaga	4.79%	Private
6	Bank Danamon Indonesia	3.72%	Private
7	Pan Indonesia Bank	3.26%	Private
8	Bank Permata	2.81%	Private
9	BII	2.52%	Private
10	BTN	2.35%	State

Source: Recreated from Indonesian Banking Statistics Vol.9, August 2011, Bank Indonesia

The study team had already started discussion with Bank Mandiri, the largest bank in Indonesia. Bank Mandiri was formed on 2 October 1998, as part of the Government of Indonesia's bank restructuring program. In July 1999, four state-owned banks–Bank Bumi Daya, Bank Dagang Negara, Bank Exim and Bapindo - were amalgamated into Bank Mandiri. Today, Bank Mandiri accounts for about 14% of total bank assets and have wide variety of corporate and individual clients across the nation. Bank Mandiri has about 25 thousand employees, 1,370 domestic branches and 7 overseas offices.

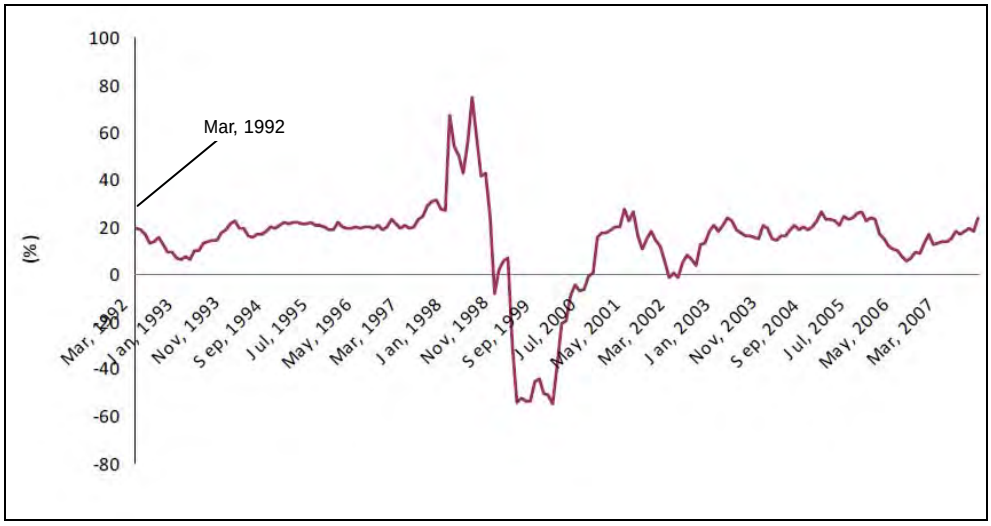
Bank Mandiri has been one of the most active banks in environmental field and already has an experience of collaboration with a foreign development agency on this matter. On June 17, 2010, Bank Mandiri signed a loan agreement with French Development Agency, AFD, for an amount of USD 100 mill., which is intended to be used for climate change and energy efficiency projects. Based on our interview with AFD, the first disbursement of USD 30 mil. is made for a project carried out by an existing corporate client of Bank Mandiri. The interest rate for this loan is priced at market level and the benefit to Bank Mandiri is mainly derived from a provision of employee training on environmental issues.

2.3.1 Analysis of the Financial Positions of Indonesian Commercial Banks

(1) Steady Improvement since Asian Financial Crisis

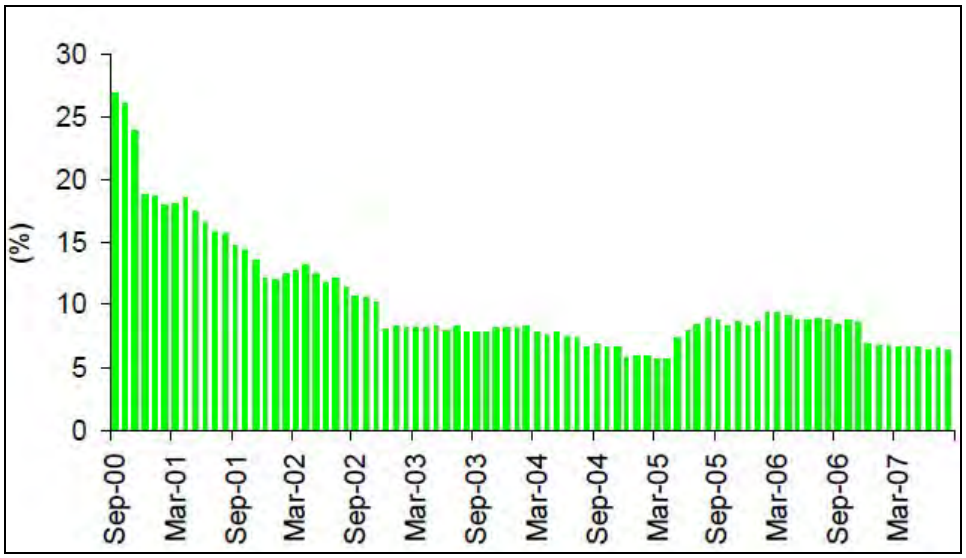
Indonesian banking sector has experienced several large shocks in the last fifteen years but gradually improved risk profile and gained stability. Today, Indonesian banks in general are healthy and profitable.

Indonesian banking sector was one of the most severely damaged during Asian Financial Crisis in 1997. Many privately owned banks were either closed or temporarily nationalized and state owned banks were also restructured and merged. As a result of this industry-wide restructuring with a strong government initiative, once-tumbled commercial loan growth turned positive in 2001 (see Figure 2.3.1-1) and non-performing loans (NPLs) had been lowered to managerial level by 2002 (See Figure 2.3.1-2).



Source: Managing Capital Flows: The Case of Indonesia, ADB Institute Discussion Paper No. 94, March 2008, page 17

Figure 2.3.1-1 Indonesia: Banks' Commercial Loan Growth



Source: Managing Capital Flows: The Case of Indonesia, ADB Institute Discussion Paper No. 94, March 2008, page 18

Figure 2.3.1-2 Indonesia: Gross NPLs of the Banking Sector, 2000-2007

Then, there was a mini crisis of 2005, triggered by soaring oil prices and its fiscal pressure on Government of Indonesia because of increase in fuel subsidy. The current account turned negative in the fourth quarter of 2005 and the rupiah depreciated drastically. Inflation also soared to 17% in 2005 from the previous year's 6.4%. However, government took a series of measure to contain speculator moves by raising interest rate, limiting state-owned enterprises' purchase of foreign exchanges and cutting down on fuel subsidies. As a result, foreign exchange and inflation rates were stabilized in 2006 and the impact on banking sector was not a major one.

Three years after 2005 mini crisis, global financial crisis triggered by the sub-prime shock and the following collapse of global financial institutions, such as Lehman Brothers and AIG, happened. Once again, Indonesian banks weathered this period without major damages.

Financial Stability Index (FSI), which is reported monthly by Bank Indonesia, can be a good proxy for the health of Indonesian banking sector. FSI is a composite index incorporating broad-based indicators. The factors incorporated in FSI are as follows.

Table 2.3.1-1 Data Included in Financial Stability Index of Bank Indonesia

Sector	Data included
Real sector	GDP, fiscal deficit, inflation, household finance, corporate finance, policy rate, monetary aggregates
External sector	Forex volatility, forex exposure, balance of payment, capital flows, foreign reserves
Financial sector	Profitability, capital adequacy ratio, loans, liability, liquidity, credit risk, market risk, interest rate risk, asset quality, systemic focus
Financial markets	Yield (Gov. & corp. bonds, money market), spread level (corp. bonds, money market), credit ratings, volatility in equity market

Source: Measures of financial stability – a review, Blaise Gadanecz and Kaushik Jayaram, IFC Bulletin No. 35, Bank for International Settlement, 2009, p373, Table 2

Figure 2.3.1-3 below exhibits the change in FSI since Asian Financial Crisis. At this point, the stability of banking sector is recovering from the Global Crisis in November 2008, thanks to favorable factors such as well-maintained bank resilience, stable stock prices, solid domestic fundamentals and controlled inflation. However, the level of stability has not yet come back to the pre-2008 crisis level due to the indirect threats from the economic crises in Europe and USA.

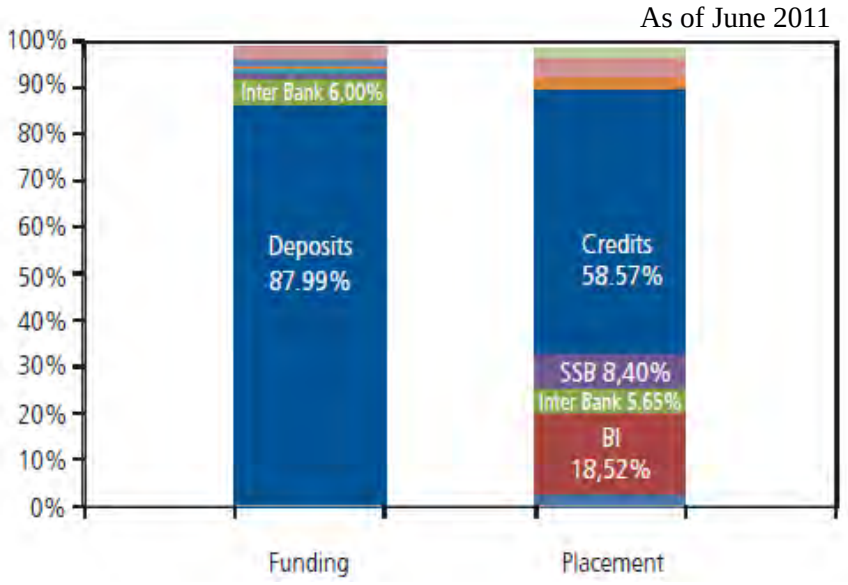
Source: Financial Stability Review No.17, Bank Indonesia, September 2011, page 26

Figure 2.3.1-3 Financial Stability Index 1996-2011

Well-maintained banking system resilience derives from steady improvements in all of the basic aspects of health of the banking system, namely liquidity, asset quality, capital adequacy, earnings and interest rate and foreign exchange risk management.

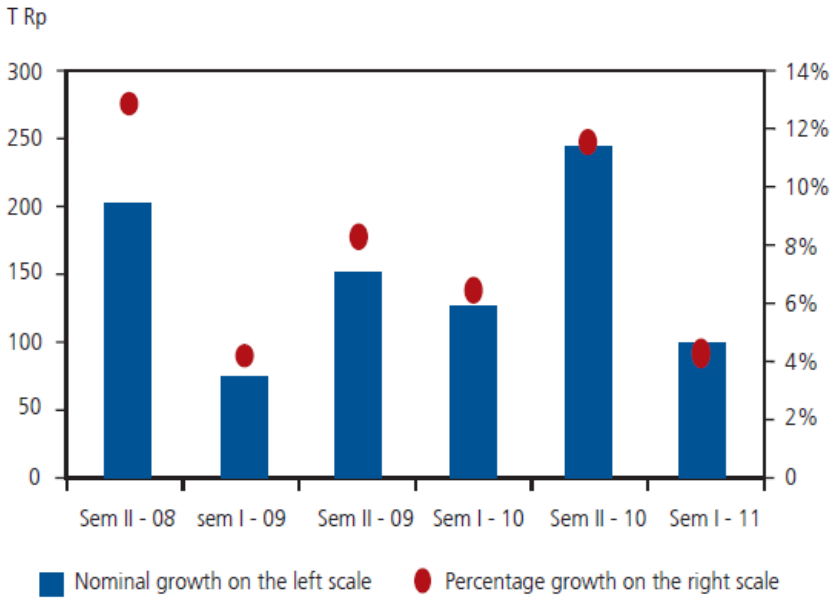
(2) Liquidity

Nearly 90 percent of Indonesian banks' funding comes from customer deposits as shown below Figure 2.3.1-4. Thanks to rapid economic growth, customer deposit has been steadily rising as shown in Figure 2.3.1-5.



Source: Financial Stability Review No.17, Bank Indonesia, September 2011, page 26

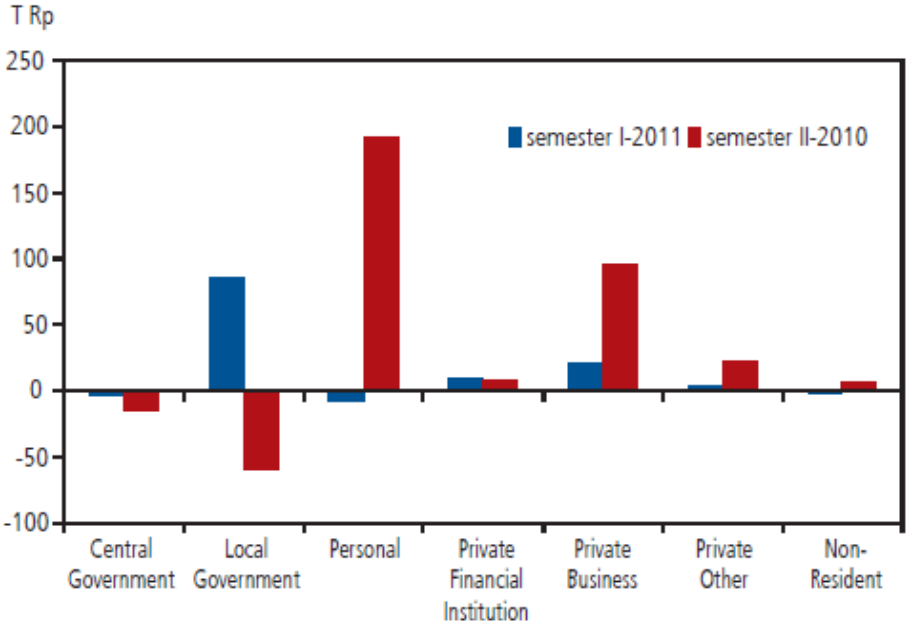
Figure 2.3.1-4 Shares of Bank Funding and Financing



Source: Financial Stability Review No.17, Bank Indonesia, September 2011, page 26

Figure 2.3.1-5 Growth in Deposit by Semester

Encouraging aspect of deposit growth is that the largest source of increase comes from private individuals and businesses, as shown in Figure 2.3.1-6. At the same time, most of deposits are in the form of saving and time deposit denominated in Rupiah. This indicates that general public and businesses have confidence in Indonesian economy and banking system. This confidence suggests that the Indonesian domestic savings would be a stable source for Indonesian Banks, while the risk of deterioration of economic environment remains.



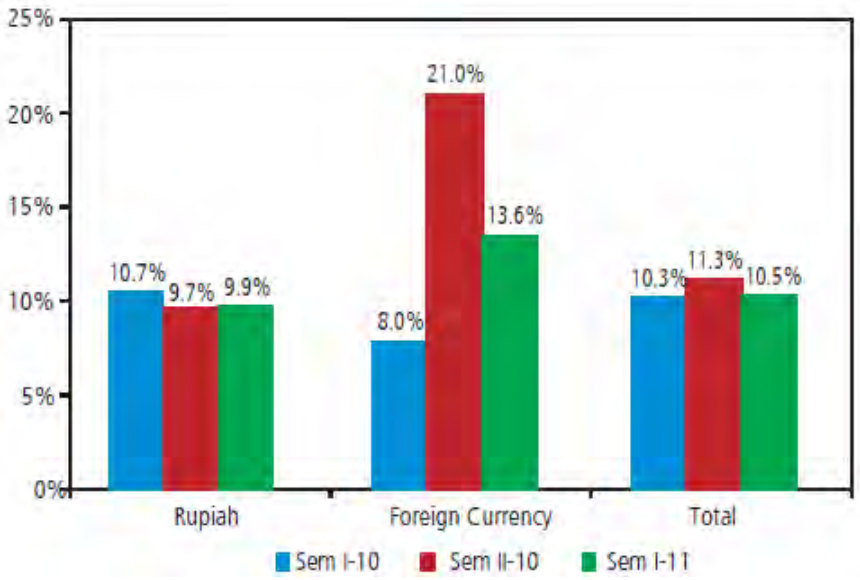
Source: Financial Stability Review No.17, Bank Indonesia, September 2011, page 27

Figure 2.3.1-6 Deposit Growth Based on Ownership

One of the risks to continued deposit growth is the reduction in real interest rate. Bank Indonesia lowered its policy rate for two consecutive months in October and November 2011 to record low 6%. This move will lower the deposit rate and the attractiveness for depositors becomes less. Should the inflationary pressure rise, the real interest rate may turn negative and further reduces the rationale for keeping funds in bank account. For reference, as of July 2011, year on year change in consumer price index was 4.61% and average of 12 months time deposit rate for all commercial banks was 6.93%.

(3) Credit Growth and Asset Quality

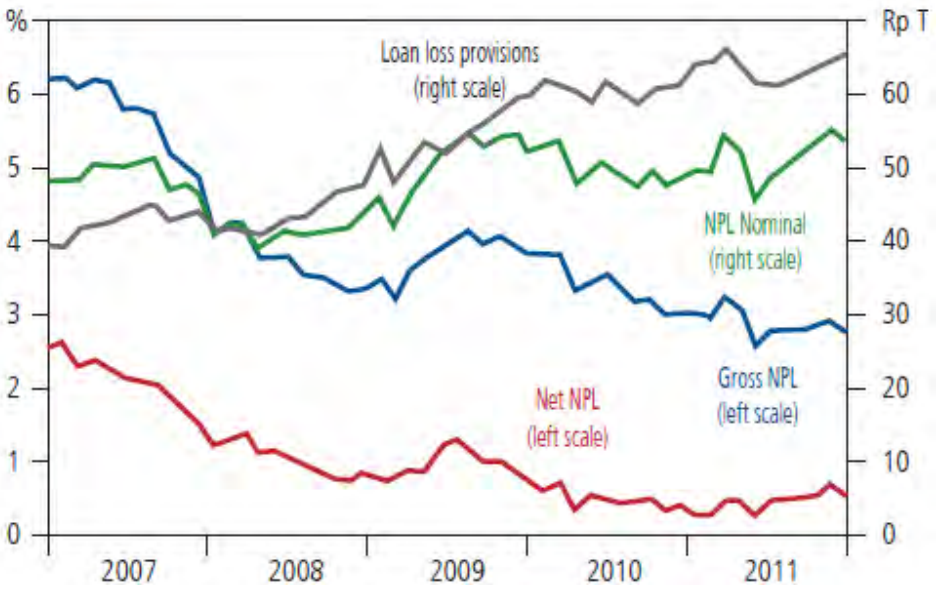
Banks are expanding its lending portfolio in response to strong economic growth. As Figure 2.3.1-7 shows, banks' credit balance grew by 10.5% in the first half of 2011. Stronger growth in foreign currency denominated loans, mostly in USD, started in later half of 2010, when Rupiah started appreciating against USD. While the majority of foreign currency loans are for working capital of exporters with natural hedge against the change in foreign exchange rate, some banks need to manage currency exposure based on their funding capabilities of foreign currencies. For discussion on foreign exchange risk management, please see Section 2.3.1 (7).



Source: Financial Stability Review No.17, Bank Indonesia, September 2011, page 28

Figure 2.3.1-7 Credit Growth by Currency

Despite this strong growth in credit balance, non-performing loans, or NPL, are still maintained at managerial level as shown in Figure 2.3.1-8. At the same time, banks are increasing loan loss provisions to prepare for future losses and, as a result, net NPL is currently very close to zero. This ratio indicates conservative approach of banks' management in expansion of credits.



Source: Financial Stability Review No.17, Bank Indonesia, September 2011, page 30

Figure 2.3.1-8 Non-performing Loans

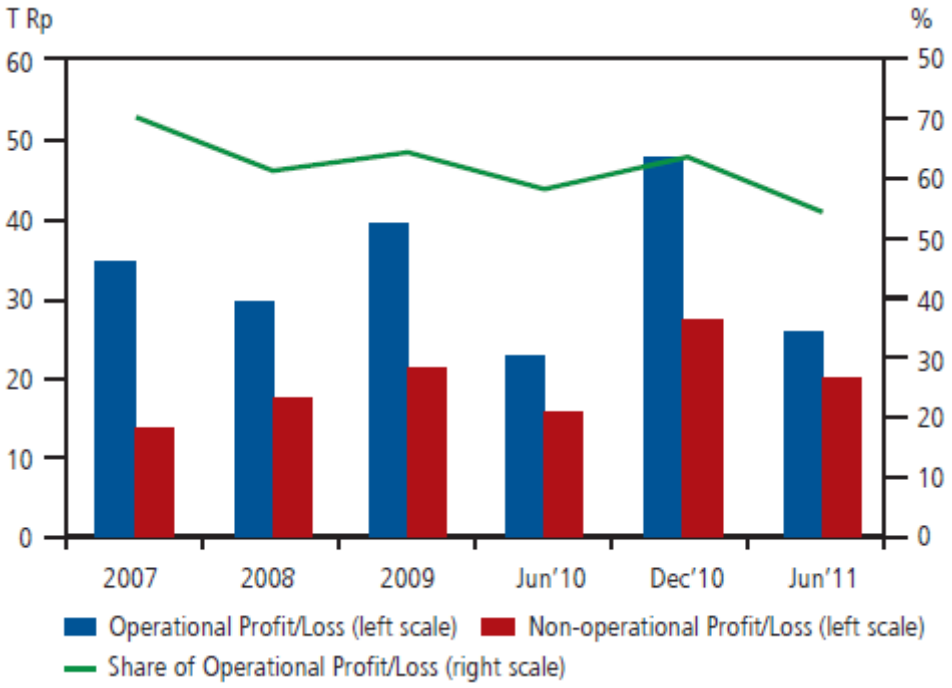
While credit growth has been greater than deposit growth, the government of Indonesia is calling for even more aggressive expansion of credit by banks because banks continue to play a relatively

small role in economic growth, among others reflected by the ratio of credit to GDP at just 27.5%. For example, in neighboring countries such as Thailand, Malaysia and Singapore, the ratio exceeds 90%. At the Annual Bankers' Dinner in January 2011 the Governor of Bank Indonesia reaffirmed the need for banks to expand the intermediation function through credit extension. [10] To put pressure for banks to expand credit, Bank Indonesia started imposing minimum loan-to-deposit ratio of 78% on March 1 of this year. [11]

Should the loan accelerated by this measure, liquidity situation of Indonesian banks may become tight in near future. At the same time, loosened credit standard by banks may result in increase in non-performing loans.

(4) Profitability

Thanks to the robust economic growth and steady increase in assets size, banks' profit is continuing to increase from slight decline in 2008 as shown in Figure 2.3.1-9. Share of operational profit is on slight decline due to the reduction in credit margins.



Source: Financial Stability Review No.17, Bank Indonesia, September 2011, page 33

Figure 2.3.1-9 Bank Profit / Loss

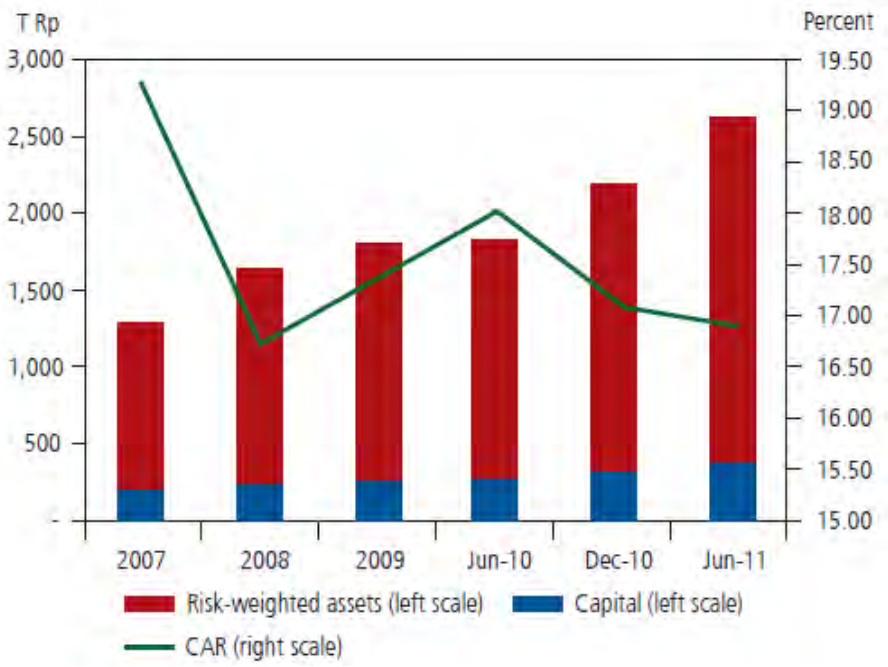
According to Banking Survey Report 2011 published by PwC Indonesia, Indonesian banks enjoy the highest net interest margin in South East Asia, which is approximately 5.8%. This level is very high when compared to neighboring countries' norm of 2.5-4.5%, or 2-2.5% in China or India. Respondents cite high inflation and higher credit risk as reasons for high net interest margin. Despite Bank Indonesia's pressure to increase lending and declining interest rate, 49% of

[10] Financial Stability Report No.16, Bank Indonesia, March 2011, page 26
[11] "Bank Indonesia's lending drive risk creating bad loans", Jakarta Post, March 1, 2011

respondents answered that the net interest margin will not change in near future and 22% responded that it will increase. [12]

(5) Capital Adequacy

Based on Basel II framework initiated in Indonesia since 2007, Indonesian banks are required to maintain minimum capital to risk-adjusted-asset ratio, or Capital Adequacy Ratio (CAR) of 8%. Despite the rapid growth in risk assets, the average CAR has been maintained well above the required level as the capital formation kept pace with the credit expansion.



