Ministry of Energy and Mineral Resources
Ministry of Industry
The Republic of Indonesia

Energy Audit Program Study

Special Assistance for Project Implementation (SAPI)
for
Climate Change Program Loan

Study on the Institutional Framework of
Energy Efficiency and Conservation
through Energy Audit and Roadmap for GHG Mitigation
in
The Republic of Indonesia

Final Report

(Main Report)

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JAPAN INTERNATIONAL COOPERATION AGENCY

THE INSTITUTE OF ENERGY ECONOMICS, JAPAN

Contents

Tables

Figures

Abbreviations

ADB	Asian Development Bank
AFD	French Development Agency
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of South-East Asian Nations
BAKOREN	Energy Coordination Committee
BAPPENAS	National Development Planning Agency
BATAN	National Nuclear Energy Agency
BAU	Business As Usual
BPPT	Agency for Assessment and Application of Technology
CCPL	Climate Change Program Loan
CDM	Clean Development Mechanism
CF	rate of conversion from clinker to cement
CFL	Compact Fluorescent Lamp
COP	Coefficient Of Performance
CY	Calendar Year
DEDE	the Department of alternative Energy Development and Efficiency
DEN	National Energy Council
EA	Energy Auditor
EAF	Electric Arc Furnace
ECCJ	The Energy Conservation Center, Japan
EE&C	Energy Efficiency and Conservation
EERF	Energy Efficiency Revolving Fund
EIRR	Economic Internal Rate of Return
EMI	PT Energy Management Indonesia (Persoro)
ESCO	Energy Service Company
ETCEM	Education and Training Center for Energy and Mineral
FOB	Free On Board
GDP	Gross Domestic Product
GHG	Green House Gas
GTZ	Deutsche Gesellschaft fur Technische Zusammenarbeit
IDO	Industrial Diesel Oil
IEA	International Energy Agency
IEEJ	The Institute of Energy Economics, Japan
IF	Induction Furnace
IISIA	The Indonesian Iron and Steel Industry Association
IPP	Independent Power Producer
IRR	Internal Rate of Return
JETRO	Japan External TRade Organization
JICA	Japan International Cooperation Agency
KEN	National Energy Policy
LULUCF	Land Use, Land Use Change, and Forestry
MEMR	Ministry of Energy and Mineral Resources
METI	Ministry of Economy, Trade and Industry
MOCSMEs	Ministry of Cooperatives and Small and Medium Enterprises
MOI	Ministry of Industry
MOPS	the Mean of Platts Singapore
MRI	Mitsubishi Research Institute, Inc
NEDO	New Energy and Industrial Technology Development Organization
Nm3	Normal cubic meter
NPV	Net Present Value
OECD	Organization for Economic Co-operation and Development
OPEC	Organization of the Petroleum Exporting Countries
PLN	PT Perusahaan Listik Negara (State Electricity Company)
PV	Present Value
Rp	Rupiah
RUEN	Comprehensive National Energy Plan
SEP	Saving Energy Program
toe	Ton of Oil Equivalent
WTI	West Texas Intermediate

CHAPTER1. INTRODUCTION

1.1 Background to the Study

Japan International Cooperation Agency (JICA) provided the Climate Change Program Loan (CCPL) in 2008 to support the efforts of the Government of Indonesia to respond to the impacts of climate change. The policy matrix for CCPL covers issues in the forestry, energy, agriculture, water resources, and cross-cutting sectors. The loan is expected to contribute to reducing CO2 emissions in the country by promoting energy efficiency through an energy audit program and a CO2 reduction roadmap. Upon monitoring policy actions for 2008, GOI and JICA concluded that formulation of a medium-term energy audit program, combined with the CO2 reduction roadmap of Ministry of Industry (MOI), would be necessary to promote energy efficiency in Indonesia. The policy matrix of CCPL includes actions for 2009 to "design a mid-term energy audit and efficiency program, including medium-term targets, incentive mechanisms, and monitoring and evaluation framework," and to "design a CO2 roadmap implementation program, including incentive mechanisms, and a monitoring and evaluation framework."

The Ministry of Energy and Mineral Resources (MEMR), MOI, and JICA have agreed to start a new joint study to analyze medium-term targets for the energy audit program, incentives to promote energy efficiency, and a monitoring and evaluation mechanisms to support implementation of the two actions above by MEMR and MOI.

The amount of greenhouse gas (GHG) emissions from the energy sector in Indonesia is the 15th largest in the world according to a study by the World Resource Institute in 2008. The diversification of energy sources and conservation of energy are, therefore, two of the main objectives of CCPL. In addition to GHG emissions, energy elasticity in Indonesia is higher than those of neighboring countries such as Malaysia and the Philippines, increasing the need for more energy supplies. Because energy consumption from the industrial and commercial sectors accounts for 48% of energy demand in Indonesia, creating a regulatory framework to promote energy conservation contributes not only to accomplishing the targets of policy actions for CCPL, but also to sustaining Indonesia's economic growth based on its national development plan.

1.2 Objectives of Study

This study analyzes the basis of the framework of the energy audit program, in combination with the CO2 reduction roadmap, including medium-term targets (CO2 reduction, audit recipients, etc.), incentive options, and monitoring and evaluation mechanisms as a basis for policy options to promote energy conservation in Indonesia.

1.3 Scope of the Study

This study comprises the following 10 items.

(1) Review of current program

A review of the current scheme of the energy audit program including:

- Overall process of energy audit program (including budget submission process and time-line)
- Selection process and criteria for selecting energy audit recipients
- Feedback process of audit results to recipients and post-audit activities of the government, including monitoring and evaluation framework.

(2) Medium-term targets: the total number of audit recipients and CO2 reductions achieved through energy audits

Medium-term targets for the following items in line with targets and goals specified in National Action Plan for climate Change, Climate Change Program Loan are proposed.

- Total number of businesses and buildings audited
- Number of audits to be conducted in one year
- Target for CO2 reductions
- Budget required

(3) Selection of target sectors

Target industries or (commercial) buildings as pilot projects to be the basis of a regulatory framework for the energy audit program are selected. As a result of discussions with counterparts during the first mission, cement and steel industries were selected as target industries.

(4) List of technologies and scenario for their introduction

A list of potential energy-saving technologies for cement and steel industries is compiled. A technology introduction scenario for energy audit recipients is also considered.

(5) Incentives for improving energy efficiency by audit recipients

The following incentive options are analyzed.

- Additional points to be included in energy audit
- Selection of model cases (businesses, buildings, and technology options)

- Cost and level of energy conservation when advice on above model cases is implemented
- Incentive options from the government such as tax, subsidy, loans, CDM, and top-runner program.

Based on the above analysis, a comparative analysis is considered on the following points. Also, the potential of energy awards to industrial and commercial facilities in relation to public announcements is assessed.

- Low-interest loans or subsidies from the government
- ESCO system

(6) Cost and benefit analysis of potential technologies and incentive options

The costs and benefits of employing energy-efficient technologies with incentive options and the economic impacts of energy audits and CO2 roadmap program, including amount of investment and reduction of government energy subsidies are analyzed.