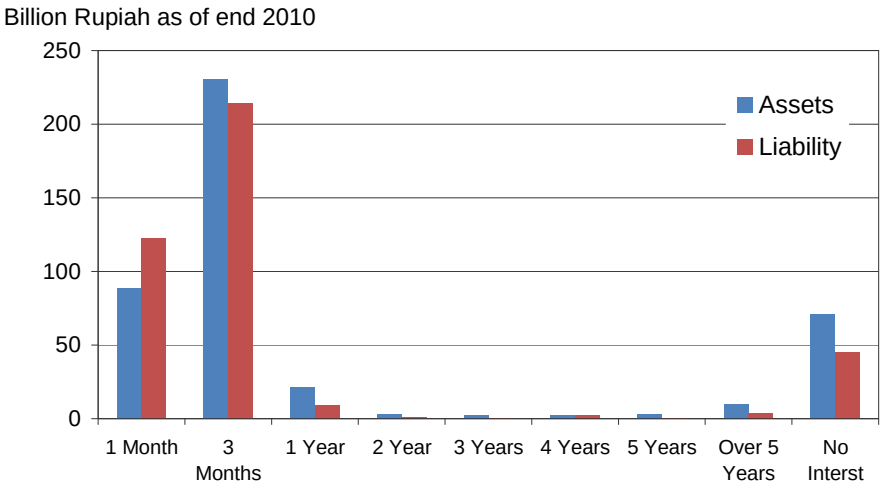
Source: Financial Stability Review No.17, Bank Indonesia, September 2011, page 34

Figure 2.3.1-10 Bank Capital, Risk-weighted Assets, and CAR

(6) Interest Rate Risk Management

Most banks in Indonesia raise funds in short-term deposit and lends in longer maturity and this may create re-pricing gap, where rising interest rates may squeeze banks' interest margin. Many banks establish limit on the amount of re-pricing gap and carry out simulations for future interest rate scenarios. The chart below shows the distribution of interest rate period for assets and liability of Bank Mandiri and the matching of interest rate period for assets and liability can be recognized.

[12] Banking Survey Report 2011, PwC Indonesia, p.7



Source: Created from Bank Mandiri Annual Report, 2010, Appendix 5, p.162-163

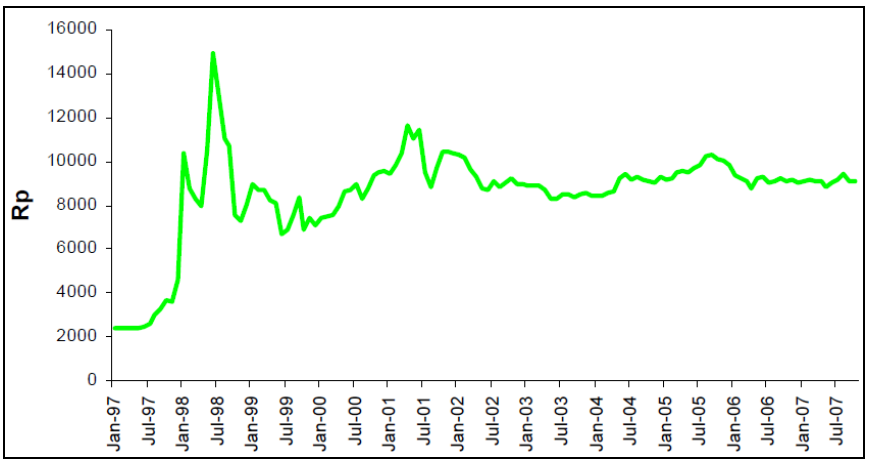
Figure 2.3.1-11 Asset/Liability Balance for Each Interest Rate Period at Bank Mandiri

(7) Foreign Exchange Risk Management

Before Asian financial crisis, Indonesian banks depended heavily on lower interest foreign debt and such dependence was a major cause for fatal damage to Indonesian banking sector during the crisis. Rupiah depreciated more than 700% against USD between 1997 and 1998 and made many banks and businesses insolvent because of sudden multiplication of foreign currency debt in Rupiah terms.

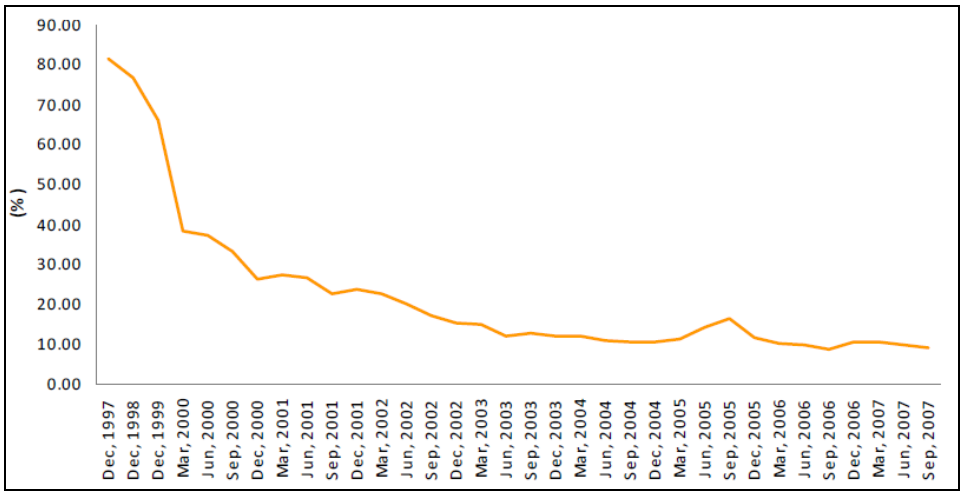
Having learned the risk of foreign exchange fluctuations in a hard way, most Indonesian people started avoiding or minimizing foreign exchange risks in their business doings, especially borrowing. Indonesian banks, too, have constantly reduced its dependence on foreign borrowing and shifted its funding to domestic deposits.

The figures below show the severity of Rupiah devaluation after the Asian financial crisis and the declining ratio of foreign borrowing by Indonesian banks to international reserve of Indonesia.



Source: Managing Capital Flows: The Case of Indonesia, Ira S. Titiheruw, Raymond, Atje, ADB Institute Discussion paper No. 94, March 2008, p15

Figure 2.3.1-12 Indonesia: Exchange Rate Movement, 1997-2007



Source: Managing Capital Flows: The Case of Indonesia, Ira S. Titiheruw, Raymond, Atje, ADB Institute Discussion paper No. 94, March 2008, p17

Figure 2.3.1-13 Outstanding External Debt to Private Bank / International Reserve

In order to prevent banks from borrowing excessive foreign debt, Bank Indonesia used to limit net open position for foreign by commercial banks to 20% of their Tier 1 and Tier 2 capital. However, even after the abolishment of Bank Indonesia's regulation, many of the banks still maintain voluntary limits on foreign exchange positions. For example, Bank Mandiri's internal limit for net open position of foreign exchange is 10% of its Tier 1 and Tier 2 capital.[13]

2.3.2 Requirements for Sub-loans between MOF and State-owned Banks

Foreign loans to Government of Indonesia can be re-lent to regional governments and state owned enterprises, based on Article 7 (1) of Government Regulation of the Republic of Indonesia Number 10 of 2011, hereafter being referred to as "Regulation No.10 of 2011". Article 7(2) of the Regulation No. 10 of 2011 allows further re-lending from regional governments to regional-state-owned enterprises. As for the conditions for subsidiary loans from the Ministry of Finance (MOF) to state-owned enterprises, Article 3 of the Regulation of Minister of Finance of Republic of Indonesia Number: 259 / KMK.017./1993, provides the following guidelines.

Article 3

The interest rates of foreign subsidiary loan shall be determined by the Minister of Finance based on the following classifications:

a. In the event that the subsidiary loan to the Debtors is in foreign exchange as was mentioned in Article 2 letter a, the interest rates that must be paid by the Government to PPHLN (foreign lender) plus 0.5% (percent) per annum or otherwise stipulated by the Minister of Finance;
b. in the event that the subsidiary loan to the Debtors is in rupiah as was mentioned in Article 2 letter

[13] Bank Mandiri Annual Report, 2010, Appendix 5, p.162

b, the interest rates of subsidiary loan shall be determined as follows:

1. for SOE included in healthy/very healthy category, the interest rates of subsidiary loan is equal to SBI Interest rates plus 1% (percent) per annum;
2. for State-owned Banks, the interest rates of subsidiary loan is equal with the SBI interest rate or otherwise determined by the MOF;
3. for Debtors that are not included in categories 1 and 2 above, it will be determined case per case in accordance with the project feasibility.

Based on the categorization above, TSL falls into either a. or b.2. Accordingly, standard interest rates are to be either SBI interest rate in Rupiah or ODA loan rate plus 0.5% in JPY. Based on the interview with a candidate for implementing financial institution such as Bank Mandiri, Bank Mandiri is not willing to take a currency fluctuation risk and dose not prefer to on-lend in the original currency of JPY. However, since on-lending in Rupiah is still an option, we examine the advantage and disadvantage of relending in both IDR and JPY.

(1) On-lending in Rupiah

Based on our interview with the MOF, Bank Indonesia Certificate (SBI) with 6-month duration has been referenced as "SBI interest rate" stipulated in Article 3, b of 1993 Regulation. Since SBI 6 months has not been issued since January 2011, MOF is considering alternative benchmark rate but no information about candidate benchmarks has been made available.

If we assume that the similar concept of "lending with central bank's interest rate", it would not be considered by state-owned banks as cheap funding because their deposit rate is fairly low. Bank Indonesia rate (BI rate), a target rate of monetary policy, was 6.75%[14] between February and September of 2011 and the interest rate for SBI 9-months in September 2011 was 6.28%, while state-owned banks' average deposit rates for 6 months have ranged between 6.51% to 6.62 from September 2010 to August 2011. It should also be noted that the cost of funds tends to be cheaper for large state owned banks. For example, average deposit rates for Bank Mandiri in 2010 were 2.89% for demand deposits, 2.39% for Saving Deposits and 6.47% for time deposits that were lower than BI rate of the same period, 6.5%.

Difference between banks' deposit rate and final cost of TSL is discussed in detail in Section 2.3.2 (1).

(2) On-lending in Japanese Yen

Under existing regulation, interest rate for subsidiary loan in original currency is original interest rate plus 0.5%. However, all of the interviewed banks showed reluctance toward borrowing in JPY as it is not their working currency. According to banking statistics, about 16% of outstanding loans extended by commercial banks in Indonesia are denominated in foreign currency as of

[14] It was lowered to 6% in November 2011.

August 2011[15] and, while the national statistics is not available, it is considered that those foreign loans are almost entirely denominated in USD, based on interviews with banks.

As mentioned in Section 2.3.1, commercial banks in Indonesia are strictly managing foreign exchange risks and try to match currencies for lending and borrowing. Bank Mandiri mentions in its annual report as follows,

"In order to manage and mitigate the foreign exchange risk, foreign currency loans and placements were funded mostly with the same currency."

The above statement is a standard practice in Indonesia and, therefore, banks usually borrow in either Rupiah or USD. When JICA proceed with the program with on-lending in JPY, it should provide supports for banks to enter into the swap arrangements to effectively convert JPY to USD. While further conversion from USD to IDR is possible, the final funding cost may become more expensive than the implementing banks' deposit rate.

An example of swap arrangements is described in Figure 2.3.2-1 below. A state-owned bank is used only as an example but the same structure can be utilized by any commercial banks.

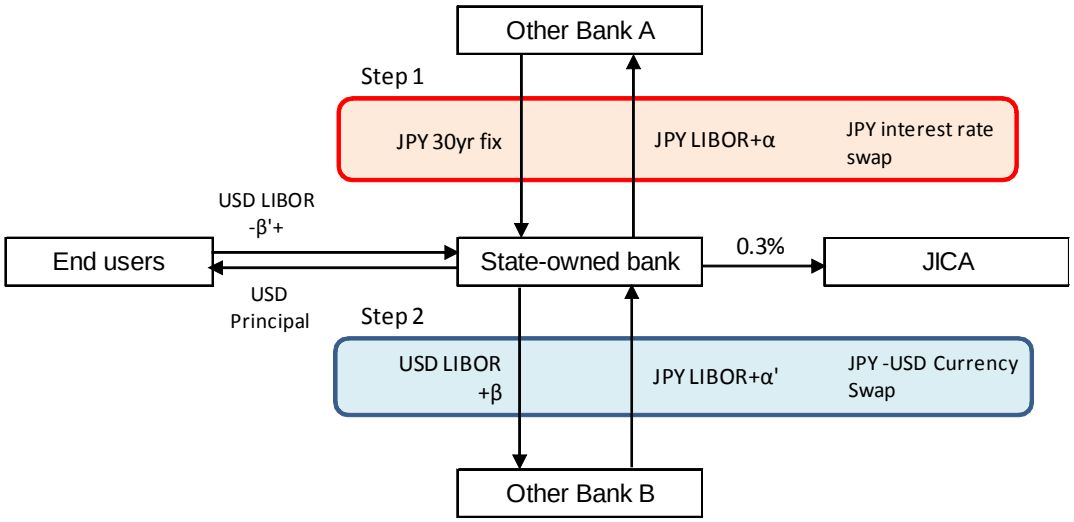


Figure 2.3.2-1 Example of Swap Arrangements to Convert JICA Loan to USD Funds

[Step 1: JPY interest rate swap]

As shown in Figure 2.3.1-11, typical interest rate period for loans from Indonesian commercial banks is three months. However, this short interest rate period cannot benefit from JICA's ultra-long-term fixed interest because absolute level of interest rate, 0.3% for climate change loan, may not be lower than the then short-term interest rate for JPY. For example, widely quoted index of JPY LIBOR[16] for three months term is 0.2% as of November 16, 2011[17] and this is much

[15] Indonesian Banking Statistics, Vol.9, August 2011, p.4, "Commercial Banks' operation"
[16] London Inter-Bank Offered Rate

cheaper than JICA loan plus MOF charge of 0.8 %.

In order to materialize low-interest nature of JICA's ultra-long term loan, implementing banks will have to first go into JPY interest rate swap which converts long-term fixed rate to floating rate. As Table 2.3.2-1 below suggests, interest rate for JICA loan is attractive when compared to long-term interest rates over ten years.

Table 2.3.2-1 Comparison of JICA Interest Rate and Yield for Japanese Government Bond

Climate Change ODA Loan 40 years	0.30%
[Reference] Japanese Government Bond Yields*	
3 Months	0.10%
6 Months	0.10%
1 year	0.11%
3 years	0.17%
5 years	0.33%
10 years	0.95%
15 years	1.40%
20 years	1.72%
30 years	1.94%

*Boomberg.co.jp as of November 16, 2011

If JPY interest rate swap is conducted, pay-off to implementing bank would be as follows.

Table 2.3.2-2 Pay-off to Implementing Bank under Interest Rate Swap

	Pay	Receive
To JICA	0.3% (Climate change)	
To MOF	0.5%	
To and from Interest rate swap counterparty	JPY-LIBOR 3M	Fix 1%* for 30 years *Estimation based on hearing in September 2011

In this case, funding cost for 3-month (3M)-JPY becomes lower than JPY-LIBOR for Climate change loans.

+) JPY-LIBOR 3M (What implementing bank pays under interest rate swap)
-) 1% (What implementing bank receives under interest rate swap)
+) MOF charge of 0.5%
+) Interest to JICA of 0.3%

JPY 3M LIBOR – 0.2%

[17] Bloomberg.com

[Step 2 JPY – USD currency swap]

Lending currencies used by Indonesian banks are IDR 84% and USD 16% as of August 2011.[18] Therefore, implementing banks need to convert short-term JPY funds obtained in Step 1 into short term USD or IDR. Since there is no market for currency swap between IDR and JPY, JICA loans will have to be first converted to USD.

Under currency swap between 3-month (3M) USD LIBOR and 3-month (3M) JPY, pay-off to implementing bank should be as follows.

Table 2.3.2-3 Pay-off to Implementing Bank under Currency Swap

	Pay	Receive
To and from currency swap counterparty	USD-LIBOR 3M + 0.7%* *Swap cost based on hearing in September 2011	JPY-LIBOR 3M 0.2% as of Nov. 16, 2011
From borrower		USD-LIBOR + Margin

When combined with the Step 1; Interest Rate Swap, final funding cost for 3-month (3M) USD becomes as follows;

+) 3M JPY LIBOR – 0.2% (Cost of short term JPY funds obtained in Step 1)
-) 3M JPY LIBOR (What implementing bank receives under currency swap)
+) 3M USD LIBOR+ 0.7% (What implementing bank pays under currency swap)

3M USD LIBOR + 0.5%

USD can further be converted to IDR but it may add additional swap costs to implementing banks, depending on the market situation. Therefore, in order to remove further complication, the final funding cost of JPY loan should be compared to banks' USD funding cost. Since USD deposit is heavily sought after by Indonesian banks and average deposit rate of state-owned banks has been about 1% higher than 3-month (3M) USD LIBOR. Therefore, the estimated USD cost of TSL shall be attractive to most banks. For more discussion on banks' deposit rate and final cost of TSL, please refer to Section 2.3.3 (1)

At the same time, special attention should be paid to the bank's ability to enter into ultra-long-term swap transactions. While the arrangement above is theoretically possible, Indonesian banks currently do not have swap counterparty for ultra-long transactions such as thirty-year JPY interest rate swap. Technical assistance for banks should be provided not only on expertise in swap transactions but also for establishment of credit lines at international banks.

2.3.3 Financial Terms for On-lending Arrangements

Under the proposed TSL program, all the risk assessments, negotiations and risk takings are born by the implementing banks. In this sense, except for discount in interest rate and confirmation with an

[18] Indonesian Banking Statistics, Vol.9, August 2011, p.4, "Commercial Banks' operation"

EE&C equipment list, arrangements for on-lending would be the same as other loans made by the implementing banks.

(1) Interest Rate

According to KfW, interest rate charged to end user under its existing two step loan program has been set at "two percent lower than the rate normally charged by the implementing banks". KfW and implementing banks agreed on such conditions based on Rupiah funding cost of KfW loan, which is a combination of interest paid to MOF and currency swap cost from EURO, as well as other benefits such as grants for technical assistance to implementing banks.

Under JICA's TSL program, too, the final interest rate should be set as certain percentage lower than the interest rate that banks normally charge. The discount level is decided through negotiation between JICA and implementing banks based on the difference in the cost of TSL funds and average funding cost of state-owned banks, as well as additional benefit that banks receive such as technical assistance.

[Average lending rate by state-owned banks]

Average interest rates charged by state-owned-banks for investment loans are as follows.

Table 2.3.3-1 Average Interest Rate of Investment Loans by State-owned Banks

	2011.2	2011.3	2011.4	2011.5	2011.6	2011.7	2011.8
IDR	10.67%	10.61%	10.61%	10.59%	10.60%	10.60%	10.56%
USD	4.96%	4.82%	4.83%	4.88%	4.85%	4.64%	4.64%

Source: Created from Indonesian Financial Statistics

For reference, Bank Mandiri's loan interest was 12.54% for IDR and 5.64% for foreign currency on average in 2010.

[Funding cost of TSL in IDR]

While the interest rate of subsidiary loan which implementing banks pay to MOF depends on the new regulations under consideration, our conversation with MOF suggests that it would be some policy rate for IDR (See Section 2.3.2). Assuming that the IDR policy rate is equivalent to Bank of Indonesia Rate (BI rate), the estimated interest rate of the subsidiary loan would be cheaper than average 3-month (3M) time deposit rate by approximately 0.11%, as Table 2.3.3-2 below shows.

Table 2.3.3-2 Estimated Cost of TSL (BI Rate) and IDR 3M Time Deposit Rate of State-owned Banks

	2011.2	2011.3	2011.4	2011.5	2011.6	2011.7	2011.8
TSL (BI rate)	6.75%	6.75%	6.75%	6.75%	6.75%	6.75%	6.75%
IDR 3M Depo	6.78%	6.84%	6.84%	6.90%	6.90%	6.86%	6.89%
Difference	0.03%	0.09%	0.09%	0.15%	0.15%	0.11%	0.14%

Source: Created from Indonesian Financial Statistics

For reference, Bank Mandiri's 6-month time deposit rate was 6.47% on average in 2010, which as slightly cheaper than BI Rate of 6.5% in 2010. The reason for cheaper rate is considered to be the banks' customer base of major state owned enterprises, who deposit their idle cash at Bank Mandiri. The existence of stable deposit base exempt Bank Mandiri from competition with other banks, who have to offer high interest rate to attract deposits.

[Funding cost of TSL in JPY (after conversion to USD)]

As discussed in Section 2.3.2 (2), Indonesian banks do not borrow in JPY because their lending currencies are either IDR or USD. Therefore, a series of swap transactions illustrated in Figure 2.3.2-1 have to be executed to convert long-term JPY to short-term US. Based on the assumptions made in Section 2.3.2 (2), the USD cost of TSL funds, USD 3-month (3M) LIBOR + 0.5%, would be cheaper than average USD deposit rates offered by state-owned banks, as Table 2.3.2-3 below shows.

Table 2.3.3-3 Estimated USD Cost of TSL and USD 3M Time Deposit Rate of State-owned Banks

	2011.2	2011.3	2011.4	2011.5	2011.6	2011.7	2011.8
USD 3M LIBOR	0.30%	0.31%	0.30%	0.27%	0.25%	0.25%	0.26%
USD cost of TSL (LIBOR + 0.5%)	0.80%	0.81%	0.80%	0.77%	0.75%	0.75%	0.76%
USD 3M Depo	1.49%	1.45%	1.30%	1.15%	1.33%	1.32%	1.31%
Difference	0.69%	0.64%	0.50%	0.38%	0.58%	0.57%	0.55%

Source: Created from Indonesian Financial Statistics and MoneyCafe.com

For reference, Bank Mandiri's foreign currency time deposit rate was 0.57% on average in 2010, which was much lower than national average and only 0.23% higher than average USD 3-month (3M) LIBOR for 2010, 0.34%[19]. The reason for the cheaper rate is considered to be the banks' customer base of major state-owned exporters, who deposit their USD revenue at Bank Mandiri. As in IDR deposits, Bank Mandiri does not have to offer high interest rate to attract USD deposits.

(2) Repayment Period

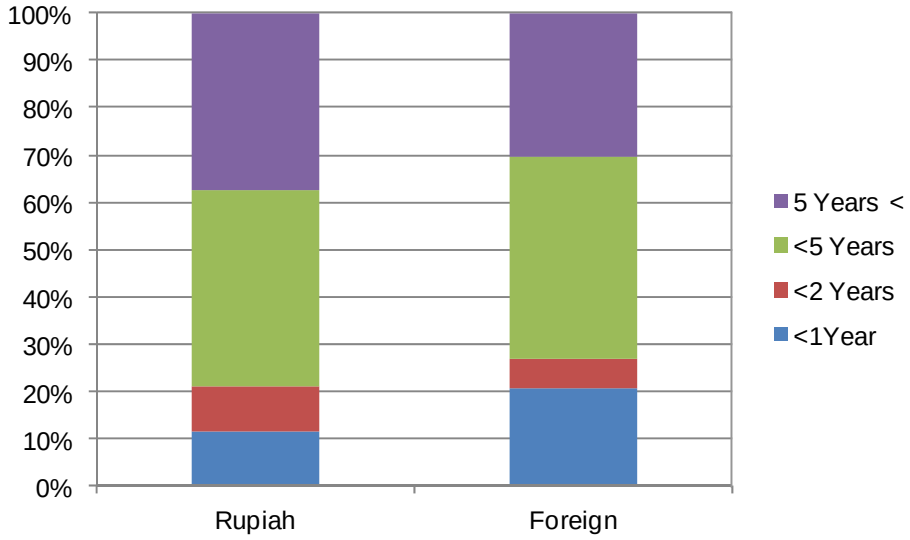
Repayment period should be the same as other loans made by implementing banks. A tenor of loan is decided based on the creditworthiness of borrowers, macro-economic conditions and use of funds. Ultra-long tenor is not usually available in emerging markets where economic conditions are volatile. The only exception is a loan for infrastructure projects that require huge capital investments upfront but have very stable revenue flows for a long time.

Average tenor of loans for the purchase of energy efficient equipments is considered to be around 5 years, based on the useful life of equipments and prevailing practice of corporate lending in

[19] Calculated from Moneycafe.com

Indonesia. In our conversation with French development agency, AFD, which has a credit line with Bank Mandiri for energy efficiency and climate change projects, a program officer in charge mentioned that AFD was having difficulty finding eligible projects that meet AFD's minimum tenor of 7 years because most loans are less than 5 years.

This assumption coincides with tenors of outstanding loans of Bank Mandiri at the end of year 2010, which is exhibited in Figure 2.3.3-1.



Source: Created from figures in Bank Mandiri Annual Report, 2010, Appendix 5, p.74

Figure 2.3.3-1 Maturity Profile of Bank Mandiri Loans as of End 2010

Based on our interview with Indonesian banks and general practice in banking sector, most of equipments to be included in the EE&C equipment list, with the exception of automobiles, will not be considered to have any collateral value. Therefore, applicants for TSL will have to provide additional collateral, such as real estate.

This collateral requirement should pose a hurdle for loan applicants who do not have existing banking relationship with implementing banks.

2.3.4 Revolving Use of the Funding for TSL

Revolving use of the funding means that the implementing banks are allowed to reuse the funds repaid by the final borrowers to make new loans. This ongoing cycle ensure that the fund can remain in operation until the time of scheduled repayment. Unlike non-revolving TSL, the tenor of JICA loan can be different from the tenor of the loans to the final borrowers.

The flow of drawdown requests and funds from non-revolving TSL can be summarized as follows.

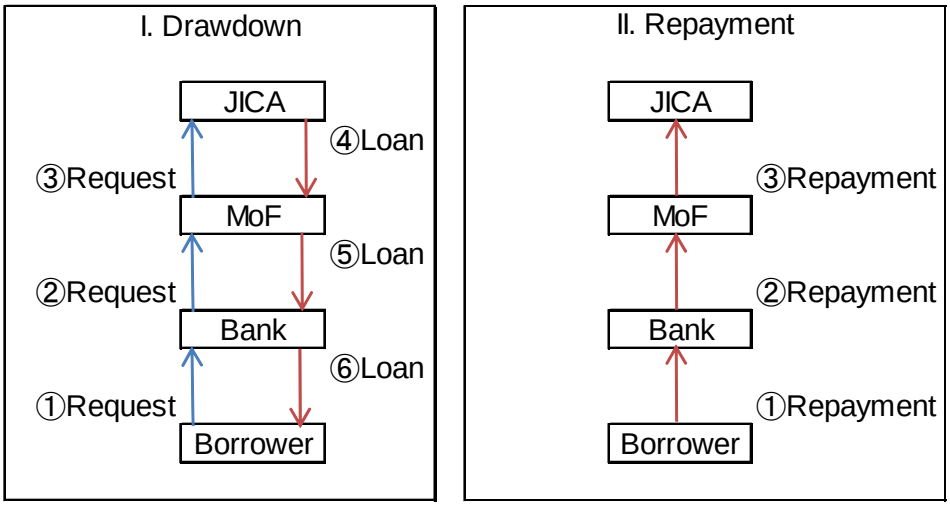


Figure 2.3.4-1 Flow of Funds under Non-revolving TSL

Since the funds repaid by the final borrower shall be returned to JICA for non-revolving TSA, the tenor of JICA's loan shall be approximately the same as the tenor of loans from implementing banks to the end borrower. Assuming that the implementing banks extend one loan under the TSL program per year for three years, with a tenor of three years and principle of USD 10 mil. each, outstanding balance of TSL shall be as follows.

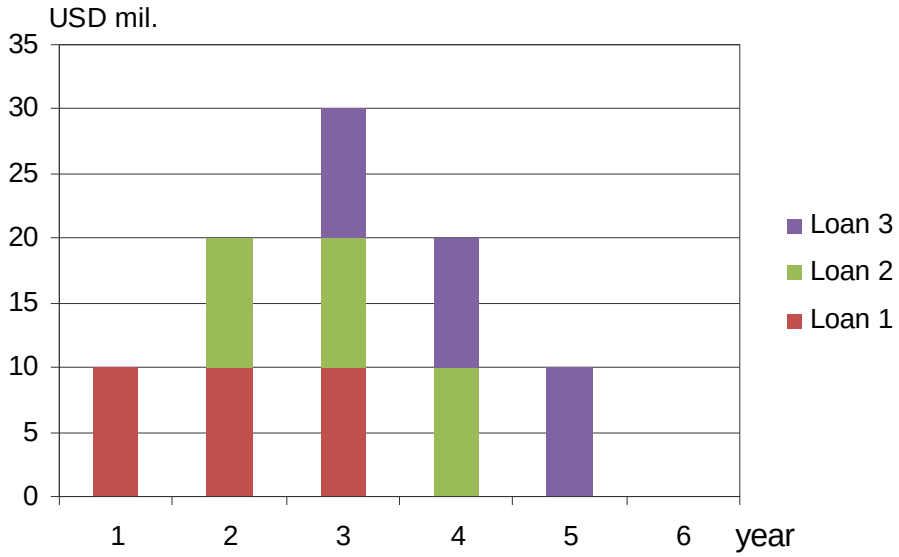


Figure 2.3.4-2 Outstanding Loan Balance of Non-revolving TSL

On the other hand, implementing banks can use the funds repaid by the final borrower for the extension of new loans under revolving facility. This means that the implementing banks can maintain the loan balance more than the tenor of each loan made by implementing banks. The flow of drawdown requests and funds under revolving use can be summarized as follows. One-to-one correspondence is required only for the initial drawdown and implementing banks are allowed to keep the funds even after the repayment of initial loans to the final borrowers.

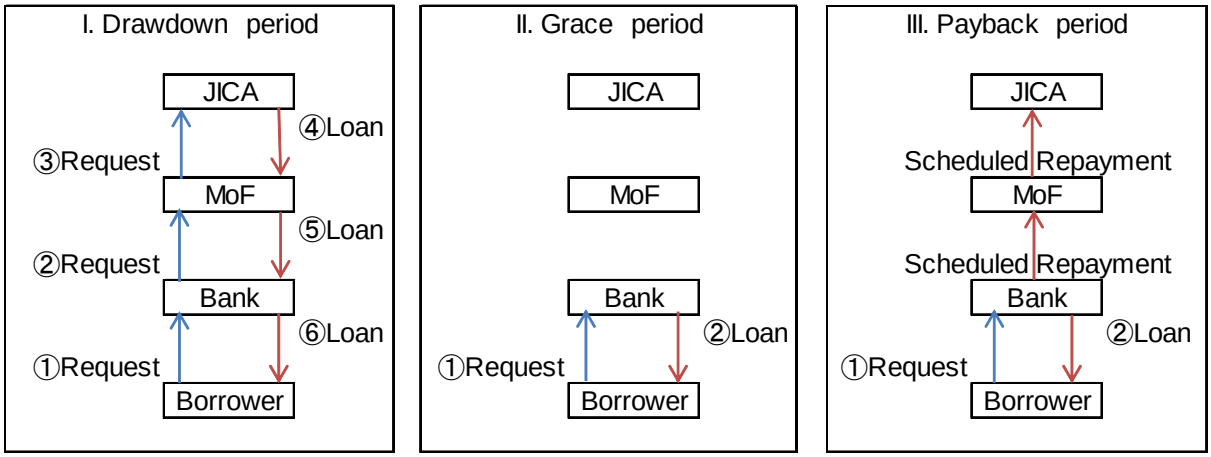


Figure 2.3.4-3 Flow of Funds under Revolving Use of Funding

Illustration of how implementing banks maintain the loan balance for a long time can be provided by using the similar example from Figure 2.3.4-2. Assuming that the implementing banks extend one loan under the TSL program per year every year, with a tenor of three years and principle of USD 10 mil. each, outstanding balance of TSL shall be maintained at USD 30 mil., as illustrated in the figure below. Implementing banks can make loan 4, 5 and 6 because they are allowed to use the repaid funds from Loan 1, 2 and 3

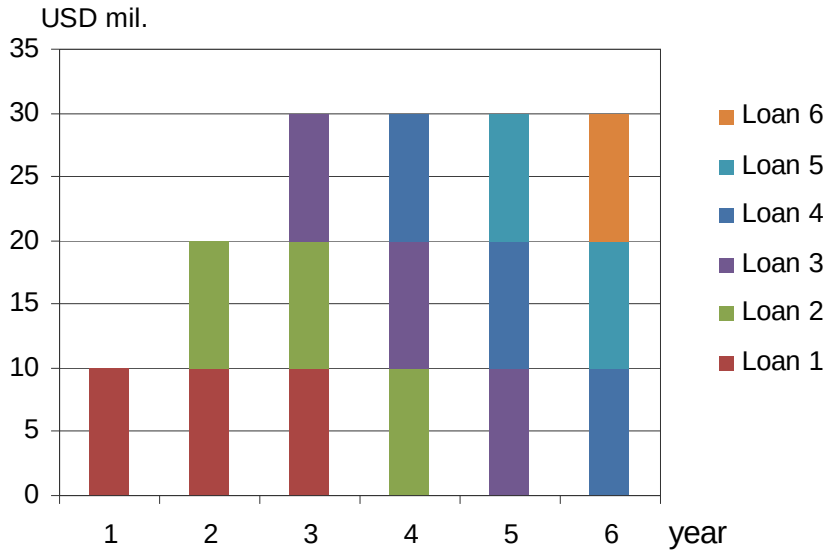


Figure 2.3.4-4 Outstanding Loan Balance of Revolving TSL

As mentioned in Section 2.3.3 (2), a median term of loan extended by Bank Mandiri was less than five years and expected loan tenor to the final user under the TSL program shall not be very different. Therefore, if the TSL does not take the form of revolving fund, most of the fund shall be repaid by the final users within 10 years, as illustrated by the example of the outstanding balance's transition shown in Fig 2.3.4-2, using the example of three year tenor to end-users.

The problem with a shorter loan term for the TSL program is a smaller advantage in interest rate. As

shown in Table 2.3.4-1 below, the difference between JICA's Climate Change ODA Loan's interest rate for 15 years, the shortest term available, and the market yield of Japanese government bonds for 10 years is only 0.8%, while that for longer term loans is 1.64%.

Table 2.3.4-1 Estimated USD Cost of TSL and USD 3M Time Deposit Rate

Climate Change ODA Loan	
15 years	**0.15%**
40 years	0.30%
[Reference] Japanese Government Bond Yields*	
10 years	**0.95%**
30 years	1.94%

*Boomberg.co.jp as of November 16, 2011

In Section 2.3.2, we estimated a floating dollar cost of the TSL based on the loan term of 40-year Climate Change ODA Loan, which interest rate is 1.64% cheaper than 30-year Japanese Government Bonds, and obtained the result of 3-month (3M) USD LIBOR + 0.5%. Due to the much smaller advantage in interest rate, it is expected that a floating dollar cost of the 15-year TSL would be almost the same as average dollar time deposit rate of state-owned banks, which is around 3-month (3M) USD LIBOR + 1.3%. (See Table 2.3.3-3)

In order to maximize the low interest benefit of Climate Change ODA Loans, it is imperative to formulate TSL program as a revolving fund.

Chapter 3 Project Implementation Structures

3.1 Proposed Organizational Set-up

3.1.1 Division of Responsibilities among Relevant Parties

In this TSL, MOF, BAPPENAS, MEMR and the intermediary financial institutions will be the main implementing entities and their roles and responsibilities are as follows:

(i) *MOF:*

- ✓ Borrower of JICA loan
- ✓ On-lending to and recovery from the intermediary financial institutions (PIP or SOBs)

(ii) *BAPPENAS:*

- ✓ Approval of TSL
- ✓ The monitoring of TSL project progress

(iii) *MEMR:* Responsible for overall project implementation and management

- ✓ Approve and update the EE&C equipment list
- ✓ After the loan is disbursed, monitor the project if TSL is used for energy efficiency.
- ✓ Report TSL impacts to the relevant parties such as MOF, BAPPENAS and JICA based on the reporting from the banks (the bank will report which equipment was invested using TSL, so based on this, the amount of energy conservation can be calculated).
- ✓ Awareness raising for EE&C to end users
- ✓ Preparation for TSL using the energy audit method
- ✓ Prepare the other regulations and incentives to promote EE&C in Indonesia

Parts of these tasks will be dedicated to loan consultants (local consultants who will be employed using the JICA loan) and the technical assistance by JICA. They are discussed in detail in Section 3.3.

(iv) *Intermediary financial institutions* (e.g. PIP or SOB such as Bank Mandiri): Implementing entity for the loan program

- ✓ They are the borrowers from MOF for TSL.
- ✓ Manage the loans extended by MOF in the revolving funds
- ✓ Appraise sub-projects in terms of the creditworthiness and extend the loan to end users based on this credit appraisal. Take the default risk of end-users. The evaluation process from the financial aspect is discussed in Section 3.1.3.
- ✓ Check the eligibility of the sub-projects against the EE&C equipment list
- ✓ Confirm whether a sub-project meets the environment criteria.
- ✓ Report quarterly to MEMR for TSL progress, including the impact on energy efficiency. For this reporting, the banks need to collect the information for what the loan was used for (the detail such as what kind of equipment was invested using the loan).
- ✓ Cooperate reporting to the government audit office (BPK) as required
- ✓ Submit the project completion report when the bank repay all loans to MOF

- ✓ Cooperate with JICA for the post-project evaluation.

(v) *End users:* Users of this program

- ✓ Install the EE&C equipment using the bank loan in the program.
- ✓ Repay the loan to the bank.
- ✓ Accommodate the site visits for monitoring by the intermediary FIs, MEMR or its consultants.
- ✓ Cooperate the survey regarding EE&C conducted by MEMR or JICA, as requested.

These responsibilities are summarized in the following diagram.

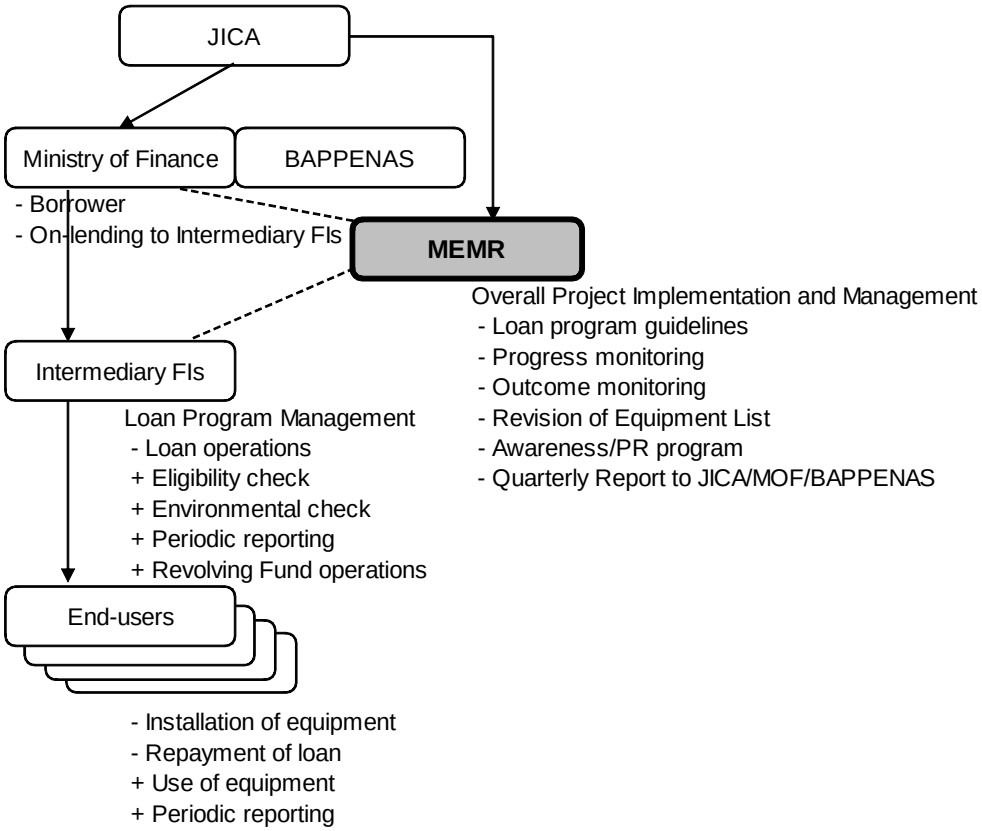


Figure 3.1.1-1 Responsibilities of the Relevant Parties

3.1.2 Details of Technical Evaluation Processes

(1) Technical Evaluation Process in the Financial Institutions

As described in Section 2.1, the EE&C equipment list approach is recommended for the technical evaluation of sub-projects at the current stage.

For the EE&C equipment list approach, the technical evaluation processes would be implemented by financial institution together with finance evaluation processes, using the support of an outside technical consultant.

The technical evaluation on the EE&C equipment list approach would have two methods. They are the evaluation by using the type and model of equipment and the evaluation by using the specification. The former evaluation is simple and easy, but it is impossible that the EE&C equipment list covers all types and models of EE&C equipment from the start. On the other hand, the latter needs times and deeper technical knowledge to evaluate the equipment, but it is possible to evaluate all equipment.

The attached EE&C equipment list is completed by using the specification. And the types and models of equipment were collected on the survey and added in the list as examples. They are the products from manufacturers who cooperated to provide the produce details to the Study Team for the survey. The other products can be added to the list if the specification can be confirmed as equivalent as the one in the list based on the following process. The flow of the technical evaluation by using this list is illustrated as the Figure 3.1.2-1.

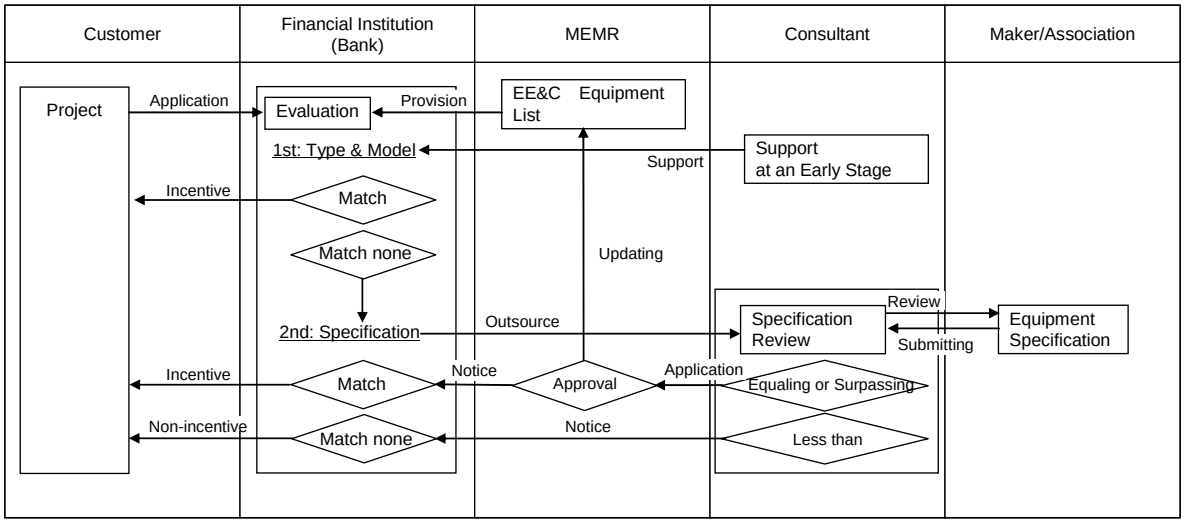


Figure 3.1.2-1 Flow of Technical Evaluation

The first step is the evaluation by using the type and model introduced in the list. In case that the equipment on the loan application matches with the type and model described in the list, the equipment is evaluated as eligible for the incentive project. At an early stage, if needed, this evaluation would be supported by an outside technical consultant.

However, in case that the equipment on the loan application does not match with the type and model introduced in the list, the evaluation by using the specification needs to be conducted. The evaluation will be conducted by an outside technical consultant, since this work needs the technical knowledge and judgment. Regarding the equipment which meets the specification in the EE&C equipment list, the consultant submits the application to MEMR in order to add the type and model of equipment to the list. MEMR approves it as the eligible equipment for the incentive program and update the list.

When reviewing the specification of submitted equipment, the consultant needs to inquire about

the specification to the manufacturers directly and evaluate if the specification of the submitted equipment is equivalent to or surpassing the specification in the list in the view of energy efficiency.

(2) Technical Processes to Maintain the EE&C Equipment List

Regarding the EE&C equipment list, in addition to the above evaluation process, the monitoring of the equipment's performance in the list in terms of energy efficiency and the updating the list will be needed in order to maintain the list. MEMR is responsible for the EE&C equipment list. Therefore, these tasks are assumed by MEMR. The processes of these tasks are discussed as follows:

1) Monitoring of the Equipment's Performance in the List in Terms of Energy Efficiency

It is important to inspect the specification and performance of the equipment in the list in order to keep the reliability of the list. The flow of the monitoring process is shown in Figure 3.1.2-2.

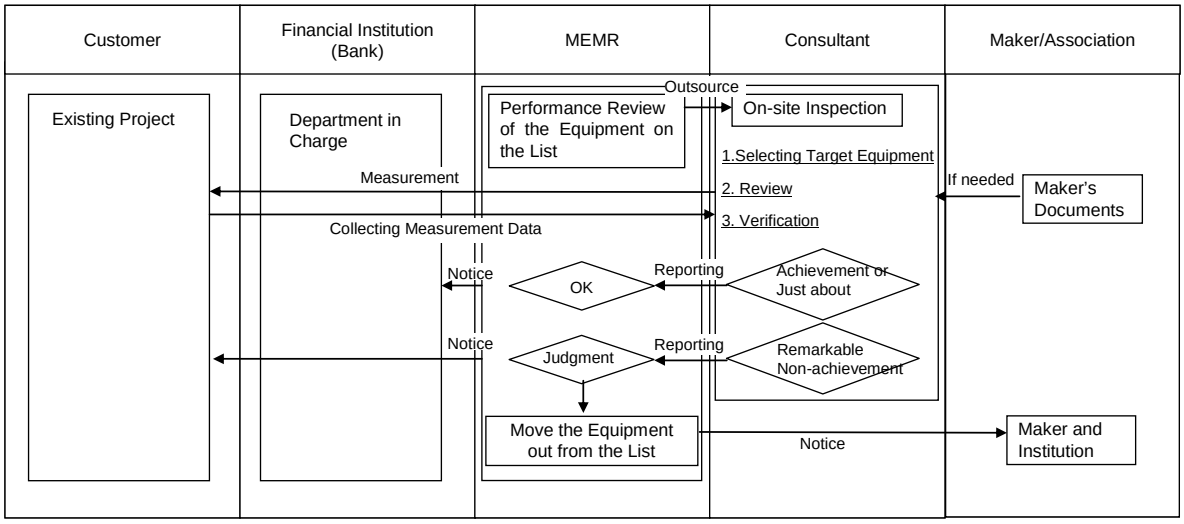


Figure 3.1.2-2 Flow of Equipment Performance Monitoring

In order to prevent fraud like the inaccurate or false specification to be submitted, MEMR needs to conduct the on-site inspections without advance notice in a random manner, especially for the equipment with bad reputation. MEMR is responsible for this monitoring, but can outsource this process to an outside technical consultant. The consultant should report the result of monitoring to MEMR. When the remarkable non-achievement of performance or the fraud of specification was found, MEMR should remove the equipment out from the list.

2) Updating the EE&C Equipment List

Updating the EE&C equipment list is needed after TSL started. The flow of the updating process is shown in Figure 3.1.2-3.