(7) Monitoring and reporting framework

The following items are proposed.

- A monitoring framework by the government and development of ESCO comparing neighboring countries
- A reporting system from auditors and audit recipients to the government
- A framework of regular meetings of related ministries

(8) Evaluation framework

An evaluation framework for the energy audit program is proposed, considering examples from neighboring countries. Also, penalties under draft energy conservation regulations are reviewed from the following viewpoints.

- Adequacy of penalty
- Process of enforcing penalty
- Comparison with examples in neighboring countries

(9) Review of regulations to expand participants of the energy audit program

A regulatory framework to shift from the current voluntary participation to mandatory participation is proposed based on the following items.

- Number of businesses and buildings subject to regulations for large-scale energy consumers
- Regulatory framework necessary to enforce a mandatory energy audit program for large-scale energy

consumers and expected time required for the framework

(10) Publication of results of model audit cases

A program framework to expand the targets of energy audits by publishing the results and outcomes of energy audits and improvement measures for model cases to be implemented in the future is proposed considering the following items.

- Selection of model cases for each category of energy audit recipient such as industry sector, commercial sector, and office buildings
- Means to publish a list of efficiency improvement technologies, costs, and conservation effects
- Proposed framework of regular meetings of related ministries

1.4 Method of Study

The study requires close cooperation among JICA study team, counterpart organizations in Indonesia, (MEMR and MOI), our local consultants, etc. Because the counterpart organizations related to this study in Indonesia are MEMR and MOI, it is necessary to confirm the assigned field of each ministry; MEMR's cooperation is expected to be mainly in the fields of Energy Policy, Institutions, and Regulations for Energy Conservation, and Energy Management nationwide; and, MOI's cooperation is expected to be mainly in the fields of Planning and Assessment upon the introduction of energy-saving technologies in the steel and cement industries. The work system envisaged and the organizations involved in conducting the study are shown in Figure 1.4-1.

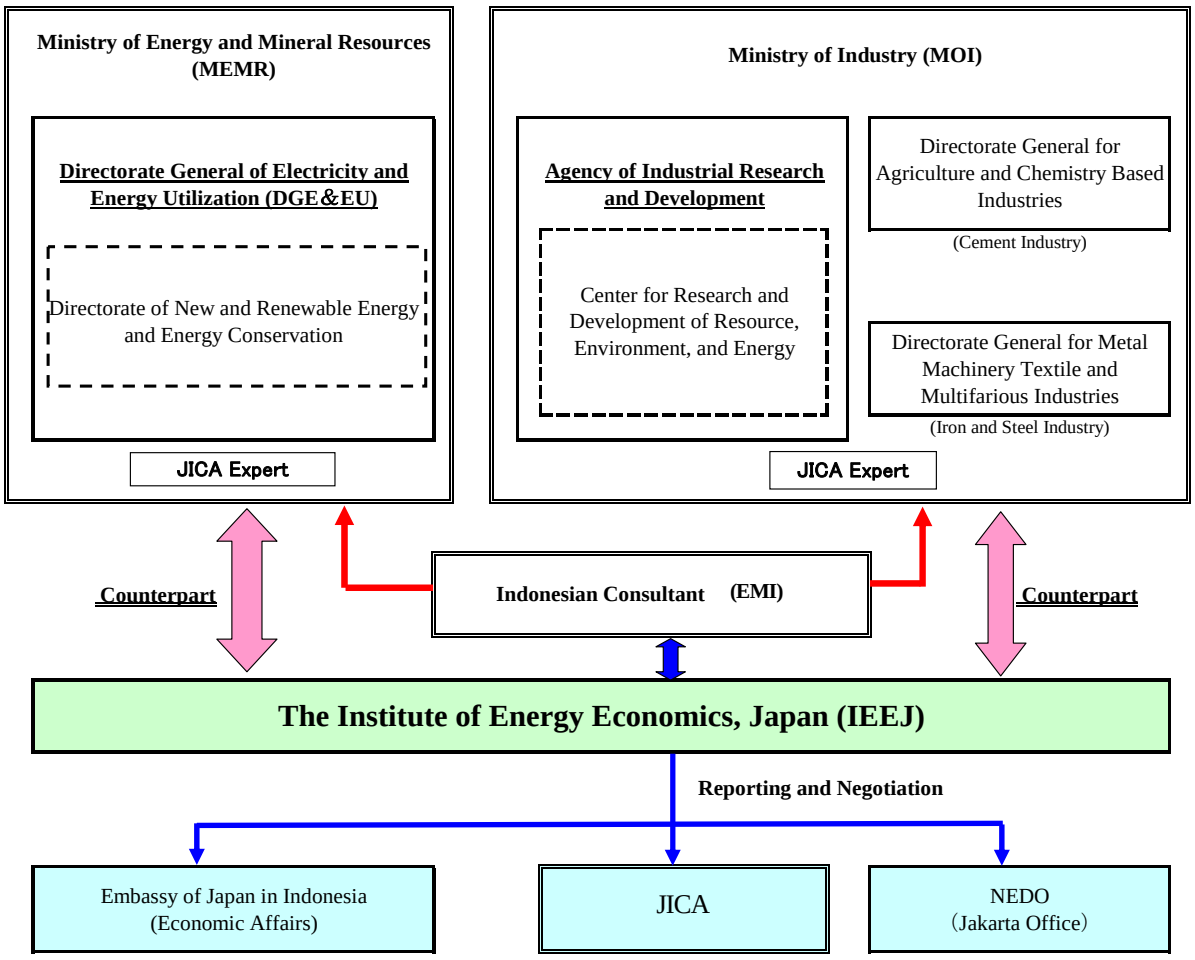


Figure 1.4-1 Work System of the Study

1.5 Schedule of Study

Table 1.5-1 Schedule of Study

Period / Study Work	Fiscal 2009				Fiscal 2010			
	12	1	2	3	4	5	6	7
Collection & review on related information and materials								
Preparation for sub-contract								
Prepare Ic/R								
Prepare 1st Work in Indonesia								
Explain & discuss Ic/R								
Selection of assigned area								
Collection on existing information								
Conclusion of reconsignment contract								
Prepare P/R								
Review of the current institution of energy audit and programs								
Study of medium term target of energy audit								
Study of medium term target of reduction of CO2 emission								
Study of technology road map & scenario for introduction								
Study of the possible additional incentive for energy audit								
Explain & discuss P/R								
Site Tour (3 factories)								
Check on sub-contract work								
Collection on additional information								
Discuss Workshop								
Prepare DF/R								
Evaluation of cost-effectiveness of EE&C on various incentives								
Study on legal & financial support system								
Prepare Workshop								
Explain & discuss DF/R								
Workshop								
Collection on additional information								
Close contact for sub-contract								
Prepare F/R								

Legend : Work in Indonesia Study Work in Japan

CHAPTER2. ECONOMIC AND ENERGY SITUATION IN INDONESIA

This chapter describes the current situation of economy and energy affairs in Indonesia. Before the potential for energy saving in Indonesia is examined, we start considering democratization and transition to market economy, economic situation, energy situation and current situation and development of CO2 emission in the country.

2.1 Democratization and Transition to Market Economy

Indonesia is at the final stage of a transition from a centralized, planned economy to a market economy. The country suffered the severest economic impact among ASEAN countries and South Korea during the Asian Financial Crisis that occurred in July 1997 with its GDP growth rate falling -13% in 1998. Nevertheless, as a result of ambitious reforms of its economic structure toward a market economy implemented by the government under an agreement with the IMF, the country has enjoyed economic growth of 5 - 6% per annum since 2005 by increasing consumer expenditure and exports.

In rural areas, however, the poverty ratio is still high. Also, basic services are not satisfactorily provided such as electricity, water supply, sewage system, transport, education, and health. Many people need improved Basic Human Needs. Such circumstances have resulted in a subsidy system that has been designed in parallel with the introduction of market mechanisms to provide many people, mainly the poorest segment of the population, with petroleum products and power at below market price, which has created a problematic structure in which private companies engaged in these sectors cannot share profits. In addition, according to a survey sponsored by the Ministry of Economic Cooperation, the segment of the population ranking in the top 40% of income enjoys about 70% of the benefits of subsidies, while those in the bottom 40% only enjoy 15%, and it is pointed out that the subsidy system doe not work effectively. Moreover, the subsidy system has brought about harmful effects such as the retention of inefficient manufacturing processes and energy-consuming equipment and waste of energy, which is one of the factors spurring an excessive increase of energy consumption that accompanies economic growth.

In line with these changes in the economic system, the political system has also evolved from a centralized, authoritarian system to a democratic system with power decentralized to local governments, and a new mechanism of political decision-making is emerging based on directly elected offices of President, state governors, prefectural governors, and mayors. The Youdhoyono Administration took office following the first-ever direct, presidential election in Indonesia held in July 2004, and there were elections of local governors and mayors from June to August 2005, which also constituted the first direct vote by the population in the history of Indonesia. As a result, the right of choice of the heads of local governments has been transferred to the population from the central government of the Suharto era through local assemblies. This has

enabled voters to elect all political posts directly, and formulation of systems for democratization has progressed. On the other hand, however, the local governments that waited for the distribution of funds from the central government, and were only authorized to spend the distributed funds as directed during the Suharto era, now need to work with the central ministries themselves to get funds; lobbying activities by local governors and locally elected parliamentarians to the central agencies have now become active. Thus, the increasingly active role played by local stakeholders is worth noting and has merits as a change brought about by decentralization, while, at the same time, it is also said that decentralization itself has spread collusive relationships and corruption, and adverse effects of democratization are suggested.

Figure 2.1-1 Map of Indonesia

2.2 Economic Situation in Indonesia

The economic reforms following the Asian Financial Crisis and active consumer spending pushed Indonesian GDP growth up to 4.8% in 2003, 5.0% in 2004, 5.7% in 2005, 5.5% in 2006, 6.3% in 2007, and 6.1% in 2008. As a result of financial reconstruction achieved over the past several years, combined with economic growth, an equalized primary balance has been maintained. The ratio of the fiscal deficit to GDP has evolved in the order of 1%: 1.7% in 2003, 1.0% in 2004, 0.5% in 2005, 0.9% in 2006, and 1.2% in 2007, before reaching almost a balance of 0.1% in 2008.

As regards total trade, exports were 62.5 billion dollars in 2003, 69.7 in 2004, 85.7 in 2005, 100.7 in 2006,

114.1 in 2007, and 137.0 in 2008. On the other hand, imports were 33.1 billion dollars in 2003, 46.2in 2004, 57.7 in 2005, 61.1 in 2006, 74.5 in 2007, and 129.2 in 2008. As a result, the balance of trade remained in surplus: 29.4 billion dollars in 2003, 23.5 in 2004, 28.0 in 2005, 39.6 in 2006, 39.6 in 2007, and 7.8 in 2008. In 2008, exports declined due to the economic and financial crisis in the U.S. and Europe.

In terms of energy sources, Indonesia is blessed with natural resources such as crude oil, natural gas, and coal, which made it possible to export 31% of crude oil produced, 77% of coal produced, and 47% of natural gas produced in 2007. About 38% of crude oil production is, however, imported from the Middle East and African countries, and the country is a net importer of crude oil although it is an oil-producing country. Also, the oil-refining capacity of the country is insufficient and cannot meet domestic demand for oil products, thus oil products equivalent to 55% of the crude oil-processing capacity of domestic refineries are imported. Moreover, the surplus of oil and gas revenues during the past few years has generally decreased[1], which provides a setting that urges the Indonesian government to look for independence from oil.

Table 2.2-1 Economic Data on Indonesia

	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008
Population	million	206	209	211	214	217	220	223	226	229
GDP	trillion Rp 2000 price	1,390	1,443	1,505	1,577	1,657	1,751	1,847	1,963	2,082
GDP growth rate	%	4.9	3.8	4.3	4.8	5.0	5.7	5.5	6.3	6.1
GDP deflator	2000=100	100	117	121	128	139	158	181	201	238
Exports	million US$	62,124	56,321	57,159	62,527	69,714	85,660	100,690	114,100	137,020
Imports	million US$	33,515	30,962	31,229	33,086	46,180	57,701	61,078	74,473	129,244
Trade balance	million US$	28,609	25,359	25,930	29,441	23,534	27,959	39,612	39,627	7,776
Exchange rate	Rp per US Dollar	8,422	10,261	9,311	8,577	8,939	9,705	9,159	9,141	9,699
Overall budgetary surplus /deficit	% of GDP at current market prices	-1.1	-2.4	-1.5	-1.7	-1.0	-0.5	-0.9	-1.2	-0.1

Source: ADB

Note: GDP growth prospects (ADB) 2009: 4.5%, 2010: 5.5%, 2011: 6.0%

2.3 Energy Situation in Indonesia

2.3.1 Overview of Energy Sector

Indonesia is one of a few energy exporting countries in Asia that are rich in energy resources such as oil, natural gas, and coal, and it is Asia's fifth largest primary energy-consuming country with a population of 230 million.[2]

[1] Oil and Gas exports: 15.2 billion dollars in 2003, 17.7 in 2004, 19.2 in 2005, and 21.2 in 2006, and Oil and Gas imports: 8.5 billion dollars in 2003, 12.1 in 2004, 17.5 in 2005 and 19.0 in 2006, Trade Balance: 6.7 billion dollars in 2003, 5.6 in 2004, 1.7 in 2005, and 2.2 in 2006.

[2] The population is based on MEMR, "Handbook of Energy & Economic Statistics of Indonesia 2009," and primary energy consumption (supply) is based on IEA, "Energy Balances of Non-OECD Countries 2009."