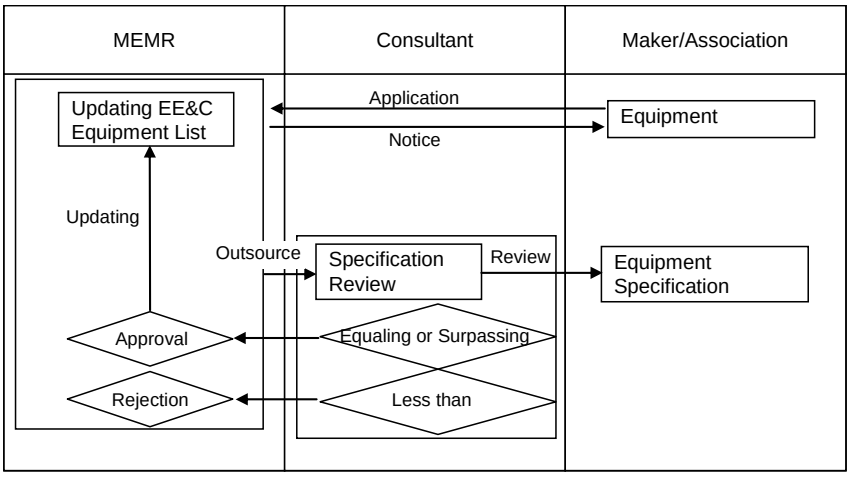


Figure 3.1.2-3 Flow of Updating EE&C Equipment List

It is desirable that MEMR is responsible for update the EE&C equipment list upon receiving the applications from a manufacturers or industrial associations. The specification review may be outsourced to an external technical consultant. Regarding the equipment which meets the specification in the EE&C equipment list, the consultant submits the application to MEMR in order to add the type and model of equipment to the list. MEMR approves it as the eligible equipment for the incentive program and update the list.

When reviewing the specification of submitted equipment, the consultant inquires about the specification to the manufacturers directly and evaluate if the specification is equivalent to or surpassing the specification in the list in the view of energy efficiency.

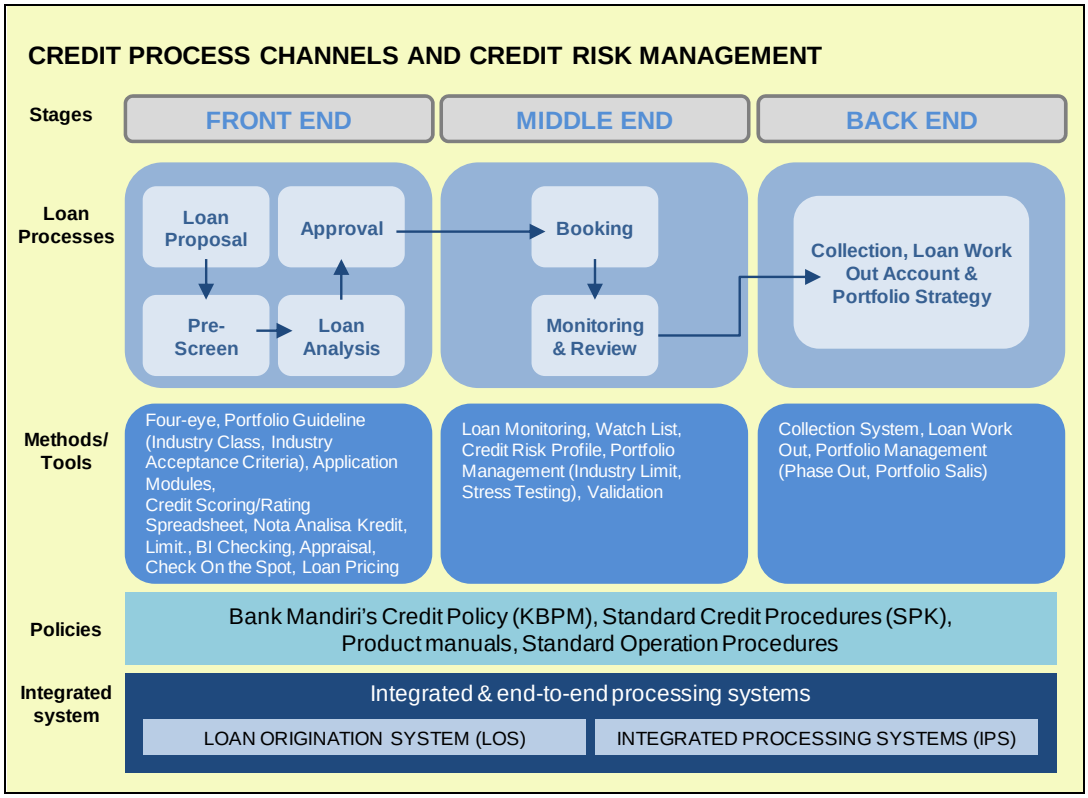
As described above, the supports by external technical consultants, which are independent and have sufficient knowledge and experiences in the EE&C field, will be necessary to implement TSL. The local consultant like EMI is one of candidates as the external technical consultant. However, the experience in the EE&C field in Indonesia is limited at present. So, the capacity building by the international consultants with extensive knowledge and experiences will be helpful.

3.1.3 Details of Financial Evaluation Processes

State-owned banks in Indonesia are considered to have already established risk management system in line with global practices. Below is an example from Bank Mandiri.

Bank Mandiri has adopted structured “four-eye approval process” for credit approval and monitoring process, in which credit decisions are made separately from marketing activities of business units[20].

[20] Bank Mandiri Annual Report 2010, page 5



Source: Bank Mandiri Annual Report 2010, page 241

Figure 3.1.3-1 Credit Process Channels and Credit Risk Management at Bank Mandiri

Under four-eye principle concept, each loan approval involves Business Unit and Credit Risk Management Unit which work independently to make an objective credit decision. The four-eye principle is executed by Credit Committee according to the authority limit and the loan approval process is conducted through Credit Committee Meeting mechanism. As Credit Committee members, the credit authority holders must be highly competent as well as having strong capacity and integrity so that the loan granting process can be conducted comprehensively and prudently.

To monitor the performance of the credit authority holders in approving and maintaining loans, the Bank has developed a database for authority-holder monitoring. By using this system, the Bank can monitor the amount and quality of the loans approved by the credit authority holders, so that the performance of the authority holders can be monitored from time to time.

To identify and measure risk of each credit application processed in the transactional level, the Bank uses Rating and Scoring systems. The Rating and Scoring systems consist of Bank Mandiri Rating System (BMRS), Small Medium Enterprise Scoring System (SMESS), Micro Banking Scoring System (MBSS) and Consumer Scoring System. The Bank can decide the risk level for each debtor individually according to each risk class (rating). [21]

[21] Bank Mandiri Annual Report, 2010, Appendix 5, p.149

3.2 Lending Guidelines for End-users

As mentioned in Section 2.3.4, all the risk assessments, negotiations and risk takings are born by the implementing banks. At the same time, many of Indonesian banks have already established their lending guidelines that are in compliance with financial, social, environmental and other regulations in Indonesia. Therefore, exiting lending guidelines at implementing banks should be applied, except for the following conditions.

3.2.1 Eligibility of End-users

Borrowers have to be "the end users" of the machinery included in the EE&C equipment list. There should not be any other restriction on end-users, in terms of size, industry and nationality.

3.2.2 Eligibility of Sub-projects

The use of funds has to be for the investment in machinery included in the EE&C equipment list.

3.2.3 Loan Details

(1) Interest Rate

The interest rate normally charged by the implementing bank less certain percentage.
Discount amount shall be decided by the negotiation with the implementing banks.
For detailed discussion, see Section 2.3.3 (1).

(2) Repayment Period

The same condition as the implementing banks normally set.

(3) Requirements for Collaterals

The same condition as the implementing banks normally set.

(4) Upper Limits of Lending

Up to 85% of investment amount for acquisition and installation of machinery included in the EE&C equipment list

Such investment costs include;

- Purchase price of machinery
- Construction, electrical and other works required for installation
- Design for such required works
- Consultant costs
- Transaction costs such as commission or freight
- Relevant taxes
- Other cost necessary for acquisition or installation

85% limit is set by JICA's guideline which limits the lending ratio to 85% of project costs.

From lenders' point of view, maximum lending limit should be decided by the credit risk of a borrower and collateral coverage. Since most of equipments to be financed shall not be the collateral by itself, bank can finance entire investment amount, if banks are comfortable with the credit risk of the borrower and the value of collateral.

(5) Debt-Equity Ratio of Sub-projects

Debt-equity ratio does not apply.

Since many of the loans are made for purchase of machinery by the borrower and not for implementation of independently functional projects or non-recourse asset-based finance, it would not be appropriate or relevant to calculate project-base equity ratio.

Appropriateness of debt-equity ratio for business entity, be it a single-purpose project or a permanent company, is judged against the level and the stability of the expected profit. If the profit level is expected to be low, debt-equity ratio should also be low to keep the conservative level of interest payment and principle repayment. If the profit is expected to be volatile, debt-equity ratio should be low to prepare for the down turn.

Also, debt-equity ratio is important for non-recourse asset-based finance for marketable assets, such as real estates and automobiles. In this case, equity provides a cushion for deterioration of future resale value.

The purpose of TSL, however, is to provide incentives for the purchase of EE&C equipments, which neither generate any income by itself nor are marketable assets. That is why the non-recourse financing is difficult and the collateral other than EE&C equipments to be financed will be required by implementing banks. Therefore, debt-equity ratio analysis should be carried out against the final borrowers' creditworthiness or values of collateral provided, but not against the value and equity of EE&C equipments to be financed.

(6) Impact on Environment

Upon the submission of loan application, the potential borrowers are required to submit the confirmation regarding the impact on environment. This is not necessarily requirement from the banks, but the requirement for JICA loan.

3.3 Consulting Services and Technical Assistance

3.3.1 Role of the Directorate of Energy Conservation, MEMR

As explained in Section 3.1.1, the MEMR will take leading role of project implementation. The Directorate of Energy Conservation in the General Directorate of New Renewable Energy and Energy Conservation (DGREEC) will be in-charge of the Project. DGREEC was created very recently only one year ago (in 2010) by spinning out from the General Directorate of Electricity and Energy Utilization. The Directorate and its staff are in the process of acquiring specific knowledge of

promoting energy efficiency in Indonesia.

For the implementation of the Project, the Directorate will take responsibility of overall project implementation and management. The major tasks are;

- Preparation of loan operations guidelines
- Progress monitoring
- Outcome monitoring
- Revision of the EE&C equipment list
- Awareness and public relations program
- Periodical reporting to JICA/MOF/BAPPENAS

As mentioned above, the Directorate is very new, and has limited experiences of (i) promoting energy efficiency investment, (ii) project monitoring and management of such large scale, and (iii) JICA's loan project. Therefore, it is advisable to obtain outside support for smooth take of the project and for complementing the administrating works perfectly. More specifically, it is recommended to use (i) JICA's technical assistance on grant basis to support loan project implementation, and (ii) Local consultants for project management to be hired by MEMR under loan project.

The shared roles among MEMR, loan consultants and JICA technical assistance are as follows;

- MEMR
  - Responsible for project implementation and management as Implementing Agency
  - Project Management Unit (PMU) with the Project Director, and Deputy Project Director and small number of supporting staff
  - Project management with the support of;
    (a) sub-contract to local consultants, and
    (b) support from JICA T/A (dispatch international experts)
- Loan consultants
  - Mainly administrative and secretarial works under guidance from Project Director
  - Managing and monitoring the Project as representatives of MEMR
  - Advising technical matters to MEMR
- JICA T/A
  - Filing the gap, and for smooth take-off, mainly at beginning until mobilization of loan consultants
  - Technology transfer to support Indonesia's new challenges

3.3.2 Proposed Consulting Services in Loan Project

Though MEMR is responsible for project implementation and management, it does not have enough number of staff to take care of all aspects of project management. Therefore, hiring local consultants is proposed to remove part of their burden by delegating mainly routine matters to the local consultants. These assignments include some technical and financial matters, where MEMR does not have enough expertise. The cost of hiring consultants will be born by the MEMR by utilizing JICA

loan proceeds.

The scope of consulting services covers mainly in the following areas;

(a) Project management and record keeping

- Assisting PMU for project management and progress monitoring
- Assisting PMU for periodical reporting to JICA/MOF/BAPPENAS
- Implementation/sub-contracting awareness/PR programs

(b) Technical review of candidate equipment/process for updating the EE&C equipment list

- As explained in Section in 3.1.2

(c) Ex-post review and confirmation

- Ex-post confirmation of subproject eligibility, and field investigation on sample base
- Ex-post confirmation of environmental clearance
- Measurement of project outcomes

- Experts
  - Energy efficiency
    - team leader
    - electrical engineer
    - mechanical engineer
  - Project/financial management
    - Project/financial management expert
    - Secretary (one or two)

- Mobilization
  - December of the 1st year, after selection and contract procedure of six months

- Cost estimate
  - Personnel: Rp 30 mil. * (50 months * 5 persons) = Rp 7,500 mil.
  - Direct cost for office space, transportation, communications, etc.
    : Rp 40 mil. * 50 months = Rp 2,000 mil.
  - Awareness Program: Rp 500 mil. * 4 years = Rp 2,000 mil.
  - Total = Rp 11,500 mil. (=JPY 100 mil.)

3.3.3 Proposed Technical Assistance from JICA to Implement TSL

The proposed low interest loan using TSL scheme with the EE&C equipment list is a new challenge for Indonesia. There have not been any incentive facilities in energy efficiency promotion in this scale. The challenge is also new to MEMR. Therefore, MEMR needs to build up its capability to carry out the Project smoothly and effectively.

JICA, when required, provides technical assistance to new loan projects, with specific objectives of (i)

technical support in challenging areas where special knowledge and expertise inputs are essential, (ii) smooth and quick take off projects of implementing agencies who are not very familiar with JICA loan. This type of technical assistance is usually provided at initial stage of loan project implementation. In some cases, the assistance is provided at middle of the project when such necessity is arisen.

Both components of (i) and (ii) of the above are applicable to this proposed project. Specific tasks are explained below;

(1) Maintenance of EE&C Equipment List

Initial equipment list has been developed under current JICA's study. The list needs to be updated by adding new energy efficiency equipment/process. The updating must be carried out regularly and timely manner to meet the demand of end-users. It is the responsibility of MEMR to maintain the EE&C equipment list, but need support from outside resources. At the initial stage until the loan consultants are hired, JICA technical assistance may review the newly proposed equipment in the market whether it is qualified for eligible item under the project or not, and make the revised list ready for approval by MEMR.

(2) Development of Sub-project Monitoring Mechanism

The Project needs to establish effective and efficient project management and monitoring mechanism, including ex-post review and monitoring of (i) sub-project eligibility, (ii) environmental clearance, and (iii) expected and realized benefits. Methodology of field surveys on sample basis to assure the above (i), (ii) and (iii) is also to be developed and institutionalized.

(3) Management and Related Transactions of Japanese Yen

As mentioned in Section 2.3.2, banks in Indonesia are not accustomed to deal with JPY as a lending currency. At the same time, recipient banks of JICA loan need to go into ultra-long-term interest rate swap in order to benefit from low-interest nature as a ultra-long-term funds if TSL scheme through the state-owned bank is taken.

To increase acceptance of JICA loan by commercial banks, technical assistance should be provided on the matters including;

a) Knowledge on JPY related swap transactions
b) Means of managing idle JPY assets, such as short term notes or CDs
c) Knowledge on JPY interest rate swaps and other long term derivative transactions
d) Establishment and maintenance of swap counterparty limits with international banks for ultra-long-term transactions, including but not limited to ISDA CSA[22]
e) Negotiation skills for establishment and maintenance of swap lines with international banks

[22] Credit Support Annex set by International Swap and Derivative Association, Inc. Under this framework, banks exchange collaterals to offset net open positions.

(4) JICA's ODA Loan Procedures

As the Directorate of Energy Conservation in MEMR is the first time to implement JICA loan project, the staff are unfamiliar with the procedures of JICA loan. The procedures in terms of loan agreement and associated guidelines include; (i) matters requiring concurrence from JICA, (ii) disbursement, (iii) periodical reporting of project implementation, (iv) financial audit of expenditures and disbursement. Some of these activities are relevant not only MEMR but also PFIs.

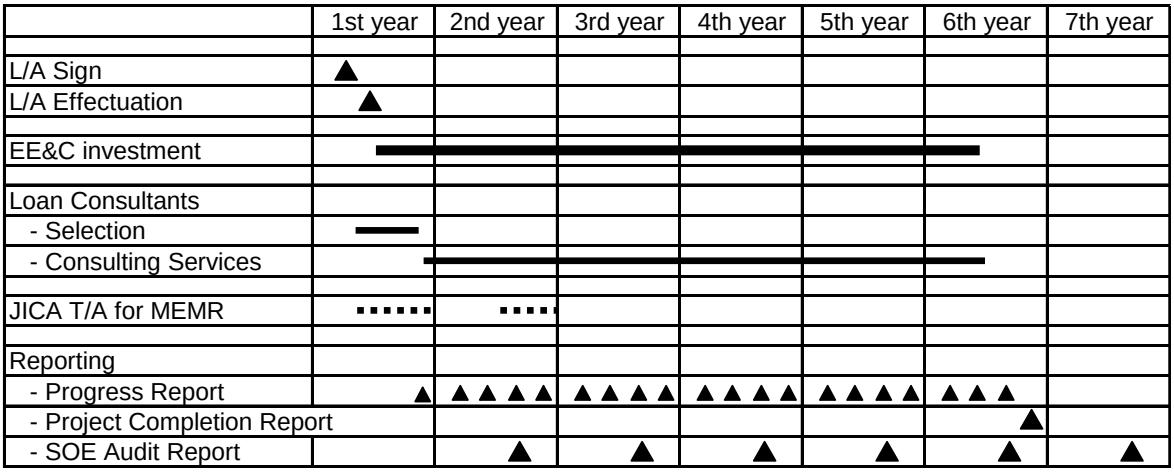
(5) Technology and Knowledge Transfer to MEMR and Loan Consultants

All of outputs of the above are to be transferred to MEMR and loan consultants, in order for them to implement their duties without further technical assistance from JICA

- Experts required
  - Energy efficiency:
    - team leader
    - electrical engineer
    - mechanical engineer
  - Expert for project/environmental monitoring and management
  - Financial/banking expert
  - Local consultants (energy efficiency, project management)
- Implementation period
  - Phase 1: Apr of the 1st year (L/A sign) – Dec of the 1st year (mobilization of consultants)
  - Phase 2 (if required): Six months in 2nd year

3.4 Project Implementation Schedule

The project implementation schedule is shown in the following figure, and explanations are given under the figure.



Note) L/A: Loan Agreement
SOE: Statement of Expenditure

Figure 3.4-1 Project Implementation Schedule

- The loan agreement is assumed to be assigned in March of the 1st year.
- The loan agreement will become effective within three months from signing of loan agreement, i.e. June of the 1st year.
- The period of project implementation is, in principle, flexible, because the Project consists of bulk of sub-projects that are small scale, and short implementation period. The demand estimate for EE&C has been done as described in Section 2.1, for the five-year period. Therefore, implementation period of the Project is set for five years, starting in mid. of the 1st year and ending in mid. of the 6th year. The Project, however, will be implemented and completed based on actual demand. The Project will become end, when the loan amount is fully disbursed.
- The selection of loan consultants takes six months. The process for selection starts as soon as the loan agreement is signed. The loan consultants are scheduled to be mobilized in December of the 1st year.
- The selection of consultants for JICA technical assistance will be commenced as soon as the loan agreement is signed. JICA's selection procedure does not take time, and consultants are scheduled to be mobilized in mid. of the 1st year.
- There are requirements with regard to report submissions specified in the loan agreements. These include; Quarterly Progress Report, Project Completion Report, and SOE Audit Report.

3.5 Project Cost and Financing Plan

3.5.1 Project Cost

(1) Investment for EE&C

As discussed in Chapter 2, the total investment potential for EE&C equipment is estimated approximately 1 billion USD over the five years. Based on this potential, the ODA loan size is

estimated as follows:

$$ODAloan = Potential \times a_1 \times a_2 \quad \text{(i)}$$

Potential: The potential investment amount for EE&C

α_1*:* Firms using banks to invest (% of firms)

α_2*:* The market share of the top 10 banks in Indonesia

According to the study by World Bank data, the percentage for the firms who use the bank loan for the capital investment is not high in Indonesia (11.70%) compared with the other countries. Therefore, in order to make the conservative estimation, only parts of the investment amount in Chapter 2 are assumed to be financed by the banks in this TSL. Therefore, 11.70% is assumed for α_1.

Furthermore, not necessarily all banks will participate in this TSL program. Therefore, in this estimation, the top 10 banks in Indonesia are assumed to participate in the program; namelyα_2 is assumed at 63.15%, using Bank Indonesia statistics as of September 2011. In "the scheme through PIP" described in Section 2.1, PIP can on-lend the money to the commercial banks as long as these banks are interested and the number of the banks is limited to the manageable level; thus, assuming the top 10 banks' market share is reasonable. In "the scheme through the state-owned banks" in Section 2.1, there is the possibility that the intermediary bank is initially the single bank, considering the potential high transaction cost required due to the several banks' involvement in order to manage the program. On the other hand, if this intermediary bank is the bank with the large loan portfolio, the bank is likely to have no difficulty finding the borrowers to extend the proposed loan.[23]

Insert these assumptions in (i).

$$ODAloan = Potential \times 11.70\% \times 63.15\% \quad \text{(ii)}$$

Since the investment potential is estimated as USD 1,070.23 mil. in Section of 2.1, ODA loan is USD 79.08 mil. using (ii), which is equivalent to approximately JPY 6 billion.[24].

(2) Cost of Consulting Services

As discussed in Section 3.3.2, local consultants will be employed to support project management activities of MEMR. The cost consulting services for five years is estimated as Rp 11,500 mil., which is approximately JPY 100 mil.

(3) Total Project Cost

The total project cost is the sum of above (1) and (2), as shown in the following table.

[23] For example, the loan disbursed by Bank Mandiri in 2010 is Rp 57.4 trillion. equivalent to USD 6.5 billion approximately. (Source: Bank Mandiri Annual report 2010. USD1.0= Rp 8840 (Bloomberg, as of 24 October 2011)). Assuming the ODA loan size is USD 79,075, it is conservative enough to assume that the bank will be able to disburse this loan.

[24] USD 1.0 = JPY 76.2 (Bloomberg, as of 24 October 2011)

Table 3.5.1-1 Estimated Project Cost

(JPY mil.)

Item	Total
Sub-loan for EE&C Sub-projects	6,000
Loan Consultants	100
Total	6,100

USD 1 = JPY 76.2 = Rp 8,840

(4) Annual Fund Requirement

As explained in Section 3.4, the project implementation period is five years; starting from mid. of the 1st year and completing in mid. of the 6th year. The lending volume is assumed to be evenly distributed for five years. For consulting services, due to time taken for selection procedure, the consultants will be mobilized in December of the 1st year at the earliest. Therefore, only nominal amount is allocated in the 1st year.

Based on above assumption, the annual fund requirement is estimated as follows;

Table 3.5.1-2 Annual Fund Requirement

(JPY mil.)

Period	Lending	Consultant	Total
1st year	600	1	601
2nd year	1,200	22	1,222
3rd year	1,200	22	1,222
4th year	1,200	22	1,222
5th year	1,200	22	1,222
6th year	600	11	611
Total	6,000	100	6,100

3.5.2 Financing Plan

JICA's ODA loan is to cover, as a general rule, maximum 85% of total project cost or total foreign currency component. Some sub-projects under the Project may require foreign currency transactions, but not many. Therefore, the rule of maximum 85% will be applied in this case. Thus, the amount of JICA loan would be JPY 5,185 mil.

Suppose 100% of the consulting service cost (JPY 100 mil.) is covered by JICA loan, the balance 5,085 will be allocated for lending for sub-project implementation. The balance 915 mil. will be born by PFI and/or end-users.

Table 3.5.2-1 Financing Plan

(JPY mil.)

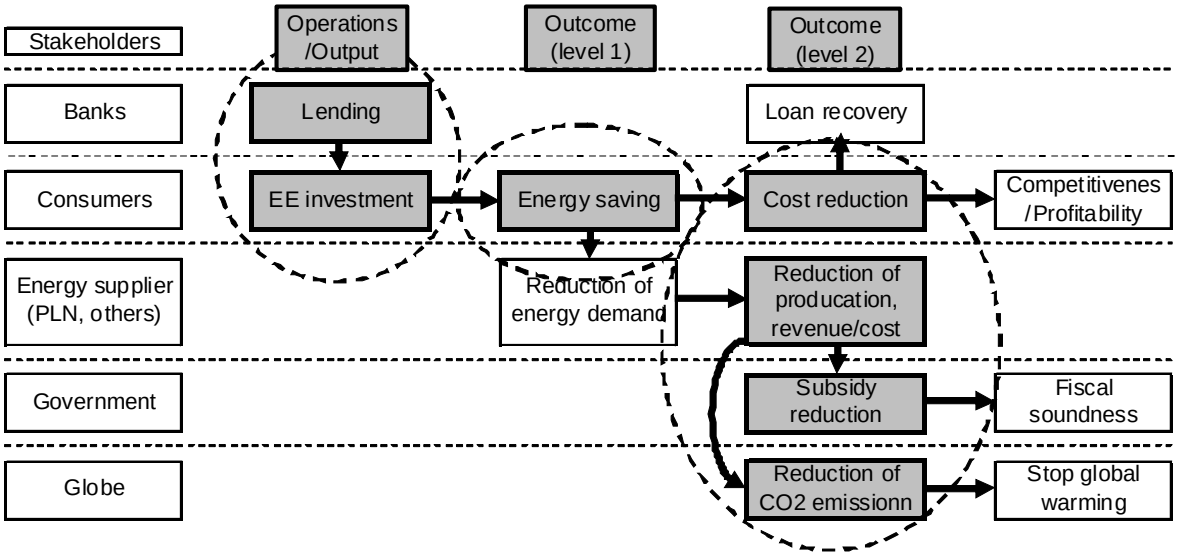
Item	Total	ODA loan	End-user /PFI
Lending for EE&C	6,000	5,085	915
Loan Consultant	100	100	0
Total	6,100	5,185	915

USD 1 = JPY 76.2 = Rp 8,840

Chapter 4 Project Evaluation

4.1 Project Beneficiaries and Performance Indicators

The classified results of project implementation can be shown in the following table. It follows the Logic Model; input, activity, output, outcome. The chart also shows kind of stakeholders involved. These stakeholders are major beneficiaries of the Projects.



Source: JICA Study Team

Figure 4.1-1 Sequence of Project Activity to Outcomes

For selecting performance indicators, guiding principles are (i) indicator's relevance (appropriateness to measure performance), (ii) reliability (scientifically appropriate), (iii) easiness and low cost for data collection. The following indicators are proposed to measure the performance of the project.

(a) Operation indicators: Number of sub-projects, Total EE&C investment amount, etc,

(b) Effect indicators: Reduction of energy consumption (TOE, kWh, etc), Reduction of energy cost (payments), Electricity subsidies paid to PLN, Reduction of GHG emission, etc.

The Project Management Unit (PMU) of MEMR is responsible (i) to monitor the progress during implementation and (ii) to measure outcomes at ex-post evaluation stage. More specifically, PMU need to do the following with cooperation from PFIs.

(a) To have applicants for sub-loan fill-in information about expected energy savings (type of energy and amount of energy saving) in loan application form

(b) To verify actual energy savings from the Project, at ex-post evaluation stage, on sample basis

4.2 Evaluation of Quantitative Effects

As explained in the previous section, performance indicators quantitatively measurable are; number of sub-projects, total EE&C investment amount, reduction of energy consumption (TOE, kWh, etc), reduction of energy cost (payments), government's electricity subsidies paid to PLN, reduction of GHG emission, etc. In this section, trials are made to make estimates of project benefits such as (i) reduction of energy consumption (TOE, kWh, etc), (ii) reduction of energy cost (payments), (iii) government's electricity subsidies paid to PLN, (iv) reduction of GHG emission as a result of investment made by the Project.

(1) EE&C Investment

The allocated budget for the Project is set as JPY 6,000 mil. equivalent to Rp 696 billion, explained in Section 3.5. Proportion of sector distribution among (i) commercial sector, (ii) industry sector, and (iii) transportation is assumed to be same as one shown in Section 2.2. Distribution of allocated Rp 696 billion is shown in Table 4.2-1. Commercial sector accounts for 84% and industry for 14%.

Table 4.2-1 Major EE&C Investment Items and Estimated Investment Amount

Sector	Energy efficiency investment item	Investment	
		Rp mil.	(Equiv JPY mil.)
Commercial	Transformer, A/C, Lighting, Heat source, Building management	584,872	(5,042)
Industry	Utility/management, Steel process, Cement, Dying/finishing, Furnace, Insulation	97,092	(837)
Transportation	Articulated bus	14,036	(121)
Total		696,000	(6,000)

Source: JICA Study Team

(2) Energy Savings: Consumers' Benefit

Expected energy saving from the EE&C investment is different from one sector to another. The next table shows the expected annual energy saving amount from the Rp 696 billion investment. A 90% of electricity saving comes from commercial sector, and other savings in oil, coal, and natural gas come from industry.

Table 4.2-2 Expected Annual Energy Savings from Investment

Sector	Investment	Expected **Annual** Savings				
		Electricity	Oil	Coal	Natural Gas	CNG
	(Rp mil.)	(1,000 kWh)	(1,000 liter)	(1,000 kg)	(1,000 m^3N)	(1,000 m^3N)
Commercial	584,872	98,584	12	0	0	0
Industry	97,092	11,966	3,730	22	805	0
Transportation	14,036	0	0	0	0	46
Total	696,000	110,550	3,742	22	805	46

Source: JICA Study Team

The unit price of energy charged to consumers are summarized in Table 4.2-3.

Table 4.2-3 Unit Price of Energy

Sector	Electricity	Oil	Coal	Natural Gas	CNG
	(Rp per kWh)	(Rp per liter)	(Rp per kg)	(Rp per m^3N)	(Rp per m^3N)
Commercial	850	9,000	-	-	-
Industry	680	9,000	8,840	2,014	-
Transportation	-	-	-	-	3,333

Source: JICA Study Team

The benefit (in monetary term) gained by end-uses are shown in Table 4.2-4. The commercial sector accounts for 66% and industry for 34%. By kind of energy, 72% for electricity saving and 26% for oil saving.

Table 4.2-4 Expected Annual Saving (Money Term) from Investment

(Rp mil.)

Sector	Expected **Annual** Savings					TOTAL
	Electricity	Oil	Coal	Natural Gas	CNG	
Commercial	83,797	112	-	-	-	83,909
Industry	8,137	33,566	193	1,621	-	43,517
Transportation	-	-	-	-	154	154
Total	91,934	33,678	193	1,621	154	127,579

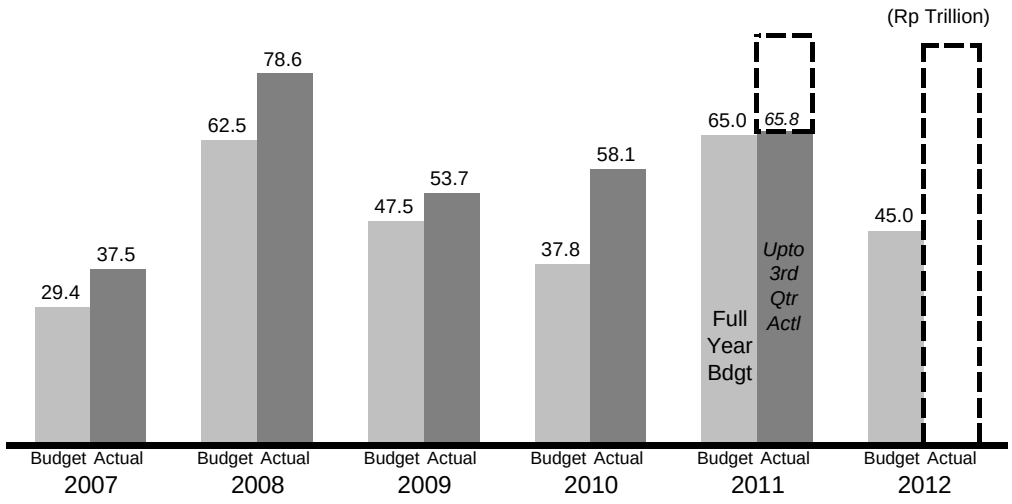
Source: JICA Study Team

(3) Energy Savings: Government Benefit

The government of Indonesia has its policy to make electricity tariff below the cost for those who need such government support. Differences between supply cost and charge to consumer are subsidized by the Government. The Government has a plan to raise the tariff reflecting the supply cost, but the adjustments are not smooth as the Government expected due to objections expressed by consumer groups. The actual subsidies in recent years are kept at high level due to the historical high level of world energy prices. Figure 4.2-1 shows the historical movement of electricity subsidy together with allocated budget for each year. The highest was amounted to Rp 78.6 trillion recorded in 2008. This amount is more than the Government total capital expenditure

in 2008 (Rp 73 trillion) and more than the sum of Government education and health expenditure (Rp 69 trillion). In this year of 2011 up to 3rd Quarter, the amount already incurred by PLN reached to Rp 65.8 trillion. If same pace was kept for entire year, it would reach to the highest in the history of more than Rp 80 trillion.

The world energy prices are predicted to be at high by many energy experts, thus it may be difficult to reduce the subsidy unless the tariff is adjusted upward regularly.



Source: MEMR and PLN Financial Statements (various years)

Figure 4.2-1 Amount of Electricity Subsidy: Budgeted Amount and Actual (2007-2010)

The electricity subsidy by the Government, in relation to energy efficiency improvement, the consumers' action for energy efficiency, therefore, brings benefit to the Government in the form of subsidy reduction. This is very much different from other kinds of energy that are in principle reflecting the cost of supply (thus no additional benefit to government by consumers' energy saving).

(4) Subsidy Formula

The electricity subsidy is calculated by the following formula (Regulations of Ministry of Finance No. 111/PMK.02/2007 and No. 162/PMK.02/2007).

Subsidy = Σ - (HJTL – (BPP * (1 + m)) * V

Where; (i) HJTL: Electricity tariff by consumer category (Rp/kWh)
(ii) BPP: Cost of supply (Rp/kWh)
(iii) m: margin (%)
(iv) V: Sales volume (kWh)

The electricity subsidy is computed as the negative difference between the average sales prices (Rp/kWh) of each tariff category less the cost of electricity supplies on the voltage for each tariff category multiplied by the electricity sales volume (kWh) of each tariff category. The cost of supply is computed based on the formula, including the rate of transmission and distribution

losses which is determined by the Directorate General of Electricity and Energy Consumption under the MEMR. The amount of subsidy includes 8% margin above the costs of supplies electricity.

Table 4.2-5 shows the tariff and sales volume of commercial (business) sector and industry. The tariff consists of kWh charge, PF adjustment and peak/off-peck differences. In order to simplify the calculation, which does not affect much of its results, only off-peak kWh charges are taken into account.

Table 4.2-5 Electricity Tariff Category and Sales

Tariff Category	Supply voltage	Tariff (Rp/kWh)	Sales 2010 (GWh)	Share of sales (%)
Business				
B-1	LV	905	3,529	5%
B-2	**LV**	**900**	**10,437**	**14%**
B-3	**MV**	**800**	**11,258**	**15%**
Industry				
I-1	LV	915	145	0%
I-2	LV	800	3,847	5%
I-3	**MV**	**680**	**35,189**	**46%**
I-4	HV	605	11,804	15%
TOTAL			76,209	100%

B-2, B-3 are major categories in business sector, and I-3 in industrial sector.
Source: PLN

(5) Electricity Supply Cost and Subsidy

The costs of supply are different among voltage level. There are some data and implications about the cost of supply.

(i) PLN publication for 1st half 2011[25] BPPs: Rp 1,044/kWh for low voltage (LV), Rp 898/kWh for medium voltage (MV), Rp 849/kWh for high voltage (HV). The weighted average is Rp 979/kWh.

(ii) PLN Financial Statements 2010: Estimated BPP as average of all tariff categories Rp 1,012/kWh.

(iii) PLN Financial Statement 1st Half of 2011: Estimated BPP as average of all tariff categories Rp 1,132/kWh

(iv) Government Budget information for 2012[26]: Estimated BPP as average of all tariff categories Rp 988/kWh

(i) and (iv) is nearly equal. (ii) is higher by 3% above (i) and (iv). (iii) is higher by 12-15% above (i) (ii) and (iv). BPP used for 2012 may be too small.

An 8% margin is added to the above cost of supply. Estimated government subsidies per kWh are shown in Table 4.2-6. These estimation is the lowest among the above four calculations

[25] PLN Investor Update, data covered up to 2nd Quarter 2010
[26] ANTARA News, "2012 Electricity Subsidy Proposed", May 2011

Table 4.2-6 Estimated Government Subsidies for Major Tariff Categories

Tariff Category	Supply voltage	(a) Tariff (Rp/kWh)	(b)Supply cost (Rp/kWh)	(c) Margin *) (Rp/kWh)	(d) Subsidy *) (Rp/kWh)
Business					
B-2	LV	900	1,044	84	**228**
B-3	MV	800	898	72	**170**
Industry					
I-3	MV	680	898	72	**290**

*) (c) Margin = (b) * 8%

(d) Subsidy = (b) + (c) - (a)

Source: JICA Study Team

It is necessary to merge two numbers in business sector into one for calculation. The results are shown in Table 4.2-7. The assumed average subsidy per kWh for commercial sector is Rp 200, and for industrial sector Rp 290 per kWh.

Table 4.2-7 Average Electricity Subsidy for Each Sector

Tariff Category	Supply voltage	Tariff (Rp/kWh)	Subsidy (Rp/kWh)
B-2/B-3	LV/MV	850	200
I-3	MV	680	290

Source:: JICA Study Team

(6) Government Subsidy Savings

From Table 4.2-7 and Table 4.2-2, the total government annual subsidy reduction is estimated as Rp 23 trillion annually, when investment of Rp 696 billion is made by private sector.

.

Table 4.2-8 Estimated Reduction of Annual Government Subsidy

(Rp mil.)

Sector	Expected **Annual Government** Savings					TOTAL
	Electricity	Oil	Coal	Natural Gas	CNG	
Commercial	19,717	-	-	-	-	19,717
Industry	3,470	-	-	-	-	3,470
Transportation	-	-	-	-	-	0
Total	23,187	0	0	0	0	23,187

Source: JICA Study Team

By the investment of Rp 696 billion by energy consumers, annual benefit of consumers is Rp 128 billion, and government benefit is Rp 23 billion

Table 4.2-9 Consumer Saving and Government Saving

(Rp mil.)

Investment	Annual Savings		
	Consumers	Government	TOTAL
696,000	127,579	23,187	150,766
	85%	15%	100%

Source: JICA Study Team

(7) Reduction of CO_2 Emission

Reduction of CO_2 emission is also a benefit derived from consumers' EE&C investment. CO_2 emission factors used in this analysis are shown in Table 4.2-10.

Table 4.2-10 CO_2 Emission Factors

Sector	Electricity	Oil	Coal	Gas
	(kg-CO_2/kWh)	(kg-CO_2/kl)	(kg-CO_2/kg)	(kg-CO_2/m^3N)
CO_2 emission	0.72	2,560	1.65	2.00

Source: JICA Study Team

With the expected energy saving amounts shown in the Table 4.2-11, annual CO_2 emission reduction from the EE&C investment is estimated as nearly 91,000 ton- CO_2. Nearly 90% comes from electricity saving, followed by reduction of oil consumption.

Table 4.2-11 Annual CO_2 Emission Reduction

	Electricity	Oil	Coal	Gas	TOTAL
Annual Energy Savings	110,550	3,742	22	851	-
	(1,000 kWh)	(1,000 liter)	(1,000 kg)	(1,000 m3N)	
CO_2 emission Reduction (t-CO_2)	79,596	9,579	36	1,702	90,914

Source: JICA Study Team

(8) Conclusion

Consumers' Benefit

- With the Rp 696 billion investment, consumers can save energies consisting of; 111 GWh electricity, 3.7 mil. liter of oil, 22 tons of coal, and 850,000 m3N natural gas, annually.
- These savings are equivalent to Rp 128 billion annually.

Government Benefit

- By the investment of energy consumers, the Government can reduce its electricity subsidy by Rp 23 billion annually

Global Benefit

- Annual reduction of GHG reduction is estimated as 91,000 ton- CO_2.

- To realize various potential benefits
- Consumers do not go for energy saving under normal circumstances. If so, Government potential benefit (subsidy reduction) cannot be realized.
- Government benefit relies on consumers' decision and action. Right decision (go for energy efficiency) can be taken by consumers, if consumers recognize government support as "attractive".
- It is economically rational for Government to give incentives to consumers within expected government benefit to realize subsidy saving. The Government must consider economic optimization from national economic perspective.

4.3 Evaluation of Qualitative Effects

In addition to quantifiable effects directly attributable to the Project as explained above, there are some other positive effects which can be expected but are difficult to quantify. The following effects are examples of such effects.

- Improvement (reduction) of energy intensity, thus increase of produces competitiveness
- Stability of energy supply and improvement of energy security
- Raising awareness and consciousness of energy savings among general public
- Capacity development of policy implementation of MEMR for energy efficiency

Chapter 5 Environment and Social Considerations

5.1 Indonesian Laws and Regulation

(1) Characteristics of the Project

The proposed project is to promote the use of equipment and process which are qualified as energy efficient, using the low interest loan as incentive. Both (i) replacement of old equipment with new/efficient one and (ii) new installation are eligible for funding.

The sectors to be covered by the project are (i) commercial, (ii) industry and (iii) transportation sectors. Installation of equipment/process will be taken place in these sectors premises, i.e. in and around the factories and buildings. The project consists of bulk of sub-projects, and majority of them are small scale, and undertaken by a large number of sub-project proponents.

The equipment/process are expected to reduce energy consumptions, which consequently bring benefits of reduction of GHG emissions at energy supply side. Such positive environmental impacts are expected from the proposed project. It is, however, impossible to confirm no negative environmental impacts, as sub-projects are not specified at this stage. Also there may be exceptional cases where old inefficient equipment is removed and some harmful objects are disposed in an inappropriate way. Such exceptional cases need to be taken into account.

(2) Indonesia's Environmental Laws and Regulations Relating to the Project

Although judgment whether the sub-projects are with or without environmental impacts can not be made at this stage, it is possible to manage the occurrence of negative environmental impacts. This can be done by effectively linking legal and regulatory obligations of sub-project proponents and PFIs, into the proposed project implementation procedures. Therefore, as the first step, Indonesia's environmental laws and regulations are reviewed in connection with the project.

The first review is in the area of environmental and social considerations. This is the Law for Environmental Protection and Management (UU32/2009), and related Regulations.

Another one is the Bank Indonesia Regulation concerning Asset Quality Rating for Commercial Banks (No. 7/2/PBI/2005).

(3) The Law for Environmental Protection and Management (UU32/2009)

- The Law covers all the influencing changes in environment caused by a business and/or activity.
- Section 22: Every business or activity with significant environmental impacts must have AMDAL (Environmental Impact Assessment).
- Section 34: Every business or activity not included in the mandatory requirement for AMDAL must have UKL (Environmental Management Effort) –UPL (Environmental Monitoring Effort).

- Section 35: Business or activity that requires neither AMDAL nor UKL-UPL must make a statement for environmental management and monitoring.
- Section 36: Every business or activity classified as AMDAL or UKL-UPL required, must have environmental permit.
- In short, under Environmental Protection and Management Law, all business and activities are required either to obtain an environmental permit (AMDAL or UKL-UPL), or if such permit is not required to make a statement for environmental management and monitoring. Neither business nor activity is allowed without these documents.

(4) Bank Indonesia Regulation

- The Bank Indonesia (Central Bank) prescribes all commercial banks to take into consideration about the measures for environmental conservation when those banks evaluate their lending for classification based on the credit quality.
- It is the Bank Indonesia Regulation No. 7/2/PBI/2005 concerning Asset Quality Rating for Commercial Banks. The Regulation stipulates, in its Section 10, credit quality shall be classified on the basis of the following rating factors: a. Business prospects. Then it is stated in Article 11, that Business prospects include assessment of the following components: e. measures taken by the debtor to conserve the environment.
- The clause is included in view of the importance to take environmental management actions under the applicable laws and regulations, which are believed to influence their business prospects.

The laws and regulations in Indonesia are well developed and articulated. These legal and regulatory frameworks further need to secure applicability in the real situation. The next section examines practical procedure for the proposed project.

5.2 Clearance and Monitoring Mechanism

(1) JICA Environmental Guidelines

JICA has its own Guidelines for Environmental and Social Considerations (April 2010) for all projects that JICA supports under various assistance schemes. The objectives of the guidelines are to encourage Project proponents etc. to have appropriate consideration for environmental and social impacts, as well as to ensure that JICA's support for and examination of environmental and social considerations are conducted accordingly. The guidelines outline JICA's responsibilities and procedures, along with its requirements for project proponents etc., in order to facilitate the achievement of these objectives. JICA classifies projects into four categories according to the extent of environmental and social impacts, taking into account an outline of project, scale, site condition, etc.

The proposed project is likely to be classified as Category FI according to the Guidelines. Projects classified as Category FI are the projects if they satisfy all of the following requirements: JICA's funding of projects is provided to a financial intermediary or executing agency; the selection and appraisal of the sub-projects is substantially undertaken by such an institution only after JICA's approval of the funding, so that the sub-projects cannot be specified prior to JICA's approval of funding (or project appraisal); and those sub-projects are expected to have a potential impact on the environment [*even expected impacts are minimum, but not being proved as zero impact*].

(2) Environmental Review at JICA Loan Appraisal

A preliminary environmental review has been conducted in terms of built-in mechanism for environmental clearance. It has been done in accordance with the project category (FI in this case), as specified in Section 3.2.1 (4) of the Guidelines. The Guidelines stipulate the review process of Category FI project as follows;

1. JICA examines the related financial intermediary or executing agency to see whether appropriate environmental and social considerations as stated in the guidelines are ensured for projects in this category. JICA also examines institutional capacity in order to confirm environmental and social considerations of the financial intermediary or executing agency, and, if necessary, requires that adequate measures be taken to strengthen capacity.
2. The financial intermediary or executing agency examines the potential positive and negative environmental impacts of sub-projects and takes the necessary measures to avoid, minimize, mitigate, or compensate for potential negative impacts, as well as measures to promote positive impacts if any such measures are available.
3. In principle, JICA undertakes environmental reviews and information disclosure for the sub-projects prior to their implementation in a same manner as specified for Category A projects, if those sub-projects are likely to be under the cooperation projects.
4. JICA discloses the results of environmental reviews on its website after concluding agreement documents.

Under the proposed project, at sub-loan applicant (sub-project proponent) side, the loan applicant is required to take appropriate measures, in terms of the Indonesian Law for Environmental Protection and Management (UU32/2009), as explained in the previous section. The application form for sub-loan will be designed to include declaration about sub-project category in terms of Environmental Protection and Management Law (AMDAL, UKL-UPL, or not required). And if a project was classified as AMDAL or UKL-UPL project, the applicant must submit copy of its environmental permit. Under the proposed project, no Category A sub-project is expected to be implemented.

When receiving sub-loan application at PFI, the applications are reviewed for environmental

aspects in terms of Bank Indonesia Regulation for concerning Asset Quality Rating for Commercial Banks (No. 7/2/PBI/2005) as explained in the previous section. Banks need to take account of the environmental conservation measures pursued by the loan applicant in their assessment of business prospects. Through this procedure, the loan applicants are required to take environmental management actions under the applicable laws and regulations, if necessary and as required.

(3) Monitoring System

According to the JICA's Guidelines, as stipulated in Section 3.2.2, at project implementation stage, JICA confirms with project proponents etc. the results of monitoring the items that have significant environmental impacts. This is done in order to confirm that project proponents etc. are undertaking environmental and social considerations for projects that fall under Category FI.

The proposed Project includes consulting services as JICA technical assistance at initial stage, and as loan consultants for entire project period. The consultants are required to support MEMR to take proper actions for environmental monitoring. Under the proposed Project, a list of all approved sub-projects is required to be attached in the Quarterly Progress Report.

(4) Conclusion

- Negative pollution impact of subprojects under the energy efficiency project is unlikely, given the size and nature of subprojects. A positive impact of the subprojects should be emphasized, since the energy efficiency by nature contributes reduction of GHG emission reduction.
- Indonesia has a comprehensive law for environmental protection and management, and has a regulation which requires banks to confirm environmental conservation measure by debtors.
- When sub-project proponents submit loan application, they are required to declare environmental classification category (AMDAL/UKL-UPL/none), and it will be checked by PFI.
- All approved sub-projects and their environmental category are reported to JICA in Quarterly Progress Report.
- The activities related to environmental review and monitoring will be supported (i) by consultants employed by JICA technical assistance, and (ii) by consultants employed under the loan Project.
- From all of the above, the risks of negative environmental and social impacts are expected to be managed (i) by existing legal requirement, and (ii) by the built-in monitoring and management system.

Chapter 6 The Activities of International Development Agencies and Other Financial Institutions

There are two ongoing loan programs for EE&C by international development agencies. Also, another three programs are in preparation.