Table 2.3-1 Fossil Energy Resources of Indonesia, 2007

	Unit	Resources	Reserves	Production	Reserves/Production (years)
Oil	billion barrels	56.6	8.4	0.3	24
Natural Gas	trillion m3	9.5	4.7	0.1	59
Coal	billion tons	90.5	18.7	0.2	93
Coal bed methane	trillion m3	12.8	-	-	-

Source: Ministry of Energy and Mineral Resources

In addition, Indonesia is the second largest crude oil producer in the Asian area after China, and was Asia's only OPEC member. However, with its crude oil production decreasing while domestic demand has been rising in recent years, it became a net importer of oil from 2004 and left OPEC formally in December 2008. Furthermore, Indonesia is the third largest LNG-exporting country in the world after Qatar and Malaysia. However, as domestic production has not been able to catch up with rising domestic demand in recent years, its export volume has continued to decline. On the other hand, its coal exports are on the rise with increased production. In the power sector, a serious shortage of supplies of electricity remains. This is because electricity prices are held down as a matter of policy, causing stronger demand, while electric power facilities are not being built up including new entries of IPPs etc., and existing facilities still have low operating rates due to rising fuel costs and other factors.

2.3.2 Trend and Outlook of Energy Supply and Demand for Primary Energy

Despite the impacts of the Asian Financial Crisis in 1997, the real GDP of Indonesia grew at an annual rate of 4% throughout the 1990s, and recorded an annualized growth rate of 5% during the 2000s. In parallel with its economic growth, primary energy consumption also increased at an annual growth rate of 3.9% and 3.4% in the respective periods. As a result, the energy elasticity to GDP reached 0.94 and 0.67, respectively. Moreover, primary energy consumption per GDP, which is a macro energy-saving indicator, improved 23% from 1990 to 2007 in Indonesia.

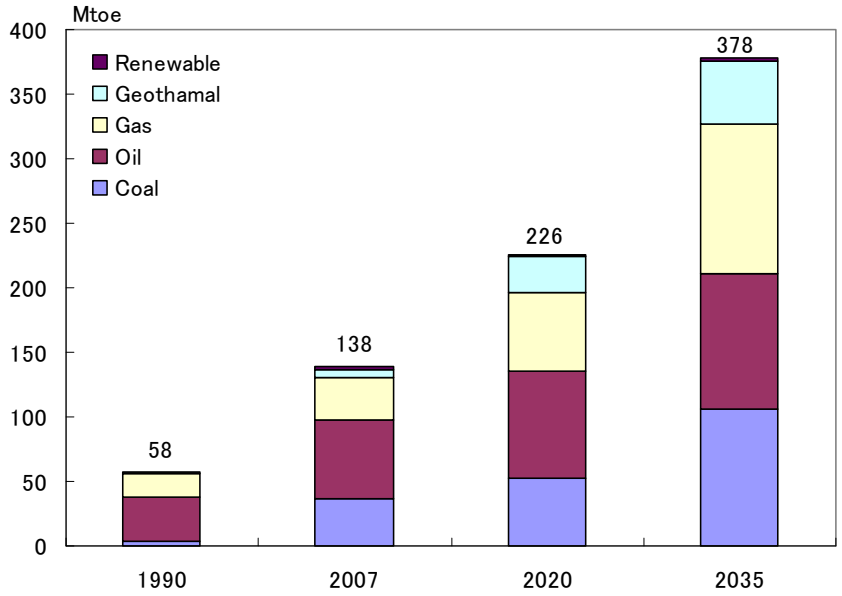
Although Indonesia's primary energy consumption per GDP is gradually improving, it was some eight times higher than that of Japan in 2007 and potential energy savings seem to be large. Meanwhile, energy consumption per capita of Indonesia was only 0.8 toe (ton of oil equivalent), or about one-fifth of that of Japan, in 2007. Further expansion of energy consumption is expected due to economic growth and rising income levels in Indonesia.

Table 2.3-2 Trend of Total Primary Energy Supply, real GDP, Population, Energy Intensity, and GDP Elasticity of Energy Consumption in Indonesia

	Unit	1990	2000	2007	2000/1990	2007/2000
TPES	million toe	102.5	150.9	190.7	3.9%	3.4%
	(excluding combustible renewables)	57.5	101.0	138.3	5.8%	4.6%
GDP	Bil.2000 US$	109.2	165.0	233.2	4.2%	5.1%
Population	millions	178.2	206.3	225.6	1.5%	1.3%
TPES/GDP	toe per thousand 2000 US$	0.9	0.9	0.8	-0.3%	-1.6%
	1990=100	100.0	97.4	87.1		
TPES/POP	toe per capita	0.6	0.7	0.8	2.4%	2.1%
GDP elasticity					0.94	0.67

Source: Based on data from IEA, "Energy Balances of Non-OECD Countries 2009"

According to the latest forecast (in October 2009) of the Institute of Energy Economics, Japan, primary energy consumption of Indonesia will increase from 140 million toe in 2007 to 380 million toe in 2035 with an average annual growth rate of 3.7%.[3] By energy source, consumption of natural gas and coal will rise mainly for power generation. On the other hand, oil consumption will increase for transportation, etc., but it will fall for power generation, making its growth rate lower than that of natural gas or coal. Nevertheless, oil consumption will rise from 60 million tons in 2007 to 110 million tons in 2035, or about 1.8 times. Meanwhile, because domestic oil production cannot be expected to increase, it is predicted that dependence on oil imports will rise from 23% to 65%. From the viewpoint of energy security, in addition to global warming and sustainable development, minimizing energy consumption through energy savings is an important policy issue for Indonesia.



Source: Based on data from IEEJ, "Asia / World Energy Outlook 2009"

Figure 2.3-1 Outlook for Primary Energy Consumption in Indonesia

[3] These values of energy consumption do not include combustible renewable energies such as biomass.

To detail energy supply and demand of Indonesia, the energy Balance Table in 2007 (hereinafter referred to as "Balance Table") is shown in Table 2.3-3. The Balance Table indicates that Indonesia exports nearly 31% of its crude oil production, 77% of its coal production, and 47% of its natural gas production. However, its crude oil imports exceed exports, making the country a net crude oil importer, although it is an oil-producing nation. In addition, because of its insufficient domestic oil-refining capacity, petroleum products representing nearly 55% of the refining volume of domestic oil refineries (nearly 37% of net import/export balance) are imported, showing that domestic demand for petroleum products cannot be met. Reducing dependence on oil has been an important challenge in terms of import-related foreign currency savings as well.

Table 2.3-3 Energy Balance Table: Indonesia, 2007

(Million toe)