6.1 Loan Programs for EE&C in Indonesia by International Development Agencies

Table 6.1-1 Ongoing Loan Programs by Development Agencies at a Glance

Development Agency	AFD	KfW
Name of Loan / Purpose of Use	Energy efficiency and renewable energy (CO_2 emission)	Industrial efficiency and pollution control (IEPC)
Target Size of End-user	Any scale	SMEs
Total Amount	USD 100 mil. (JPY 7.6 billion)	EUR9 mil. = USD 12.5 mil.** (JPY 946 mil.)
Maximum Loan Size per Project	N/A	Rp1 billion = USD 113,112*(JPY 8.6 mil.)
Tenor	7 - 10 years (AFD – bank)	40 years (KfW – MOF)
Interest rate	6-months LIBOR + margin (AFD – bank) Almost same as a market rate (bank – end-user)	KfW + 0.5% (MOF – bank) 2% lower than the market rate (bank – end-user)
Participating Banks	Bank Mandiri	7 banks (including 2 APEX banks)
Notes	- Direct loan - Accompanied with technical assistance program	- Two-step loan - Initial deposit: EUR 1 mil. each to APEX banks. - Accompanied with grant technical assistance to MOE staffs. (EUR 1 mil. / JPY 106 mil.)

*USD 1 = Rp. 8,840 = JPY 76.2
**EUR 1 = JPY 105.73 = USD 1.39

6.1.1 AFD (Direct Loan for Energy Efficiency and Renewable Energy)

AFD loan to Indonesia is limited to climate change and this loan program is a part of it. This program is for CO_2 reduction and renewable energy utilities for industrial and commercial sectors. In this program, AFD directly lends money to Bank Mandiri.

(1) Target Sector

Any sector can apply for the loan as long as the project is to invest equipments for renewable energy, fuel conversion, combined cycle, bio-fuel, etc., which emit less CO_2. Also, there is no limitation in the company size to apply for this program. The first disbursement was for a large company and AFD hopes to expand this loan to SMEs as well.

(2) Size of Loan

The total size of loan is USD 100 mil. (JPY 7.6 billion). AFD disburses to Bank Mandiri every

time when the loan is approved. The lending and repaying currency is USD.

(3) Tenor

The tenor between AFD and Bank Mandiri is 7 – 10 years, which depends on the conditions between the bank and end-users. Bank Mandiri requested AFD to set the tenor as short as the ordinary lending term in Indonesia but the term is decided to be 7 – 10 years after the discussion.

(4) Participating Banks

The number of participating bank is one (1), which is Bank Mandiri. When AFD offered the loan to several commercial banks in Indonesia, Bank Mandiri showed an interest the most. Bank Mandiri was trying to gain knowledge of environment loan because the then CEO of Bank Mandiri thought it would be important in Indonesia in the future.

(5) Others

If the loan target will be expanded to SMEs or project finance bases for EE&C projects, the knowledge in the new area will be necessary. AFD is thinking to support Bank Mandiri for capacity building by grant TA program for this area.

Currently, there is no any further disbursement planned after the first disbursement was conducted. AFD requires Bank Mandiri to lend to at least five projects with USD100 mil. in total under this loan program to accumulate know-how on environment loans.

6.1.2 KfW (Industrial Efficiency and Pollution Control 1&2)

KfW provides the low-interest loan for equipments for industrial efficiency improvement and pollution control projects. It is called IEPC (Industrial Efficiency and Pollution Control) and now the program goes on to phase 2.

Table 6.1.2-1 KfW-IEPC Outline Phase 1 and Phase 2

	IEPC1	IEPC2
Target Size of End-user	SMEs	SMEs
Type of loan	Investment	Investment (60%) Working capital (40%)
Interest Rate (bank – end-user)	9 – 14%	Below commercial rate (2% lower)
Participating Banks	1. PT. BNI, Tbk. (Persero) 2. PT. BPD Jawa Tengah 3. PT. Bank Jabar 4. Bank Nagari (BPD Sumatera Barat) 5. PT. BPD Bali	1. PT. BNI, Tbk. (Persero) 2. Bank Ekspor Indonesia (BEI) 3. Bank Jateng 4. Bank BPD Kaltim 5. Bank Kalbar 6. Bank Niaga 7. BPD Yogyakarta

Source: Environment Soft Loan, Ministry of Environment

(1) Source of Fund

KfW provided Deutsche Mark-denominated grant on phase one (1) and Euro-denominated soft loan on phase 2 to the government of Indonesia.

(2) Participating Banks

Participating banks are all commercial banks and most of them are regional banks (banks whose customers are limited to a certain regional area). On phase one (1), four out of five banks were regional banks. (Only BNI was a national bank whose business activity is nation-wide.) On phase 2, seven banks are participating and four of them are regional.

(3) Process

1) Loan Process

On phase one (1), KfW provided the fund to the central bank (Bank Indonesia), and Bank Indonesia allocated to handling banks.

On phase 2, KfW lends money to MOF in Euro with KfW interest rate. MOF allocates to APEX banks (BNI and BEI are in charge) in Euro with 0.50% margin. APEX banks are responsible for converging currency from Euro to Rupiah and lend to handling banks with SBI + 1% interest rate. They can directly lend to end users too. When handling banks (including BNI and BEI – they also lend the loan to end-users) lend to end-users, the interest rate is 2% lower than the market rate (average: 12%).

Initial disbursement from KfW to APEX bank is one (1) mil. Euros for each via MOF. The initial capital was disbursed to BNI and BEI's accounts created in Germany. BNI and BEI submitted the report of lending after the lending amount equivalent to this initial capital was made. When this report was approved by KfW, additional disbursement was conducted from KfW to the banks via MOF. If no lending is made by the banks for six months, the funds in the accounts are withdrawn by KfW.

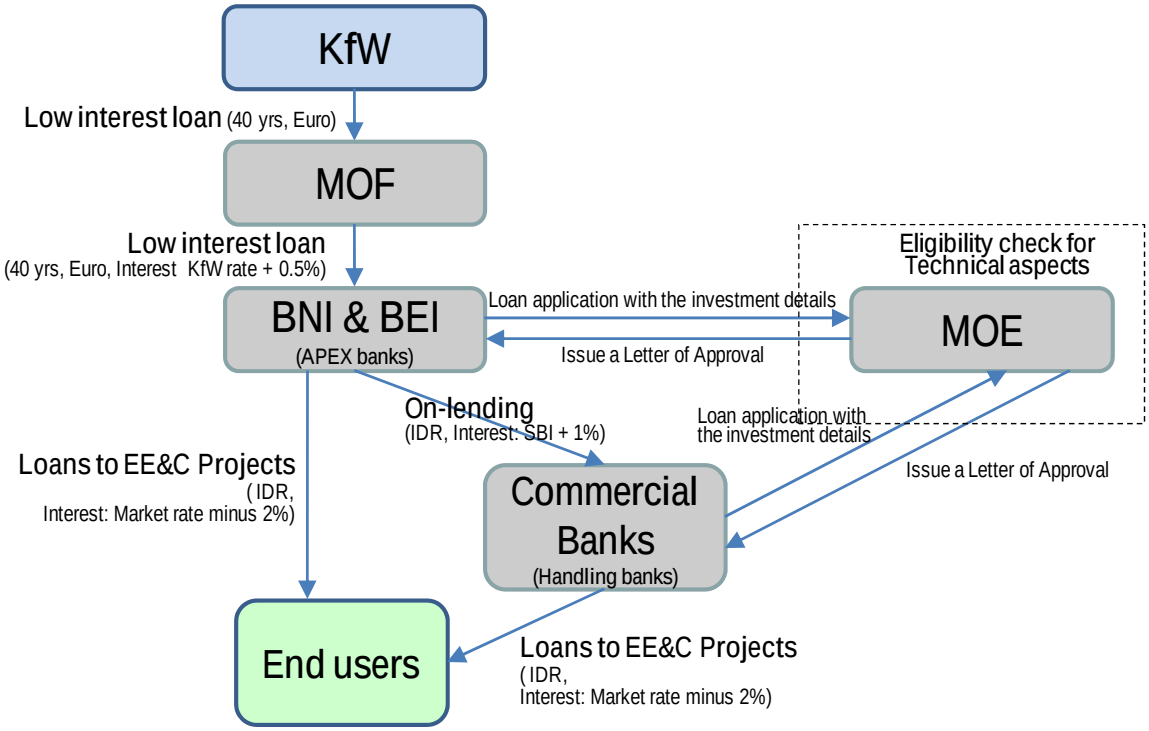


Figure 6.1.2-1 IEPC2 Loan and Application Process

2) Application Process

When an end-user applies for the loan to one of the handling banks (including BNI and BEI), the bank appraises the financial conditions of the end-user. When the end-user passes the appraisal, the bank sends technical assessment request to Ministry of Environment (MOE). MOE conducts on-site assessment (by visiting the end-user's office and factory). If the assessment is passed, MOE issues the approval letter to the bank. When the bank receives the letter, the bank can disburse to the end-user.

(4) Interest Rate

On IEPC2, the interest rate (2% lower than the market rate) is figured out by negotiation between KfW and APEX banks based on final Rupiah funding costs of two-step loans, after currency swap from Euro, and additional benefits such as technical assistance to enhance banks' expertise on energy efficiency and pollution controls. However, APEX banks are not required to swap funds from the two-step loan and may invest Euro funds in money markets to earn return to subsidize a loan interest to end-users.

(5) Monitoring

MOE performs a monitoring after the project implementation. MOE monitors how much the project has reduced pollution by sampling and comparing the data (energy saving, CO_2 reduction, water pollution, etc.). The assessment is conducted before starting the project and 6 months after the implementation.

(6) Others

The issue of IEPC2 was slow-starting to the first disbursement. It took a time to conduct the first disbursement from both APEX banks; BNI took 6 months and BEI did one (1) year. To disburse the entire fund, EUR 9 mil. it took five 5 years in total.

6.1.3 Other Loan Projects Planned by Development Agencies

(1) ADB (Energy Efficiency in Support of the Indonesia Eximbank)

ADB (Asian Development Bank) is going to provide a technical assistance grants for Indonesia Eximbank in 2012. This program is including a loan for SMEs for energy efficiency projects.

Many banks in Indonesia have adequate amount of fund to lend from deposit. However, the banks are prudent in lending especially to SMEs. Banks are not necessarily interested in lending for energy conservation project because companies are not necessarily interested in energy conservation when expanding their business. ADB approved the loan in its board in 2011, including the portion for EE&C.

Table 6.1.3-1 Planning Loan Program Provided by ADB

ADB	
Purpose of use	Energy efficiency
Target size of end-user	SMEs
Total Amount	USD 30 mil.
Maximum Loan Size	USD 200,000 – 5 mil.
Tenor	6 – 8 years (ADB – bank)
Interest rate	LIBOR + 250bps (ADB – bank)
Participate FIs	Eximbank
Notes	- Non-sovereign investment - Planning to start in 2012 - Loan conditions will be same as market one - To allocate to at least 15 projects within 18 months of the loan

Source: Proposed Loan and Administration of Technical Assistance Grants, ADB, 2011

(2) Emission Reduction Investment / ERI (KfW)

This is a new soft loan program to be provided by KfW. This program is already on the Bluebook in Indonesia and in preparation. A working group has already been organized and is discussing the detail of the program.

Table 6.1.3-2 ERI at a Glance

Emission Reduction Investment (KfW)	
Purpose of use	Reducing green house gas
Total Amount	EUR 20 mil. = USD 14.4 mil.* (JPY 1.1 billion)
Maximum Loan Size	Rp 10 billion = USD 1.13 mil.* (JPY 86.1 mil.)
Notes	- Already on the Bluebook and working group has been organized (member: MEMR, MOI, MOF, BAPPENAS) - Grant TA will be accompanied mainly for MOE staff. (1.5 mil. Euro = USD 1.07 mil. / JPY 81.5 mil.)

Source: Interview from KfW and MOE
*EUR 1= JPY 105.73 = USD 1.39
*USD 1 = JPY 76.2 = Rp.8,840

(3) Chiller Energy Efficiency Project (World Bank & KfW)

This program is in preparation by the World Bank. The purpose of this project is "to reduce the ODS (ozone depleting substances) consumption and greenhouse gas (GHG) emissions by replacing inefficient ODS chillers with energy efficient non-ODS chillers." (World Bank, 2010) The project is to facilitate the replacement about 160 ODS-based chillers with energy efficient non-ODS-based chillers over a period of 5 years. To facilitate the replacement, this project provides both subsidy and concessional loans to chiller owners.

6.2 EE&C Low-interest Loans in Thailand and Malaysia

The neighboring countries such as Thailand and Malaysia have the low interest loan program to promote energy efficiency and their experience will be the good reference considering TSL in Indonesia. Thailand enacted Energy Conservation Promotion Act (ECP Act) in 1992 and formulated ENCON fund for energy conservation activities including low-interest loan. In Malaysia, the first energy policy, The National Energy Policy, was formulated in 1979. To emphasize the energy conservation activity including renewable energy and green technology, the government of Malaysia now enacts the 9th and 10th Malaysia plan to set short and long-term national goals.

Table 6.2-1 EE&C Low-interest Loans at a Glance (Thailand and Malaysia)

	Thailand	Malaysia	
Loan Name	Energy Efficiency Revolving Fund (EERF) / Soft Loan	GTFS (Green Technology Financing Scheme)	
Implementation Agency	DEDE	GreenTech Malaysia – technical CGC – guarantee	
Source of Funds	ENCON Fund (from oil fund and oil tax revenue)	Establishing a fund by the government	
Target User	Facility owners, project developers, ESCOs	Equipment producer / manufacturer	Equipment User (incorporated)
Loan Size	7,000 mil. Baht (accumulated, total) = USD 210 mil. / USD 17.2 billion * 500 mil. Baht (allocated in 2011) = USD 15 mil. / JPY 1.2 billion*	RM1.5 billion (total) = USD 4.7 billion / JPY 36.5 billion**	
	50 mil. Baht (per project) = USD 1.5 mil. / JPY 123 mil.**	RM50 mil. (per project) = USD 16 mil. / JPY 1.2 billion**	RM10 mil. (per project) = USD 3.2 mil. / JPY 243.2 mil.**
Loan Period	7 years	15 years	10 years
Interest Rate **- to Bank** **- to End-user**	- 0 - 0.5% (to Banks) - not more than 4% (fixed rate) (to End-users)	Interest rate: Determined by the participating bank → 2% subsidized interest per year	
Participating FIs	11 commercial banks	All commercial and Islamic banks, DFIs	
Notes	- Two-step loan (blended with Bank's original loan) - For investment (equipment and installation costs)	- For investment (new and renovation project) - Government guarantee: 60% of the loan amount	

Source: DEDE, GreenTech Malaysia

* 1 Baht = JPY 2.46 = USD 0.03 (Mizuho Bank exchange rate as of October 24, 2011)

** RM 1 = JPY 24.32 = USD 0.32 (Mizuho Bank exchange rate as of October 24, 2011)

6.2.1 Thailand (Energy Efficiency Revolving Fund / EERF)

EERF is a soft loan program (low-interest loan), which is established in January 2003. Any corporate entities can borrow money with lower interest than market from bank(s) as long as the project is for energy efficiency improvement and/or renewable energy development and utilization. The purpose of this activity is to stimulate financial sector and let the banks involved in national energy conservation activities.

(1) Implementation Agency

DEDE (Department of Alternative Energy Development and Efficiency) handles technical assessment and monitoring the project. DEDE is a part of Ministry of Energy.

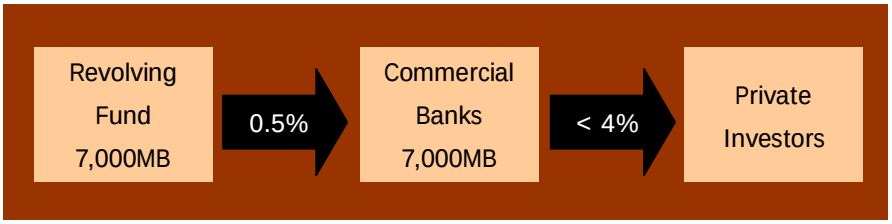
(2) Source of Fund

The source of this loan is from ENCON Fund which is provided by the government. This fund is used for energy conservation activities in Thailand. The source of ENCON fund comes from transferred the Petroleum Fund at first and now from oil products tax revenue (gasoline, diesel, fuel oil, and kerosene: 0.04 – 0.25 Baht per litter).

(3) Fund Size

Total fund size is 1.5 - 4 billion Baht in each phase (The average is 2 mil. Baht / phase). The program comes to 4th phase now and accumulated fund size is approximately 7 billion Baht (USD 210 mil/) and 95% of total amount has already been disbursed. The allocation of the fund is getting decreased. In 2011, the allocation is cut down to be 500 mil. Baht (USD 15 mil.).

Maximum fund size per project is 50 mil. Baht (USD 1.5 mil.). When the size exceeds the maximum, banks can blend loan with their own fund source.



Source: Business Opportunities in Thailand's Renewable Energy, DEDE, April 2010

Figure 6.2.1-1 Energy Efficiency Revolving Fund (EERF)

(The above amounts are the maximum loan amount per project. If the loan amount from commercial banks to private investors exceeds 7,000MB, commercial banks can add their own fund for the remaining amount.)

(4) Target End-user and Equipment

Only corporate entities can take this loan program to produce or install EE&C products. (e.g. Project developer, industrial / commercial facility owners, ESCOs, etc. No sector limitation.)

Table 6.2.1-1 Eligible Investment Costs

Eligible	- Equipment and installation costs - Consulting costs – design, control, supervision, guarantee fee - Civil works, piping, or necessary components specifically and necessary for the project - Associated costs necessary – removal of existing equipment, transportation, taxes, VATs.
NOT Eligible	- Land costs - Land improvement costs - Building construction - Costs not specifically needed for the project e.g.) main tranformers, substation

Source: Thailand's Energy Efficiency Revolving Fund: A Banker's Perspective, CIMB THAI, June 2009

(5) Participating Banks

Eleven (11) commercial banks are participating in the program now. Initial participating banks are 6 and 5 are joined since phase 2

The participating banks are nominated by DEDE. They receive a nomination letter from DEDE and accepted.

Table 6.2.1-2 Eleven Participating Banks

Participating Banks	
- Bangkok Bank	- Thai Military Bank (TMB)
- Bank of Ayudhya	- Siam City Bank (SCIB)
- CIMB Thai (former Bank Thai)	- Exim Bank
- Siam Commercial Bank (SCB)	- Krung Thai Bank (KTB)
- Kasikorn Bank	- SME Bank
	- Union Overseas Bank (UOB)

Source: Energy Efficiency, Standard and Labeling Policies in Thailand, DEDE, May 2010

(6) Procedure

Bank conducts financial appraisal and DEDE evaluates technical side. When the project is eligible for both financial and technical side, the bank disburses to the end-user. The term of the assessment is normally 1 - 2 weeks to approval.

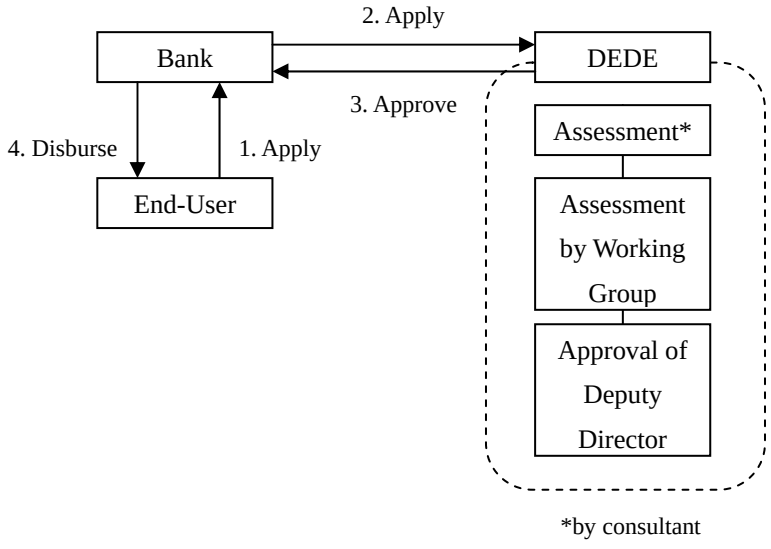


Figure 6.2.1-2 Process of Loan to End-user

The technical assessment is only when applying the loan. The points of the assessment are "energy efficiency", "payback period", and "annual operating hour." Actual technical assessment is conducted by contracted consultants from a private company. The contract is annual-basis.

(7) Tenor

Up to 7 years for both between "government and bank" and "bank and end-users"

(8) Interest Rate

Banks can lend money to end-users with lower interest rate than market rate because banks can lend money from ENCON fund with very low interest rate (0 – 0.5%).

Interest rate between bank and end-user is up to banks. The participating banks can set the lending rate based on their own criteria, but since the minimum lending rate of the banks are around 7 – 8%, the lending rate of EERF should keep low - not exceeded to 4%.

Table 6.2.1-3 Minimum Lending Rate (MLR) for Corporate of Participating Banks

Participating Banks	MLR	Participating Banks	MLR
Bangkok Bank	7.25%	Siam City Bank (SCIB)	7.625%
Bank of Ayudhya	6.75%	Exim Bank	6.75%
CIMB Thai (former Bank Thai)	7.75%	Krung Thai Bank (KTB)	7.25%
Siam Commercial Bank (SCB)	7.25%	SME Bank	7.25%
Kasikorn Bank	7.25%	Union Overseas Bank (UOB)	7.875%
Thai Military Bank (TMB)	7.625%		
MLR Average		**7.33%**	
cf.) Bank Mandiri (Prime Lending Rate: Corporate /SME)		11.25% / 13.00%	

Source: Website from each banks, 2011

(9) Others: ESCO Fund

ESCO Fund covers borrowers who cannot use EERF due to too small loan amount. ESCO Fund is also a government fund whose source is from ENCON fund. This fund was launched by DEDE in October 2008 with an initial fund size of 500 mil. Baht (USD15 mil.). The fund was established as a pilot venture capital initiative to address the issue of the lack of equity capital for small project. DEDE currently provides three functions: 1) ESCO Venture Capital, 2) Equipment Investment, and 3) Equipment Leasing. If the project is too small to make use of EERF, the end-user can receive a support from ESCO Fund through equipment leasing.

Table 6.2.1-4 Conditions of ESCO Fund (Equipment Leasing)

ESCO Fund (Equipment Leasing)	
Maximum loan size per project	10 mil. Baht (USD300,000) (covering 100% of the total project cost is available)
Tenor	5 years
Interest Rate	4 – 6%

Source: Interview with DEDE

To make use of this program, end-users are supposed to take 3 steps to be approved.

1st Step: Technical and Financial Assessment

Conducted by fund managers from 2 NPOs (Energy for Environment and Energy Efficiency Thailand)

2nd Step: Overall Assessment

Conducted by a working group in DEDE

3rd Step: Approval from Investment Committee

Members are from DEDE, Ministry of Industry, Federal Thai Industry, etc.

A member from DEDE takes a chair of the committee.

According to the interview with DEDE, a total expected saving cost for energy conservation by ESCO Fund is calculated to be 1.06 billion Baht (USD 32 mil.) per year.

6.2.2 Malaysia (Green Technology Financing Scheme / GTFS)

Malaysian Government provides low-interest loan to corporate entities, both manufacturers and users of green technology. This is called “Green Technology Financing Scheme (GTFS)”. GTFS was established in January 2010 to promote investments in green technology to a sector which is envisaged to be one of the emerging drivers of economic growth in Malaysia. This program will run for 3 years or until the budget is running out.

(1) Implementation Agency

Malaysian Green Technology Corporation (GreenTech Malaysia) is a focal point of the program. GreenTech Malaysia is non-profit company administrated Ministry of Energy, Green Technology and Water (MEGTW / KeTTHA). Their tasks are project screening and monitoring, conducting promotional and awareness program, and collaborative effort with participating financial institutions for GTFS.

Credit Guarantee Corporation Malaysia Berhad (CGC) provides the guarantee against the credit risk for the end-users. However, there is no special criterion of guarantee for GTFS and CGC appraises guarantees for GTFS same as the usual business.

(2) Source of Fund

The source of GTFS soft loan is from a fund that the government established from a budget.

(3) Fund Size

Total fund size is RM1.5 mil. (USD 11.7 mil.)

Maximum funding size per project is RM 50 mil. (manufacturer) / RM10 mil. (user).

(4) Target End-user and Equipment

The applicants of this loan are both manufacturer and user of green technology. Both types of users should be legally registered Malaysian-owned companies. (Manufacturer: at least 51%, user: at least 70%)

The green technology must be located within Malaysia and utilizing local and/or imported technology.

Eligible: project for new, retrofitting or expantion that incorprates Green Technology elements which have not been funded. NOT Eligible: R&D project, project which are already underway (in construction phase – physical process), project which has already been completed

Source: MEGTW and Green Tech Malaysia

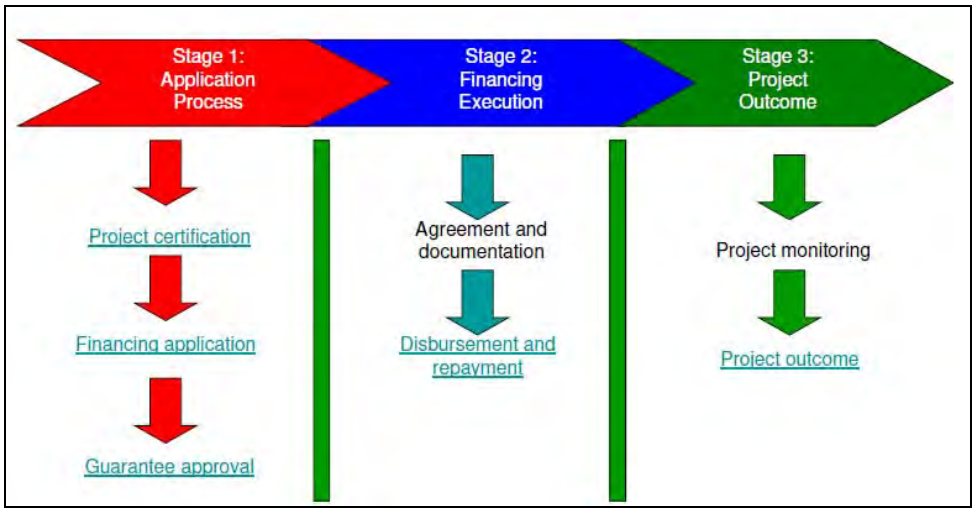
(5) Participating Banks

All commercial banks, Islamic banks, and DFIs can participate in the program.

(Present participating DFIs: Bank Pembangunan, SME bank, Agrobank, Bank Rakyat, EXIM bank, and Bank Simpanan Nasional)

(6) Procedure

There are 3 stages of overall process: 1) Application Process, 2) Financing Execution, and 3) Project Outcome.



Source: Maybank, April 2011

Figure 6.2.2-1 Overall Process of GTFS

1) Step 1: Application Process

Technical assessment is conducted by consultants that GreenTech Malaysia contracted. The total process to get certified will take 3 months depending on a schedule of the committee in the GreenTech Malaysia.

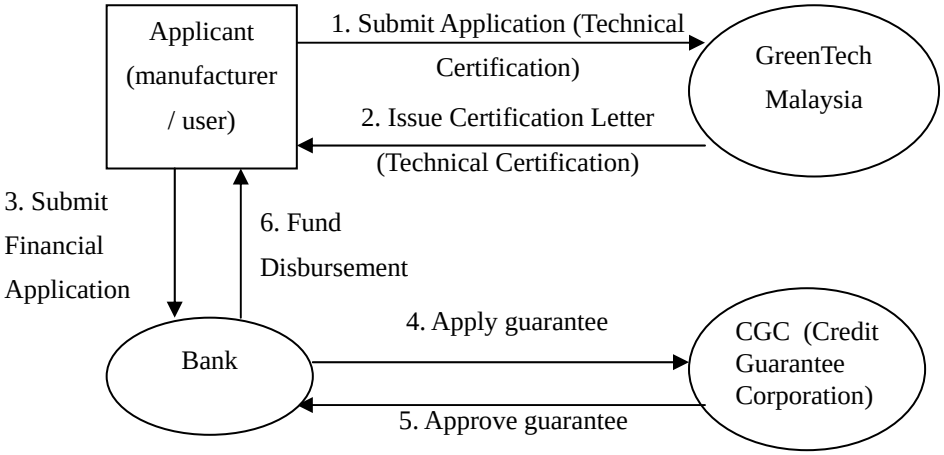


Figure 6.2.2-2 GTFS Application Process

2) Stage 2: Financing Execution and 3) Stage 3: Project Outcome

When the bank receives Letter of Guarantee from CGC, the bank proceeds to the loan agreement with the applicant (Stage 2). After the fund disbursement from the bank to the applicant, the applicant is supposed to hand in reports to GreenTech Malaysia during the project implementation (Project Progress Report and Project Outcome Report). On Stage 3, monitoring after the project is taken by GreenTech Malaysia. The certified corporate is supposed to submit "Project Impact Study" to GreenTech Malaysia after the implementation.

(7) Tenor

Maximum 15 years for green technology manufacturers and 10 years for users

(8) Interest Rate

2% lower than the market rate. The actual interest rate is depending on the banks.

Government subsidizes to the banks via Green Tech Malaysia for reducing loan interest. The bank receives certain amount of fund in one time (not every application) therefore the banks can pool the fund. When a bank disburses from the fund, the bank informs Green Tech Malaysia.

Also, GTFS user is to pay 0.5% guarantee fee to CGC per year.

(9) Others

Approval rate of technical assessment by GreenTech Malaysia is around 80% (certified 67 applications out of 87 applications, as of December 31, 2010) but not all of the approved projects can get financial approval from the bank, since the credit risk of the loans is born by the banks; thus the credit decision is made by the banks.

Chapter 7 Concluding Summary

(1) Background

In Indonesia, the electricity demand is growing rapidly together with the economic growth. To meet this demand, the supply is increasing and the electricity subsidy to PLN in 2011 will exceed the one in 2010 under the current tariff structure. For the historical and future trends, the industrial, commercial and transport sectors account for a substantial portion of the electricity consumption and energy consumption. In this regard, targeting these sectors for EE&C promotion will be highly effective to facilitate EE&C in Indonesia. This is also in line with the policy taken by Indonesian government. Regulation PP70/2009 on energy conservation mentions the provision of incentives to companies that consume more than 6000 toe energy annually.

(2) Incentive Options: Low Interest Loan

As the incentives to the commercial/industrial/transport sectors, low interest loans, direct subsidies, tax incentive and credit guarantee can be options. Considering the impact on the country's fiscal position, easiness to implement the policy and possibility for ODA fund use, the low interest loan is most feasible and has relatively small impacts on the country's fiscal position.

(3) Methods to Assess Energy Efficiency Improvement: EE&C Equipment List Approach

In the low interest loan program, how to evaluate a sub-project (the loan to end users from the intermediary bank) in terms of contribution to energy efficiency is the challenge since this evaluation is not the usual business for the financial institutions. For this eligibility check, there are mainly two methods to assess the expected energy efficiency impact through an investment. One is using the "EE&C equipment list approach" and the other is based on the energy audit by the external entities such as ESCOs (Energy service companies) ("Energy audit approach"). Comparing these two methods, "EE&C equipment list approach" is more suitable in Indonesia at present since there are no mechanisms in Indonesia yet to distinguish the entities which are reliable to conduct energy audit to the international standard in order to ensure the quality of energy audit. In this regard, it is beneficial to start the program using "EE&C equipment list approach" now, and "energy audit approach" will follow in the next phase after such a certification system for energy audit is established in Indonesia.

(4) Potential Demand for Energy Efficiency Investment

In adopting the "EE&C equipment list approach", the eligible types of equipment were selected to achieve 20% of energy saving. 20% was set as the target based on the target submitted in 5th East Asia Summit Energy Minister's meeting (held in 2011) and the energy saving potential in Indonesia from the previous JICA study. In addition, based on the EE&C equipment list proposed in this report, the EE&C investment potential was estimated. In the commercial sector, the eligible equipment categories include power receiving and distribution, AC equipment, lighting, heat sources, elevator and escalator and building management system. In the industry sector, the eligible equipment covers utility and management, iron and steel industries, cement industry,

textile industry, industrial furnace and thermal insulation. In the transport sector, the eligible equipment covers articulated buses. In total, the demand for EE&C equipment investment for 5 years is estimated as USD 1,070.1 mil. (USD 899.3 mil., USD 149.3 mil. and USD 21.5 mil. in commercial, industry and transport sectors, respectively).

(5) Financial Scheme for the Low-interest Loan

In terms of the financial scheme, JICA loan could be of help to provide the incentive program of the low interest loans, since this program requires low cost funding for FIs. Based on the interview and discussion with the financial institutions in Indonesia regarding their interest in EE&C lending, their customer base and the restriction by law, the JICA Study Team focused on two financial schemes assuming the mobilization of JICA loan: (a) through state-owned banks (SOB) and (b) through PIP.

In the first scheme with SOBs, MOF on-lends the JICA loan to the SOBs and these SOBs will provide the loans to end users (companies) in the lower interest rates than the commercial rates. (For the detail, refer to the diagram in page 10.) In this scheme, it is ideal if many SOBs participate in the program in order to cover as many potential end users as possible. However, the more SOBs participate, the more difficult to coordinate the opinions about the program. Therefore, starting the program as a pilot with a single strong bank and increasing the number of participating banks in the future will be more realistic. The strong bank here means a bank with high market share in the asset and lending in the target sector. On the other hand, while this JICA loan is denominated in JPY, JPY based lending is rare in Indonesia and the banks including SOBs are reluctant to take the currency risk. Therefore, if the scheme utilizes JICA loan and an SOB hedges exchange rate risk by currency swap, there is the possibility that the funding cost for an SOB is higher than its usual funding cost, depending on the currency swap market. If this happens, there is a possibility that the SOB cannot provide the low interest as the incentive to the companies, and the scheme utilizing PIP can be better option.

In the scheme with PIP, MOF on-lends the JICA loan to PIP (or if MOF allows, lends JICA loan directly to PIP) and this PIP will provide the loans to end users (companies) or the commercial banks in the lower interest rates than the usual commercial rates. (For the detail, refer to the diagram in page 11.) According to the interview with PIP, PIP does not have experience to in foreign currency related transactions. Nevertheless, it is one of the departments in MOF. Therefore, if the importance of EE&C's promotion is recognized by MOF (ultimately the impact on the electricity subsidy reduction) and the approval from MOF can be obtained, PIP has the possibility to bear the exchange rate risk and provide the low interest rates as the incentive to companies and the commercial banks (ultimately to the clients of these banks).

(6) Lending Guidelines

If this soft loan program is implemented, the existing lending guidelines at the implementing FIs should be applied except some items discussed below, since all the risk assessments, negotiations and risk taking are borne by the implementing FIs, and their guidelines are established in

compliance with financial, social and environmental regulations. The guidelines specific to this low interest loan program will be based on the purpose of this expected program. One of these guidelines is that the eligibility of end-users are the end-users of the machinery included in EE&C equipment list and the eligibility of sub-projects are for the investment in machinery included in EE&C equipment list. In terms of the loan, the interest rates will be at the lower rates than the ones usually charged by the implementing FIs. This discounted rate will be up to the negotiation with these implementing FIs. The repayment period and collateral requirements will be the same conditions as the implementing FIs normally set. On the other hand, following JICA's lending guideline, the upper limits of lending to end users will be 85% of the investment amount for acquisition and installation of machinery included in eligible EE&C equipment list. For the same reason, the impact on environment by the potential borrowers is required to be confirmed upon the submission of the loan application.

(7) Implementation Structure

In order to implement the program, the expected responsibilities among relevant parties will be as follows (Refer to the diagram in page 52.):

- MOF: Borrowers of JICA loan and on-lending to and recovery from the intermediary financial institutions
- BAPPENAS: Approval of TSL and monitoring of TSL project progress
- MEMR: Approve and update of the EE&C equipment list
  - Monitoring of the invested project using TSL
  - Reporting of TSL impacts to MOF, BAPPENAS and JICA based on the reporting from the banks
  - Awareness raising for EE&C to end users
  - Preparation for TSL using the energy audit method
  - Prepare the other regulations and incentives to promote EE&C in Indonesia
- Intermediary financial institutions: Implementing entity for the loan program
  - The borrowers from MOF for TSL
  - Manage the loans extended by MOF in the revolving funds.
  - Appraisal of sub-projects in terms of the creditworthiness and take the default risk of end-users
  - Check the eligibility of the sub-projects against the EE&C equipment list.
  - Confirm whether a sub-project meets the environment criteria.
  - Report quarterly to MEMR for TSL progress including the impact on energy efficiency.
  - Cooperate reporting to the government audit office (BPK) as required.
  - Submit the project completion report when the bank repays all loans to MOF.
  - Cooperate with JICA for the post-project evaluation.
- End users: Users of this program
  - Install the EE&C equipment using the bank loan in the program.

- Repay the loan to the bank.
- Accommodate the site visits for monitoring by the intermediary FIs, MEMR or its consultants.
- Cooperate with the survey regarding EE&C conducted by MEMR or JICA, as requested.

(8) Proposal for Technical Assistance

For the smooth implementation of this incentive program, the consulting service and the technical assistance in the following areas will be of great help:

- Structuring of sub-project monitoring mechanism
- Management and related transactions of JPY denominated loan
- Loan project management and record keeping
- Technical review of candidate equipment to be listed in the EE&C equipment list
- Ex-post review of sub-project eligibility and environmental clearance and project outcome.

(9) Potential TSL Size for EE&C Low Interest Loan and Its Expected Impacts

As mentioned earlier, the total investment potential is estimated at approximately USD 1 billion over the five years. Since this amount is the “investment potential”, the project cost can be estimated conservatively as JPY 6,100 mil. (including the loan consultant of JPY 100 mil.), considering the percentage of the firms using the finance by banks to invest and market share of the top 10 banks in Indonesia.

By making JPY 6,000 mil. (i.e. Rp 696 billion.) equivalent investment in EE&C through this program, oil, coal, natural gas and electricity are expected to be saved annually 3.7 mil. liter, 22 tons, 850,000 m3 and 111 GWh, respectively. These savings lead to the impacts at the various levels. For end users, Rp 128 billion can be saved annually from this energy saving. Due to this improvement of energy intensity, production competitiveness can be improved as well. In the country-wide level, this energy consumption saving will lead to the improvement of energy security. At the same time, this will lead to the reduction of electricity consumption, and electricity subsidy can be reduced by Rp 23 billion annually for the government, assuming the current tariff structure (For the detail, refer to the page 70-72). For the general public, awareness for EE&C can be expected to be raised. At the global level, greenhouse gas emission is expected to be reduced by 91,000 t-CO2 annually. In this regard, this program to provide the incentive for EE&C by the government will provide great social benefits, and it is rational for the government to implement the program.

APPENDIX 1　EE&C Equipment List

EE&C Equipment List

No.	Equipment	EE&C Basic Concept and Benefit	Specifications	Supplier Name and Equipment Type & Model (Examples)
Commercial				
1	Power Receiving and Distribution			
1.1	High Efficient Transformer			
1.1.1	Oil-immersed amorphous transfo	Energy saving to conventional: 50%	Efficiency at standard load factor (30%): 99% or more Efficiency at rated power: 98% or more Core metal: Amorphous metal	PT.UNINDO (Oil-immersed Amorphous Transformer)
1.1.2	Dry type amorphous transformer	Energy saving to conventional: 50%	Efficiency at standard load factor (30%): 99% or more Efficiency at rated power: 98% or more Core metal: Amorphous metal	TATUNG (Taiwan) (AMT-MT series)
2	Air Conditioning Equipment			
2.1	Air Conditioner			
2.1.1	Split type air-conditioner with inverter	Energy saving to conventional: 50% Inverter control	Rated COP: 3.3 or more Weighted COP (0.4×full load COP+0.6×50% load COP): 3.7 or more Inverter control	PT.Panasonic G.I (Envio Inverter series) Daikin (DC Inverter Control R410 series, Super Multi series) Toshiba (Digital Inverter / Super Digital Inverter series)
2.1.2	Split type air-conditioner with non inverter	Energy saving to conventional: 30%	Rated COP: 3.1 or more	PT.Panasonic G.I (Envio series)
2.1.3	Variable refrigerant flow (VRF)	Energy saving to conventional: 50% Inverter control	Rated COP: 2.9 or more Weighted COP (0.4×full load COP+0.6×50%load COP): 3.5 or more Inverter control and PM motor	DAIKIN (VRV series) Sanyo (ECO-VRF Heat Recovery series) Toshiba (SMMS-I series) Hitachi (SETFREE FSXN series)
2.2	Heat Transfer Unit			
2.2.1	AHU	Energy saving to conventional: 30% Inverter control	Measures against partial load (2 fans-2 motors configuration and/or inverter control)	SINKO (Relief Air AHU Model RH-A)
2.2.2	FCU	Energy saving to conventional: 50% Inverter control	PM motor and inverter control Large ΔT (8 degC) water coil.	SINKO (Model SCRM)
2.3	Fan and Pump with Inverter			
2.3.1	Low voltage inverter for fan and pump	Energy saving to conventional: 30% Inverter control	Efficiency: 95% or more PM motor and inverter control Output frequency: 25 to 120Hz variable Life time: 7 years or more (ambient temp.40degree, load factor 100%)	Mitsubishi (FR700 series) Toshiba (TOSVERT series) PT.EBARA Indonesia (EVFC series, Booster Pump series)
3	Lighting Equipment			
3.1	Fluorescent Lamps			
3.1.1	Electric ballast	Energy saving to magnetic ballast: 25% Long life equipment	Life time: 40,000 hours or more Luminous efficiency: 95 lm/W or more	Philips (EB-Primalume/HF-Performer, HF-Regulator) PT.Panasonic E.W.G.S.I (Panasonic HF Type Electronic Ballast)
3.1.2	HF (High frequency) fluorescent lamps	Energy saving to conventional: 40%	Configuration: fixture with HF fluorescent lamp and HF ballast	Panasonic (FSA610xxA series)
3.2	LED (Light Emission Diode)			
3.2.1	Down light	Power saving to incandescent lamp: 80% Long life equipment	Life time: 40,000 hours or more Body & frame: Aluminum die cast	Panasonic (NNP71200, NNP71201, NNP71202, NNP71203) Philips (Master LED Bulb series)
3.2.2	High luminance lamp	Power saving to mercury lamp: 50% Long life equipment	Model / HLED 1 / HLED 2 / HLED 3 / HLED 4 Luminouse efficiency (lm/W): 80 / 80 / 75 / 75 Fixture luminous flux (lm): 18,000 / 18,000 / 10,000 / 10,000 Power consumption (W): 220 / 220 / 130 / 130 Vertical luminous intensity (lm): 100 / 240 / 60 / 130 condition:beam angle (deg.): 120 / 60 / 120 / 60 Life time: 60,000 hours or more CRI: Ra70 or more Warrantee: 1 year or more	Sharp (DL-EHS01, 02, 03, 04)
4	Heat Sources			
4.1	Chilled Water			
4.1.1	Centrifugal chiller	Energy saving to conventional: 30%	COP: 6.0 or more	Mitsubishi Heavy Ind. (ER, AAR, AART-H, AART-HR) EBARA (RTBF series) Hitachi (HC-It-F-GX series)
4.1.2	Screw chiller	Energy saving to conventional: 30%	COP: 5 or more	EBARA (RHS-M series)
4.1.3	Air cooled chiller	Energy saving to conventional: 20%	COP: 3 or more	Hitachi (RCUP-AUZ series)
4.1.4	Steam absorption chiller	Waste heat resource recovery	Waste heat resource recovery	EBARA (REW, RGWA series)
4.1.5	Hot water absorption chiller	Waste heat resource recovery	Waste heat resource recovery	EBARA (RCH series)
4.1.6	Adsorption chiller	Waste heat resource recovery	Waste heat resource recovery Minimum temperature of waste water heat: 65 degC	PT. mAYEKAWA (MYCOM AdRef-Noa)
5	Elevator and Escalator			
5.1	Elevator			
5.1.1	Elevator	Energy saving to previous model: 50% Inverter control	VVVF control gearless traction machine PM motor with inverter control Regenerative system LED lighting	Hitachi (F1-Ⅱ) Mitsubishi (NEXIER-MR)
5.2	Escalator			
5.2.1	Escalator	Energy saving to previous model: 30% Inverter control	VVVF with inverter control Human sensor Dual speed control system (30m/minuits speed, 10m/minuits speed, or stop)	Hitachi（SX） Mitsubishi (Z type-ESC)

6	Building Management System			
6.1	Management System			
6.1.1	Utility optimization system	Energy savings of whole building energy consumption: 10% Building energy management system	Building Management System (BAS), Building Energy Management System (BEMS), Digital Controllers (DDC), Sensors, Control Valve combined with Flow Meter, Temperature Sensor and appropriate Energy saving Applications. These items must be linked with each other and implement cooperation control.	azbil (Savic-net FX,Energy Data Server, Infilex series, Actival Plus)
Industry				
7	Utility and Management			
7.1	Middle Voltage Inverter			
7.1.1	Middle voltage inverter	Energy saving at 80% of controlled equipment load: 50%	Efficiency at rated load: 97% or more Power factor: 95% or more at rated load Harmonics current: less than 1% on each order Main Circuit Voltage: 3-phase, 3/3.3kV, 3-phase, 6/6.6kV Output frequency: 0.2 to 50Hz	MEIDENSHA (THYFREC VT730S） Hitachi (HIVETOL-HV I series) FUJI (FRENIC4600FM5e series)
7.2	Compressor			
7.2.1	Oil injection screw compressor with inverter	Energy saving to non inverter standard type: 50% Inverter control	Ripple on discharge pressure：±0.01MPa Pressure output: from 0.45 to 0.9MPa PM motor Variable motor speed control by inverter driving	Hitachi (HI Screw V Type OSP series)
7.2.2	Oil free screw compressor with inverter	Energy saving to non inverter standard type: 50% Inverter control	Ripple on discharge pressure：±0.01MPa Pressure output: from 0.45 to 1.0MPa PM motor Variable speed control by inverter driving	Hitachi (HI Screw V Type DSP series)
7.3	Process Control System			
7.3.1	Utility optimization system	Energy saving to conventional: 5% Factory energy management system	Online operational guidance system and/or online feedback control system. Mixed Integer Linear Programming (MILP) Data chart presentation function and data analyzing function	azbil (U-OPT, EneSCOPE) YOKOGAWA (APC1, APC2)
7.3.2	Distributed control system (DCS)	Energy saving to conventional: 50% Factory energy management system	The basic DCS should consist of Operator Station, Engineering Station, and Controller	azbil (Harmonas-DEO series) YOKOGAWA (Centum series)
7.4	Steam Boiler and Hot Water Supplier			
7.4.1	Small-sized once-through steam boiler	Energy saving to conventional flue tube boiler: 10% High efficiency in partial load Short warm-up hours	Steam generating capacity: 1 ton/h to 4 ton/h Efficiency: 90% or more at rated load and 80%or more at 50% load	PT. Miura Indonesia (EI1000, EI1500, EI2000, EX1500, EX2000, EX4000, SQ1000, SQ2000, SQ2500)
7.4.2	Multiple installation system of small size boiler	Energy saving to conventional flue tube boiler: 20% High efficiency in all over load Short warm-up hours	Steam generating capacity of a single boiler: 2ton/h to4 ton/h Total steam generating capacity: 2 ton /h to 4ton/h multiple numbers of boilers Stream pressure: 0.098 Mpa or less Fuel: LPG, Natural gas, Diesel oil Efficiency: 90% or more at rated load and 90% or more at 50% load Control panel	PT. Miura Indonesia (MI System)
7.4.3	Hot water supplier with heat pump	Waste heat resource recovery	Waste heat recovery The maximum temp. of hot water supply: 85 degC Hot water supply: 8.5m3/h at 75 degC from 30 degC Available range: supply hot water 65 to 85 degC	PT. mAYEKAWA (MYCOM Plus+Heat) Mitsubishi Heavy Ind. (ETW series)
7.4.4	Hot air supplier with heat pump	Waste heat resource recovery	Waste heat recovery Maximum hot air temp: 120 degC	PT. mAYEKAWA (MYCOM EcoSirocco)
8	Iron and Steel-making Industry			
8.1	Steel-making process			
8.1.1	Ladle pre-heating unit with regenerative burner	Energy saving to single port burner: 50%	Regenerative burner on the ladle cover Type: Twin burners Fuel gas: Natural gas Thermal efficiency: 70% or more	Chugai-Ro (FRC series)
8.2	Rolling process			
8.2.1	Regenerative burner units for reheating furnace	Energy saving to single port burner with pre-heated air: 30%	Regenerative burner Fuel: Natural gas or fuel oil Regenerator: Ceramic honeycomb or ceramic ball	Chugai-Ro. (RCB series)
8.2.2	Ceramic fiber lining of reheating furnace	Energy saving to brick and castable lining: 10% Shorten heating-up time	Insulation for side wall and ceiling of furnace Shape: Blanket, 75mm thickness Density: 130 kg/m3 Density: 100 to 160 kg/m3 Allowable service temperature: 1200 degC Linear shrinkage: 1.4% at 1000 degC	PT. Nichias Sanijaya (Fine Flex TOMBO No.51xx, 52xx and 53xx series)
9	Cement Industry			
9.1	Raw Material Process			
9.1.1	Vertical roller mill in raw material process	Energy saving to ball mill process: 30%	Vertical roller mill Capacity: 100 ton/h or more Input material: clay, limestone, and coal Function: crushing and drying	Ube Co. Ltd. (UM series)
9.2	Burning Process			
9.2.1	Variable speed control of exhaust gas fan of rotary kiln	Energy saving to dumper control type: 20% Inverter control	Variable speed control by high tension inverter: 3000V and 6000V Motor output: 800kW to 2000kW	Yaskawa (FSDrive-MV1S series)
9.2.2	Power generation plant with rotary kiln waste heat recovery	Waste heat resource recovery Energy recovery of power consumption in cement factory: 25%	Heat source: Exhaust gas of suspension pre-heater and clinker cooler Equipment: Waste heat boiler, steam turbine, and generator	Kawasaki Heavy Industry PT. JFE Engineering Indonesia