	Hydro	Geothermal	Combustible renewables	Coal	Natural gas	Crude, NGL	Fuel oil	Other Petroleum products	LPG	Electricity	Total
Production	1	6	52.5	160.7	69.4	41.6	0	0	0	0	331.1
Import	0	0	0	0	0	16	21.2	0	0.2	0	37.5
Export	0	0	-0.1	-124.3	-32.7	-13.1	-6.7	-1.1	-0.3	0	-178.3
Stock changes	0	0	0	0.4	0	0	0	0	0	0	0.4
Total Primary Energy Supply	1	6	52.4	36.8	36.7	44.4	14.6	-1.1	-0.1	0	190.6
Transformation	-1	-6	-1.5	-15.9	-4.5	-44.4	29.4	4.7	1	12.2	-26
Electric Utilities	-1	-6	0	-15.9	-4.2	0	-8.3	0	0	12.2	-23.2
Auto Generation	0	0	0	0	0	0	-0.1	0	0	0	-0.1
Refinery	0	0	0	0	-0.2	-44.4	38.7	3.8	1	0	-1.2
Others	0	0	-1.5	0	0	0	-0.9	0.9	0	0	-1.5
Own use and Losses	0	0	0	0	-15.5	0	-1.7	-0.8	0	-1.8	-19.8
Own use	0	0	0	0	-11.7	0	-1.7	-0.8	0	-0.5	-14.7
Distribution losses	0	0	0	0	-3.8	0	0	0	0	-1.3	-5.1
Statistical differences	0	0	0	0	-2.1	0	-0.7	2.3	0.6	0	0.2
Total Final Energy Consumption	0	0	50.9	20.9	14.7	0	41.5	5.2	1.4	10.4	145.1
Industry	0	0	6.2	20.9	9.7	0	6.4	0	0.2	3.9	47.2
Transportation	0	0	0	0	0	0	24.4	0	0	0	24.4
Household	0	0	44.5	0	0	0	6.8	0	1.1	4.1	56.6
Commercial	0	0	0.2	0	0	0	1.1	0	0.2	2.4	3.9
Other sector	0	0	0	0	0	0	2.9	0	0	0	2.9
Non energy use	0	0	0	0	4.9	0	0	5.2	0	0	10.1

Source: Based on data from IEA, “Energy Balances of Non-OECD Countries 2009”

The electric power production of electric power suppliers was 12.2 million toe. The largest share of fuel used for power generation was held by coal (15.9 million toe), followed by oil (8.3 million toe), geothermal energy (6 million toe), and natural gas (4.2 million toe).

Final energy demand totaled about 145.1 million toe. The sectoral breakdown is: 47.2 million toe for industry, 24.4 million toe for transportation, 56.6 million toe for household use, and 3.9 million toe for commercial sector.

By energy source, coal was mostly used by industry, followed by natural gas and petroleum products. Transportation mostly used petroleum products including gasoline and diesel oil. As for household use, traditional biomass fuels, such as firewood and straw, are consumed mainly in rural areas. In addition, kerosene used for cooking is in great demand. As an alternative to kerosene, LPG is being promoted politically because of delays in expanding the city gas network, etc. Although the total energy needs of the commercial sector are relatively small at about 3.9 million toe, big cities, such as Jakarta, are extensively electrified, making the ratio of power demand as high as 62%.

The trends of sectoral final energy consumption are shown in Table 2.3-4. The average growth rate was 3.7% between 1990 and 2007. Compared by use, 6.3% is for industry, 9.9% for commercial, and 5.0% for transportation, while household use has a low growth rate of 1.8%. Industrial use is increased by production activities associated with economic growth. Transportation use is intensified by stronger demand for gasoline and diesel oil, especially for automobiles. In the commercial sector, more energy is being consumed due to increased power demand and electrification caused by the concentration of population in large cities and air conditioning and lighting in office buildings. Compared to the overall energy demand increase of 4.4%, the increase for industrial and commercial use has been remarkable. Therefore, from the viewpoint of the macro-economy, it is effective to focus on industrial, transportation, and commercial use as a policy target of energy saving for some time.

Table 2.3-4 Trend of Total Final Energy Consumption by Sector

(Million toe)

	1990	1995	2000	2005	2006	2007	2008	2008/1990
Industry	16.7	20.7	30.4	34.4	36.1	47.2	53.0	6.6%
Commercial	0.8	1.6	2.4	3.2	3.4	3.9	4.1	9.5%
Transportation	10.7	16.4	21.3	25.0	24.5	24.4	28.1	5.5%
Household	41.6	45.7	52.0	56.0	56.4	56.6	46.6	0.6%
Other sector	9.0	9.6	12.0	14.2	14.8	13.0	20.1	4.6%
Total	78.8	94.0	118.1	132.8	135.2	145.1	152.0	3.7%

Source: Based on data from IEA, “Energy Balances of Non-OECD Countries 2009” (except 2008), Ministry of Energy and Mineral Resources (2008)

However, the Balance Table indicates that the actual status of energy consumption on which energy-saving policy is based has not been sufficiently investigated in Indonesia. Industrial use in the Balance Table is further classified by type of industry in Table 2.3-5. Although consumption of petroleum products is identified by type of industry, coal and natural gas are mostly included in non-specific industries. There is no breakdown for biomass and electricity consumption by type of industry, and the classification is unclear. Although advanced nations legally require the energy consumption of each enterprise to be identified, such an energy statistics system remains to be not established in many developing countries.

Table 2.3-5 Industrial Energy Consumption by Type of Industry, 2007

(Thousand toe)

	Coal	Petroleum products	Natural gas	Combustible renewables and waste	Electricity	Total
Iron and steel	0	712	194	Non specified	Non specified	906
Chemical and petrochemical	0	707	0			707
Non-ferrous metals	174	0	0			174
Non-metallic minerals	3,971	962	75			5,008
Machinery	0	62	0			62
Mining and quarrying	0	920	0			920
Food and tobacco	0	603	0			603
Paper, pulp and printing	1,436	0	0			1,436
Construction	0	296	0			296
Textile and leather	0	1,047	0			1,047
Non-specified (industry)	15,314	1,221	9,455			25,990
Industry total	20,895	6,530	9,724	6,154	3,939	47,242

Sources: Based on data from IEA, "Energy Balances of Non-OECD Countries 2009"

2.3.3 Energy Price and Subsidy Policy

Table 2.3-6 shows the trend of export prices[4] for coal, LNG, and crude oil. Oil prices soared after 2000, causing WTI futures prices to reach a peak of 148 dollars per barrel in July 2008 (2008 annual average: 99.6 dollars).The price of Minas crude oil, which is representative of Indonesian crude oil, rose to 96.1 dollars per barrel in 2008, nearly 4.4 times higher than in 2001. The table indicates that, during the same period, coal prices increased nearly 2.0-fold to about 65.5 dollars per ton and LNG prices increased nearly 2.8-fold to about 12 dollars per million BTU. Thus, energy prices in the international market have risen by 2.0 to 4.4 times since 2001.