10	Textile Industry			
10.1	Dyeing and Finishing Equipment			
10.1.1	High performance tenter	Energy saving to non-inverter control type machine: 30% (Saved energy: 300Mcal/h) Inverter control	Stenter with inverter control Fuel: Natural gas Fuel intensity: Less than 0.2 kcal/m-cloth (Equivalent fuel consumption: less than 400Mcal/h at 2000m/h)	Hirano Entec (Simplex Tenter)
10.1.2	Dyeing system with high efficiency equipment	Energy saving in consumption of steam, electricity, and water to drum type dyeing machine, non-inverter control tenter, and non-recovery system of steam: 65% Stable quality Inverter control	Dyeing machine with inverter control Tenter with inverter control Drying machine Steam condensate recovery from dyeing process	Hisaka Works (Circular Dyeing Machine: CUT-MR, CUT-AR) Hirano Entec (Simplex Tenter, Suction Drum Dryer SSD)
11	Industrial Furnace			
11.1	Aluminum melting furnace for die casting (Tower type hurry melter)	Fuel saving to reverberatory furnace: 20%	Tower type hurry melter Melting capacity: 1 ton/h to 3 ton/h Fuel: Natural gas Raw material: Aluminum ingot Tapping temperature of aluminum: 720 C +-30C Fuel consumption: Less than 700,000 kcal/ton-metal	PT Hirochiku Asia Indonesia (NM1000,HM1500, HM2000, HM2500, HM3000)
11.2	Aluminum melting and transferring for die casting (Hot line melt system)	Energy saving to ladle and melting pot handling system: 20%	The system consists of: - Tower type hurry melter for aluminum (3 ton/h) - Launder and carrier - Holimesy furnace - Dosing furnace with level control	PT Hirochiku Asia Indonesia (HM3000, B1200,Carrier, LC1000)
12	Thermal Insulation			
12.1	Rock wool for industrial use	Radiation heat recovery of steam pipe to non-insulated pipe: 90%	Thermal insulation material Type: Wired blanket Density: 80 kg/m3 Service temperature: up to 200 C Ambient temperature: 30 C Thickness: 50mm Insulated pipe size: 350 mm diameter Thermal conductivity (W/mK): 0.0580 Weight: 14.4kg/roll	PT. Nichias Sanijaya (M.G. Felt, M.G. Lath board)
12.2	Insulation blanket for steam line	Radiation heat recovery of steam valve to non-insulated valve: 90% (Saved energy: 0.04 to 0.1 liter/h of fuel oil)	Thermal insulation cover Steam line valve: Valve size= 40A to 400A Material of insulation: Rock wool or glass wool Material of cover: Glass cloth with silicon coating Max. allowable temperature: 250C Density: 80 kg/m3 Thickness: 50mm	PT. Nichias Anijaya (Insulation Blanket R)
12.3	Insulation blanket for plastic injection machine	90% of radiation heat recovery of plastic heating part to non-insulated part (Power saving: 2 kW to 5kW per machine)	Thermal insulation cover Plastic injection machine Insulation area: 2 m2 Material of insulation: rock wool or glass wool Material of cover: cloth: glass cloth with silicon coating Max. allowable temperature: 250C	PT. Nichias Sanijaya (Insulation Blanket R-IJ)
Transportation				
13	Bus			
13.1	Articulated bus	Energy saving to single bus with CNG engine: 15%	TransJakarta: 2 connected cars (Articulated bus) Seating capacity: 40 Standing capacity: 120 Fuel: Compressed natural gas (CNG) Fuel consumption: 1.7 to 2.0 Nm3/km	PT. Asian Auto International (Articulated Bus) PT. Inka (Articulated Bus)

APPENDIX 2 The Other Approach for Investment Amount Estimation for EE&C in the Commercial Sector in Jakarta

1. Jakarta Building Inventory

Property development has been one of the major driving forces of economic growth in Jakarta over the past three decades. The first large commercial building in the capital was built in the early 1960s. As soon as the country entered the oil boom era, more medium to large-sized commercial buildings were built throughout the city. The first property boom took place between the mid-1980s and early 1990s. This growth was then slowed down by the economic crisis in 1997 and it was not until 2003 that the property sector started to get back on its feet.

Currently, the city landscape consists of around 1,200 medium to large sized buildings (2,000 square meters or larger), most of which had been developed and/or are owned by large property developers or private holdings having a significant property portfolio. The Jakarta property sector consists of more than a dozen large corporations that secured their land since the 1980s. Out of the hundreds of commercial buildings in Jakarta, most are well above 10 years old, some even more than 15 years old.

Table 1 Jakarta Building Stock Profile[1]

Building Categories	No. of Buildings	Size (million sqm)	Average Height (floors)	Average Age (yrs)
Office	548	13.5	24	16
Retail	108	5.7	5	12
Residential	251	20.7	28	7
Hospital	61	3.3	8	10
Hotel	81	3.8	21	15

1.1 Existing Buildings

Government-owned buildings and facilities and schools tend to be low-rise buildings (small buildings), while residential (apartments) and commercial buildings tend to be much larger in size (or total number of square meters). Most of the low-rise buildings are private offices owned by small enterprises and government offices. 90% of the low-rise office buildings are less than 5 years old. This type of office building is located outside of Jakarta's two central business districts of Kuningan and Sudirman-Thamrin.

[1] For the purpose of targeting energy efficiency in largest energy consumer in the commercial building sector, the above data compilation includes only building of more than 2,000 square meters.

Table 2 Jakarta Building Stock[2]

Building Type	Number of Buildings	Total Sqm	Buildings <=5 yrs (%)	Buildings >5 yrs (%)
Office	548	13,567,998	68	32
Retail	108	5,681,635	38	62
Residential	251	20,822,558	56	44
Hospital	61	3,294,077	57	43
Hotel	81	3,783,294	47	54

1.2 Projected Growth

Table 3 Average Growth Rates (2005-2009)

CATEGORY	CUMULATIVE SQM AS OF 2010	AVG ANNUAL GROWTH BY SQM	AVG ANNUAL GROWTHBY SQM (%)
Office	9,281,646	494,155	5.32%
Residential	20,447,539	1,321,933	6.47%
Retail	5,681,635	431,691	7.60%
Hospital	260,206	24,191	9.30%
Schools	411,688	22,898	5.56%
Hotel	3,258,777	213,841	6.56%

All commercial (including residential) sectors have been growing at an annual rate of over 5% for the past five years and this is predicted to continue into the next 5 years at least as well. With increased urbanization, the health care sector has been growing at the fastest rate with an average growth rate of almost 10%. However, because of the very low number of existing hospitals (private) this only means an additional 24,000 square meters per annum. This is extremely minimal compared with almost one 1.5 million additional square meters of residential space and almost half a million additional square meters in both the retail and office sectors.

Jakarta will see at least 680,000 square meters of additional office space and more than 32,000 units of apartments by 2012 (Jones Lang-LaSalle, 2010). It is also projected that there will be approximately 600,000 square meters of additional retail space by that same year.

[2] Jakarta building stock inventory is based on data from Jakarta's Buildings Control Agency, Jones Lang LaSalle and BCI Asia

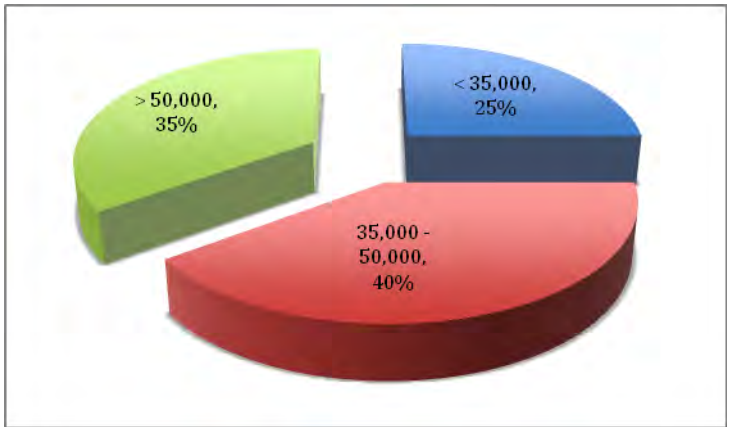


Figure 1 Future Supply of CBD Office (Colliers, 2010)

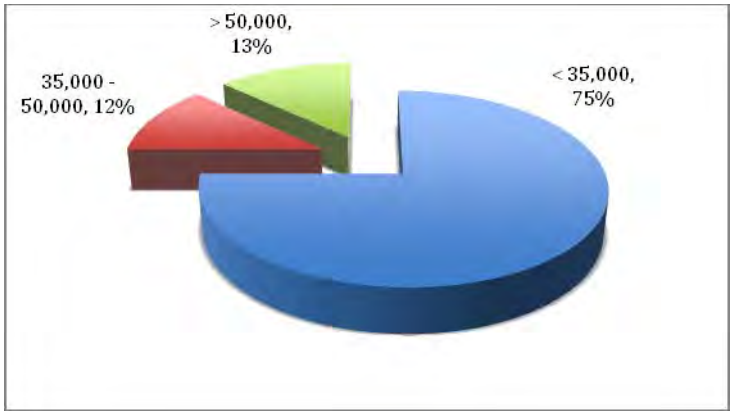


Figure 2 Future Supply of Non-CBD Office (Colliers, 2010)

Over the next three years, it is expected that the new supply of office space will still be in balance between those located in the CBD and those outside. As the availability of land in the CBD area is developed and becomes scarcer, it is predicted that future office supply will move towards the city's outer ring road (Colliers, 2010). Increasing 'verticalization' and development of mixed-use complexes will continue in the CBD. Based on the growth trend of office space over the last five years, there's an average of about 300,000 square meters of additional new office space added to the market every year. If the office sector continues to grow at this rate, Jakarta will see a cumulative supply of at least 15 million square meters by 2015. Out of that total office space, 70% would be more than 10 years old with significant opportunity and need to improve its energy efficiency and replace aged equipment and systems.

For the residential sub-sector, most of the new supply will be coming from middle class apartment tower projects subsidized by the government. These units will continue to increase for at least the next five years. By 2015, there will be around 30 million square meters of supply of residential space, of which 60% would have been more than 10 years old.

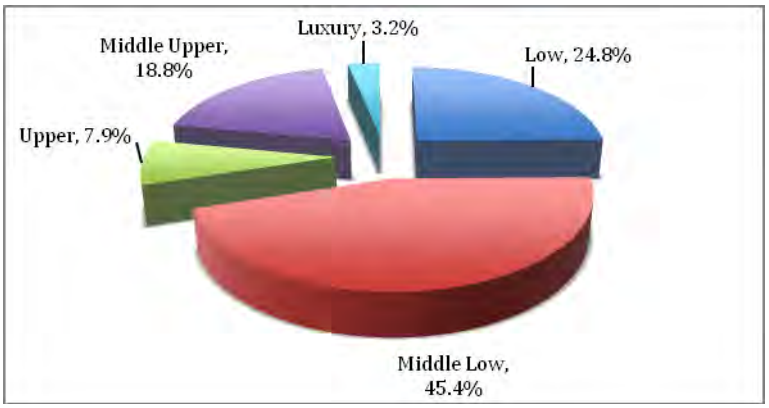


Figure 3 Breakdown of New Residential Space Supply (Colliers, 2010)

By 2012, it is expected that there will be approximately 600,000 square meters of additional retail space and from then onwards, there will not be any significant additional supply within the city. Development of large retail space will move outside of Jakarta as the trend over the last five years has already shown. By 2015, it is projected that there will be a cumulative supply of around 7 million square meters of retail space, of which more than 80% will be more than 10 years old.

2. Energy Consumption of Buildings in Jakarta

2.1 Current Energy Consumption Trend

At around 13,511 GWh per year, combined electricity consumption in commercial and high-rise residential buildings in Jakarta makes up on average around 55% of total consumption[3].

Table 4 Energy Consumption by Building Sub Sector

Building Type	Energy consumption (kWh/annum)
Office	3,362,819,859
Retail	1,830,617,976
Residential	6,153,347,430
Hospital	965,958,630
Hotel	1,199,195,823

In total, high-rise apartments, office towers, shopping malls and trade centers are the largest electricity consumers making up more than 82% of total commercial buildings' electricity consumption. For the first two sub-sectors, it is mainly because they are quite significant in numbers as residential space makes up for 40% of total space by square meters and offices around 28%.

[3] Based on data of electricity consumption by sector between 2005 and 2009 (PLN, 2010) and estimation of total energy consumption in buildings.

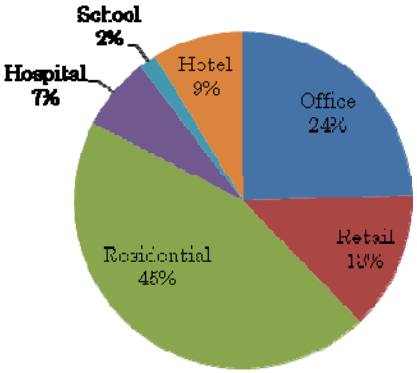


Figure 4 Breakdown of Energy Consumption in Jakarta Buildings by Sub Sector

2.2 Potential for Energy Savings by Sub-sector

As illustrated in the table below, while being the largest electricity consumers in terms of per square meter consumption, hotels, hospitals and retail buildings also have the highest potential for energy efficiency measures. Buildings which are more than 5 years old can see average potential energy savings of 21% (Average of Table 8 below). Shopping malls and trade centers of the same age can see average potential energy savings of around 23%.

The exact savings per building can, on a case-by-case basis, reach up to 50%, depending on the current condition of the building as well as the extent of efficiency measures that are undertaken. The opportunities to reduce energy consumption can be further increased if the acceptable financial/investment criteria are broadened to include Energy Conservation Measures (ECMs) that require larger investments (and often longer paybacks) or there is the availability of low cost external funds.

Retail buildings that are older than 5 years are assumed to have a 22% potential to reduce energy consumption. 62% of retail buildings are more than 5 years old, but in terms of square meters, this represents 76% of total retail space. This sub sector has an average building age of 12 years.

As for hotels, currently 79% of large hotel buildings are older than 5 years old. This sub-group has an average age of 15 years. Although being mostly low-rise buildings, hospitals have the highest average electricity consumption per square meter and have an average building age of 10 years. Due to their high consumption, even targeting newer hospital buildings (5 years old or less) still presents an attractive energy efficiency opportunity.

Table 5 Assumption for Potential Energy Savings by Building Type (%) [4]

Assumption for potential energy savings	>5 yrs (Building age)	<=5 yrs (Building age)
Office	20.5	15.5
Retail	21	16.5
Residential	15	12
Hospital	22.5	18
Hotel	25.5	19.5

Compared to retail buildings, office towers actually have slightly higher savings potential. However, their consumption per square meter is lower than retail buildings and their operating hours shorter, leading to less cumulative results. At the same time, energy efficiency efforts on an individual basis might not seem that attractive for an office building owner because of the traditional owner tenant disconnect. Unlike the public sector where the government typically owns the buildings it occupies, many commercial office buildings are held by "non-occupying owners". Combined with net leases where the tenant/lessees pay utilities directly, the owner becomes largely insulated from both the costs of rising energy expenses and, conversely, benefits of energy efficiency. The result is an owner with limited incentive to invest into energy efficiency. And while the tenants are not insulated, as lessees they won't proactively invest in long-term capital improvements to the building.

A structured comprehensive program with financial scheme to assist and incentivize the retrofit of commercial office buildings will have quite significant impact on the overall consumption and greenhouse gas emissions because their overall numbers are the highest among the commercial sector.

Since they are large in number, residential and office sub-sectors contribute 35% and 25% potential energy savings per annum from energy efficiency measures in commercial buildings in Jakarta. However, if we compare this to the estimated individual potential savings, the residential sector has low savings potential with a very high level of difficulty in the implementation. They are made up of individually owned or rented units and, most of the time, very minimal centralized building systems (Individual split air conditioning units, hot water systems, electrical and consumer equipment). One building can only be addressed through approaching and convincing hundreds and sometimes thousands of individual owners, not to even mention the fact that some of these units will be leased and the tenant therefore has neither incentive nor authority to invest into larger energy efficiency measures.

This then suggests that the most attractive potential for energy efficiency projects in the commercial building sector is that where there is the ease of reaching the key decision making authority (in addition to the specific opportunity to reduce energy consumption in particular building type)– which points in the direction of both hospital and hotel buildings as potential priorities to target.

As mentioned earlier, in Jakarta alone there are more than 1,200 commercial and residential buildings

[4] Assumptions are based upon the Clinton Climate Initiative's Energy Efficiency Building Retrofit Program in Jakarta and the Asian region with simple paybacks on investments within 5 years or less.

that alone represent opportunities to increase energy efficiency, even buildings, which were built within the past five years. However, if one were to narrow down the scope of opportunity to the largest buildings based upon a minimum size criteria for these opportunities in terms of square meters, then the opportunities could be presented as shown in the table below:

Table 6 Sample Baseline Scenario (2010)

Size Criteria	Number of existing buildings	Total Sqm	Energy Consumption (MWh)
Office (>50,000m^2)	193	9,281,646	2,322,844
Residential (>50,000m^2)	227	20,447,539	6,045,361
Retail (>50,000m^2)	108	5,681,635	1,830,618
Hospital (>20,000m^2)	5	260,206	71,961
Hotel (>20,000m^2)	52	3,258,777	1,040,669
TOTAL	585	38,929,803	11,311,453

If one were then to identify the total financial opportunity for improving energy efficiency in these largest buildings in Jakarta alone then the table below can illustrate the total investment potential:

Table 7 Sample Investment Opportunity

Building Type	Number of existing buildings	Total Sqm	Estimated Investment Opportunity (USD)
Office (>50,000m^2)	193	9,281,646	159,180,229
Residential (>50,000m^2)	227	20,447,539	223,900,552
Retail (>50,000m^2)	108	5,681,635	120,734,744
Hospital (>20,000m^2)	5	260,206	10,863,601
Hotel (>20,000m^2)	52	3,258,777	105,747,314
TOTAL	585	38,929,803	620,426,439

The calculations of “Estimated Investment Opportunity” above were undertaken by allocating an investment figure per building type to achieve the average savings within a 5 year or less payback period (average savings). The investment figure has been predetermined by looking across a portfolio of building projects across Asia and the required investment to achieve the savings. These represent live actual projects that the Clinton Foundation (CCI) had managed. By addressing energy efficiency in the largest buildings in the city of Jakarta alone, there is a potential for over US$600 million worth of investments. Most of these will include equipment replacements such as chillers (and chiller plant equipment such as cooling towers, pumps etc.) and boilers as well as smaller systems such as building

automation/management systems, lighting, and improvements to the overall building envelope. Such investments would only be able to be implemented in a multiple-year program and would require significant investment into the development of the core engineering and technical expertise, the introduction of new energy efficiency technologies (from overseas) as well as technical assistance in supporting the activities needed to develop these investment opportunities and develop the overall market for energy efficiency projects.

2.3 Building Systems and Equipment in Existing Buildings

An interesting approach to attempting to identify the opportunity for increased energy efficiency in buildings is to understand the existing equipment and systems in place in these respective buildings. In relation to energy consumption across all relevant building types, the air conditioning system and lighting are the two most relevant aspects to be evaluated. In hotels and hospitals, hot water systems have been found to represent 7% to 10% of total energy consumption.

Table 8 Energy Consumption Distribution in 60 Selected Buildings in Jakarta (Hindarto, 2005)

TYPE OF BUILDING		ENERGY DISTRIBUTION (%)		
		Air-con	Lighting	Others
Offices		45.74	21	30.05
Retail		51.55	18.57	25.1
Residential		53.45	12.25	27.55
Hospitals		62.04	11.77	21.92
Hotels	Five star	60.18	14.54	18.84
	Four star	60.15	9.57	22.4
	Three star	65.4	10.4	8.1

Currently, many buildings are running chiller plants with air-cooled chillers. Average plant efficiency was reported to be between 0.98 and 1.3 kilowatt (kW)/ton refrigerant (TR) (MEMR, 2009), which places them at ASHRAE's "need improvement" efficiency category. According to the ASHRAE benchmark, moderate efficiency is reached when chiller plants are running at efficiency of 0.9 kW/TR. The audits also found that cooling capacity is most of the time overdesigned, thus the installed chillers are not running at optimal load.

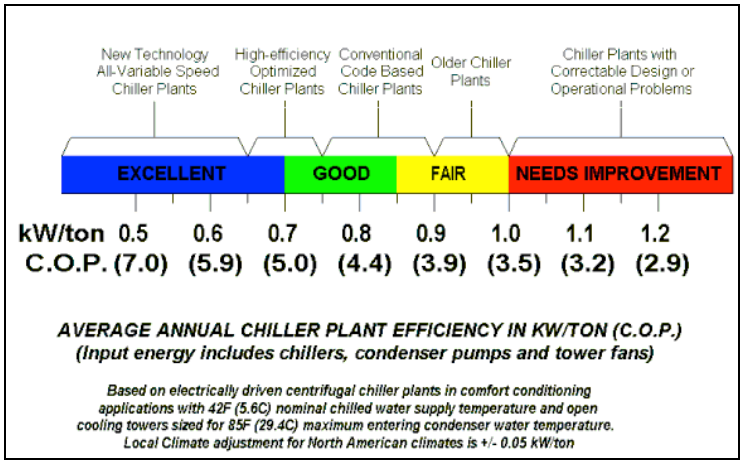


Figure 5 American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE), 2009

On the more passive design aspect of existing buildings, buildings more than 10 years old have only been glazed with safety films or no window films at all. Double-glazing is a rare case. And hence, heat penetration from the sun into the building is not minimized requiring an additional cooling load from the chiller plant to compensate.

For lighting, most of the buildings are still using inefficient T8 fluorescent lamps, even in newer buildings. Some medium-sized government offices are even still using magnetic ballasts. LEDs are a very rare case in newer buildings although there have been recent initiatives in some retrofits within the city center and by large multinationals.

Table 9 Sample Energy Efficiency Opportunities

Sample Energy Efficiency Opportunities	
Sample 1: Hospital Project	
Building Type:	Hospital
Year Built:	1970
Building Size:	300 beds
Investment:	US$625,000
Savings:	US$750,000/annum
ECMs: integration of all individual split units into one main water-cooled system, upgrade of existing boiler system, high efficient lighting replacement, humidity control upgrade	
Sample 2: Office Building	
Building Type:	Office
Year Built:	1995
Building Size:	28 Floors
Investment:	US$945,000
Savings:	US$185,000/annum
ECMs: Main chiller replacement, redesign of pump system, cooling tower optimization, integration of air cooled and split units into the main chiller system, lighting upgrade with controls	
Sample 3: Hotel Project	
Building Type:	Hotel (5-Star)
Year Built:	1996
Building Size:	428 Rooms
Investment:	US$1,300,000
Savings:	US$250,000
ECMs: Chiller replacement, hot water system upgrade, lighting upgrade, building envelope improvement (window film)	
Sample 4: Office Project	
Building Type:	Office
Year Built:	1974
Building Size:	42,000sqm
Investment:	US$2,400,000
Savings:	US$180,000/annum
ECMs: Chiller plant replacement, lighting upgrade, internal wiring upgrade, lift upgrades, building envelope (window film, construction of eaves above windows), increased daylight, back up generators	