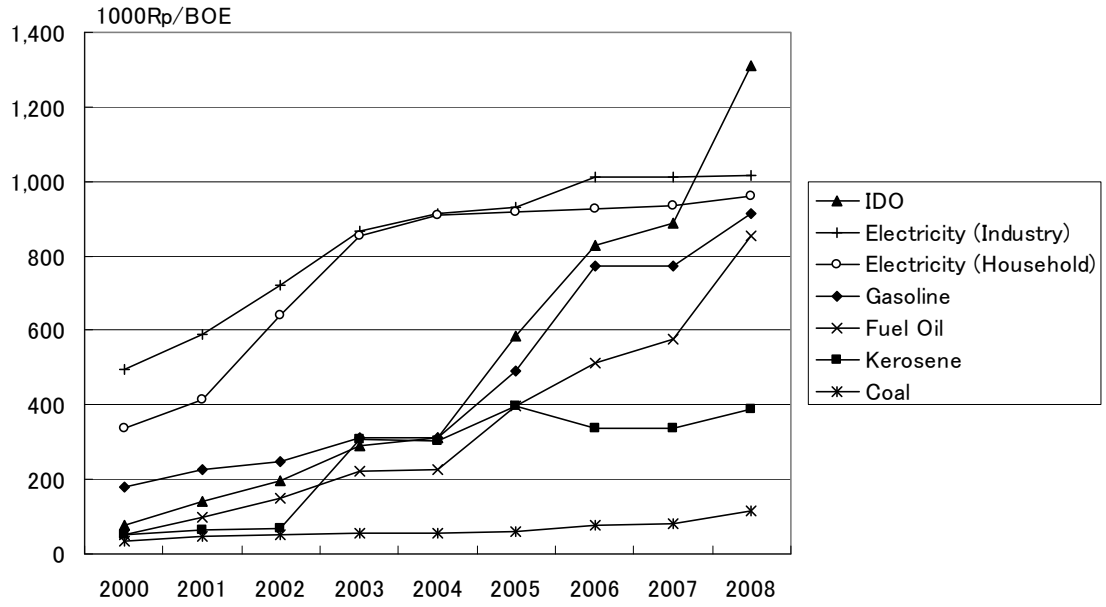
Table 2.3-6 Energy Exporting Prices in Indonesia (FOB)

	Coal (FOB)	LNG (FOB)	Crude Oil
	US$/ton	US$/MMBTU	$/bbl
2001	32.07	4.31	21.94
2002	29.98	4.45	22.46
2003	28.63	4.84	26.34
2004	43.00	6.00	36.4
2005	36.48	7.19	53.66
2006	42.35	8.49	64.27
2007	41.79	9.04	72.31
2008	65.51	11.97	96.13

Sources: Based on data from MEMR, "Handbook of Energy & Economic Statistics of Indonesia 2009."

[4] The price of LNG is the price of Japanese imports from Indonesia.

Retail prices of kerosene and electricity in Indonesia are regulated through subsidies from the standpoint of supporting the poor, and they are traded at almost the same price level as in 2003, while prices of fuel oils and diesel oils for Industry without subsidies are rising to be cloes to such international market prices as Singapore market (see Figures 2.3-2).



Source: Based on data from MEMR, "Handbook of Energy & Economic Statistics of Indonesia 2009"

Figure 2.3-2 Trend of Energy Retail Prices in Indonesia, 2000-2008

(1) Trend of prices of petroleum products

The new oil and gas law (Oil and Gas Law No.22/2001)[5] is intended to abolish subsidies and liberalize prices (transition to international level)[6] by November 2005. As a preparatory step, the Indonesian government substantially reduced subsidies and raised prices in October 2004 and October 2005. Consequently, gasoline prices increased nearly 2.5-fold to 4,500 Rp/L (nearly equal to 50 yen/L[7]), kerosene 2.9-fold to 2,000 Rp/L (nearly equal to 22 yen/L) and diesel oil increased 2.6-fold to 4,300 Rp/L (nearly equal to 47 yen/L). But, due to a public backlash and the resistance from various government agencies, the Minister for Energy Mineral and Resources announced in November 2005 that "the total liberalization of prices will be phased in by 2010."

[5] In 2001, under the post-Suharto administration, the new oil and gas law (Oil and Gas Law No.22/2001) was enforced as a revision of the old law and the National Oil Company (Purtamina) was liquidated. The function of policy and planning was transferred to the Ministry of Energy Mineral Resources (MEMR) and the function of management and supervision (including licensing) was transferred to BPMIGAS (oil) and BPHMIGAS (gas; a newly established organization), and Purtamina was retained as an operational company. However, the downstream sector of oil, which is to be privatized and liberalized, remains a virtual monopoly, partly because Domestic Market Obligation (DMO) is imposed on Purtamina.

[6] National Energy Policy aims at reducing the oil dependency rate to 20% or lower by 2025.

[7] 1 yen is nearly equal to 91 Rp

Subsequently, the prices of gasoline, kerosene, and diesel oil (subsidized) were raised again in May 2008, but a wide gap with international levels remain.

Table 2.3-7 Domestic Fuel Prices in Indonesia, 2001-2008

(Rp/L)

Year /month	Gasoline		Kerosene		Diesel Oil		Fuel Oil	
	Subsidized (RON88)	Subsidized (Premium)	Subsidized	Industry	Subsidized (Transportation)	Industry	Subsidized	Industry
2001.5	1,150	1,970	350	2,330	600	2,300	400	1,650
2002.5	1,150	1,750	350	1,890	600	1,900	400	1,500
2003.5	1,810	1,980	1,800	1,930	1,650	2,080	1,580	1,580
2004	1,810	1,980	700	1,930	1,650	2,080	1,580	2,300
2004.1	2,400	(Link to Market) 2005.7	700	(Link to Market) 2005.7	2,100	(Link to Market) 2005.7	(Link to Market) 2005.7	
2005.1	4,500	5,160	2,000	5,600	4,300	5,350	3,150	
2006.7	4,500	6,502	2,000	6,372	4,300	6,609	3,759	
2007.7	4,500	6,179	2,000	5,926	4,300	6,125	3,950	
2008.5	6,000	---	2,500	---	5,500	---	---	
2008.7	6,000	9,136	2,500	11,229	5,500	11,277	6,784	

Source: Based on data from U.S. Embassy Jakarta, “Petroleum Report Indonesia 2008.”

Note: The market price is calculated by adding fuel tax (5% for gasoline and diesel oil) and value-added tax (10%) to the prices listed above

On the other hand, the prices of high octane (premium) gasoline and industrial petoleum products were fully liberalized in July 2005 with the adoption of a market-linked system. The price formula is as follows: The Mean of Platts Singapore (MOPS) for the latest two weeks is a gate price at the Pertamina oil terminal for the following one week (Table 2.3-7). This price plus the oil terminal cost, transportation costs (actual expenses), Pertamina's margin, and value-added tax (10%) is the delivered price to a factory.

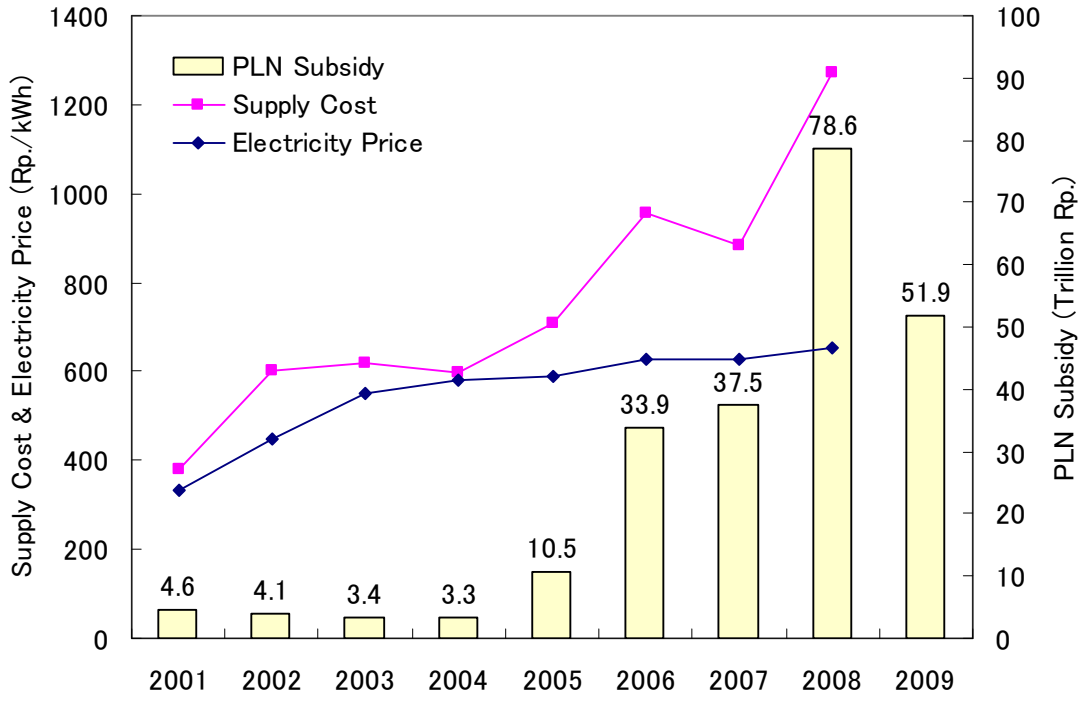
(2) Trend of electricity prices and electricity subsidies

Indonesia's electric power distribution section is monopolized by the national electric power company PT PLN (hereinafter PLN), and electricity retail prices are determined by the government. PLN is obliged to sell electricity at lower prices than its supply cost due to its public service obligations. The resulting loss is made up with subsidies from the government. When the impact of the Asian Financial Crisis in July 1997 caused the rupiah to collapse, PLN had a huge debt due to the negative margin because fuel costs and prices of electricity purchased from IPP were dollar-based as a rule. For this reason, electricity prices were gradually raised until July 2003, and the PLN subsidy was decreased to 3 trillion Rp in 2003.

Then, with soaring oil prices in the international market and reduced oil subsidies in the domestic

market, fuel prices rose sharply, causing a negative margin for PLN to increase again. However, electricity prices were not raised due to political considerations and election politics, and the subsidy was expanded to 78.6 trillion Rp in 2008. In addition, non-power producers are increasing power purchases from PLN at lower prices with rising costs of power generation due to fuel price hikes instead of increasing self-power produced.

Although the subsidy was reduced to 51.9 trillion Rp with falling fuel prices in 2009, the negative margin remains.



Source: Based on data from PLN, “Electricity Subsidy / PSO in 2008” etc.

Figure 2.3-3 Trends of Electricity Prices, Supply Cost, and PLN Subsidy in Indonesia, 2001-2008

(3) Comparison of electricity, gas, and coal prices and fuel prices

Table 2.3-8 compares domestic energy prices as calorie euivalent. Because the prices of industrial petroleum products (fuel oils and diesel oils) have been equivalent to the international level, they are high in isolation compared to the prices of coal and natural gas.

Table 2.3-8 Comparisons of Domestic Energy Prices for Industrial Use, 2008

	Price		Calorific value		Price per Energy Unit (Rp/MJ)
High Speed Diesel	8,738	Rp/L	9,006	kcal/L	231.8
Industry Diesel	8,650	Rp/L	9,006	kcal/L	229.5
Marine Fuel	5,762	Rp/L	9,341	kcal/L	147.4
Natural Gas	1,029	Rp/m3	9,800	kcal/m3	25.1
Coal	489	Rp/kg	6,139	kcal/kg	19.0

Sources: PLN Statistics 2008

Prices of self-power produced (at a level of 10,000 kW) only based on fuel evaluation(Table 2.3-8) are estimated to be 817 Rp/kWh for heavy oil, 385 Rp/kWh for natural gas, and 317 Rp//kWh for coal.[8] Table 2.3-9 shows the power generation costs by fuel (generation type). If a purchased power price from PLN is 622 Rp/ kWh (see Table 2.3-10), a industrial user is most likely to select the purchase from PLN instead of self-power produced expecpt for using a coal fired or a hydro electric power station .

Table 2.3-9 Average Generation Cost per kWh in 2008

Generation Type	Average Generation Cost Rp/kWh
Hydro	132
Sterm	597
Diesel	3,578
Gas Turbine	3,298
Geothermal	747
Combined Cycle	1,278
Total	1,052

Source: PLN, “Electricity Subsidy / PSO in 2008”

Table 2.3-10 Average Selling Price of Electricity by Sector in 2008

Unit:Rp/kWh

	Residential	Industrial	Business	Social	Gov.Office Building	Publ. Street Lighting	Total
Outside Java	585	643	838	585	914	662	665
Java	588	629	842	580	800	661	650
Indonesia	588	622	851	581	847	665	653

Sources: PLN Statistics 2008

[8] Power generation efficiency is set at 40% for heavy oil (diesel), 35% for natural gas (gas engine), and 20% for coal (steam turbine).

2.4 Current Situation and Development of CO2 Emissions in Indonesia

2.4.1 Current Situation of CO2 Emissions in Indonesia

Indonesia, which contributes 355.8 million tons of carbon dioxide (Mt-CO2) annually, or 1.29% of total global emissions, is the 17th largest greenhouse gas emitter in the world[9]. When other non-carbon dioxide gases are added, total annual GHG emissions (excluding emissions from Land Use, Land Use Change, and Forestry: LULUCF) are 582.9 Mt-CO2e, putting the country in 12th place in the world.

If CO2 emissions from LULUCF are included, total annual GHG emissions become 2,041.9 Mt-CO2e, making the country the 4th highest emitter following China (7,187.0 Mt-CO2e), the United States (6,814.3 Mt-CO2e), and Brazil (2,841.9 Mt-CO2e), due to the large scale of deforestation and forest degradation[10]. Total emissions from LULUCF account for 71.5% of total annual GHG emissions in Indonesia. CO2 emissions from LULUCF in Indonesia (1,459 Mt-CO2e) are the second highest in the world following Brazil (1,830 Mt-CO2e) [11]. According to the Government of Indonesia (2007), the total forest area decreased from 144 million ha in total at the beginning of 1970 to 126.8 million ha in 2005. In addition, 53.9 million ha of forest area has also been degraded for various forest types.

Table 2.4-1 Total GHG Emissions Including LULUCF (Mt-CO2e)

	GHG Emissions	% of World Total
China	7,187	16.6%
U.S.A.	6,814	15.8%
Brazil	2,842	6.6%
Indonesia	2,042	4.7%
Russian Federation	2,005	4.6%

Source: World Resources Institute, "Climate Analysis Indicators Tool"

Note: The emissions from LULUCF include only CO2.

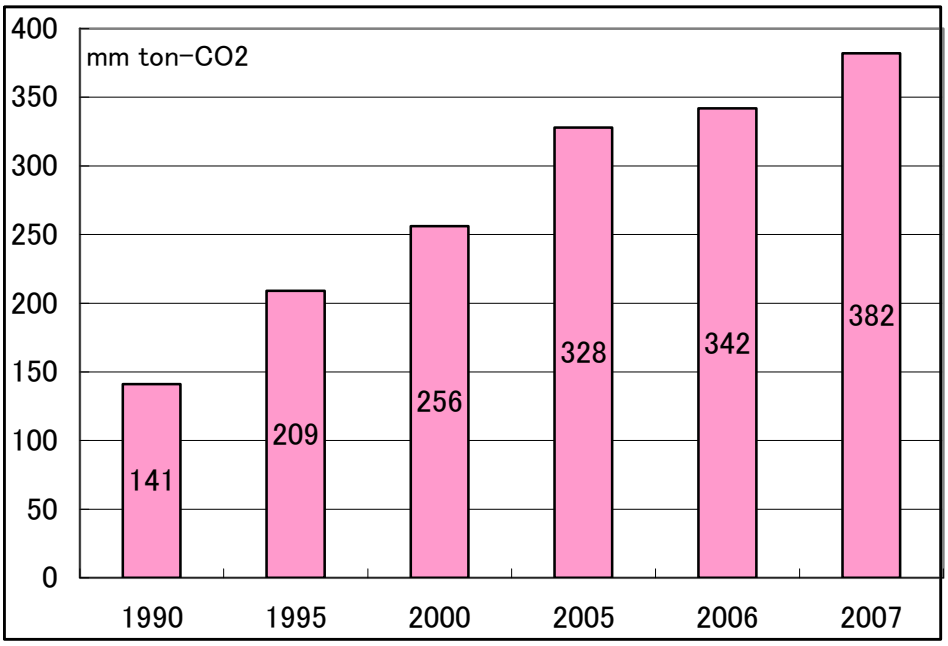
Peat land is a major GHG emission source in the LULUCF sector on top of rapid deforestation. While deforestation accounted for only 22%, peat land fires accounted for 53% of total annual emissions from LULUCF. Indonesia has about 21 million ha of peat land, and it stores about 35 Gt-CO2e. However, peat land has degraded seriously. According to Indonesia Forest Climate Alliance (2007), the deforestation rate of peat land reached 89,251 ha/year in Sumatra and 9,861 ha/year in Kalimantan from 2000 to 2005. Annual emissions could reach up to 2,000 Mt-CO2e.

[9] As of 2005 from Climate Analysis Indicator Tools Version 7.0

[10] All figures on LULUCF are as of 2005 from Climate Analysis Indicator Tools Version 7.0

[11] According JBIC reports, "Background and policy issue note on climate change program loan to the Republic of Indonesia (2008), the GHG emissions from LULUCF in Indonesia (2,563 Mt-CO2e) are the highest in the world and far exceed those of Brazil (1,371 Mt-CO2e) in 2000.

CO2 emissions in the energy sector of Indonesia rose from 140.2 million tons in 1990 to 377.2 million tons in 2007 with an annual rate of 6%. The growth of CO2 emissions slightly exceeded the growth (annual rate of 5.3%) of primary energy consumption (except combustible renewable energies) because the share of coal in primary energy consumption rose from 6% to 27%.



Source: IEA, Energy Balances of Non-OECD Countries

Figure 2.4-1 Trends: CO2 Emissions from Fossil Fuels

2.4.2 CO2 Emissions in the Industrial Sector of Indonesia

(1) Road Map

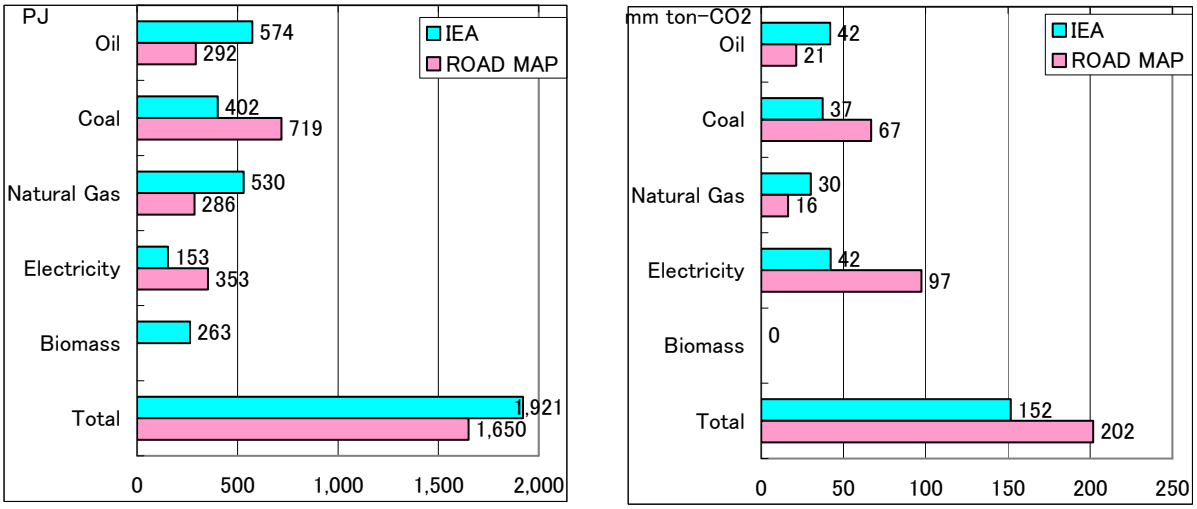
The Ministry of Industry of Indonesia has prepared a road map for GHG mitigation, and the latest version was revised in November 2008. The road map shows the present status of energy in Indonesia, direction of energy policy, energy-saving technologies required to be introduced by type of business in the industrial sector, prospects for energy consumption until 2025, and challenges related to promoting energy saving, etc. The road map focuses on energy intensive sectors such as cement, steel, textile, fertilizers, and chemicals from a view point of the priorities of saving energy policy. For cement and steel in particular, investigations are progressing under specific projects.

The road map does not cover power consumption or CO2 emissions. However, reports on estimates of energy consumption and CO2 emissions in the industrial sector are, in relation to analyses of the road map, prepared by Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ) and Mitsubishi Research

Institute (MRI).

(2) Energy Consumption and CO2 Emissions in 2005

Figure2.4-2 indicates the comparison between the road map and IEA regarding estimates of energy consumption and CO2 emissions in 2005: 1,650 PJ in energy consumption and 202 million tons in CO2 emissions are estimated by the road map while 1,921 PJ in energy consumption and 152 million tons in CO2 emissions by IEA . Excluding biomass, the total energy consumption of each data is almost the same (1,650PJ for the road map and 1,658 PJ for IEA), but the breakdown of energy sources is very different. CO2 road map estimates consumption of energy from electricity use much larger than IEA, and CO2 emissions are approximately 1.3 times greater than the IEA estimate. This is because the CO2 coefficient value (thousand ton per PJ) [12]of electricity is the biggest compared with those of fossil fuels such as oil, coal and natural gas. In other words, the larger the portion of electric power to the total energy consumption is, the greater the total amount of CO2 emissions becomes. In particular, the efficiency of power stations in Indonesia is low due to big transmission losses and a large share of oil and coal in the total use of fuels. Thus, the large share of electricity in the total energy usage leads to a large amount of CO2 emissions.



Source: IEA,

ROAD MAP, Ministry of Industry

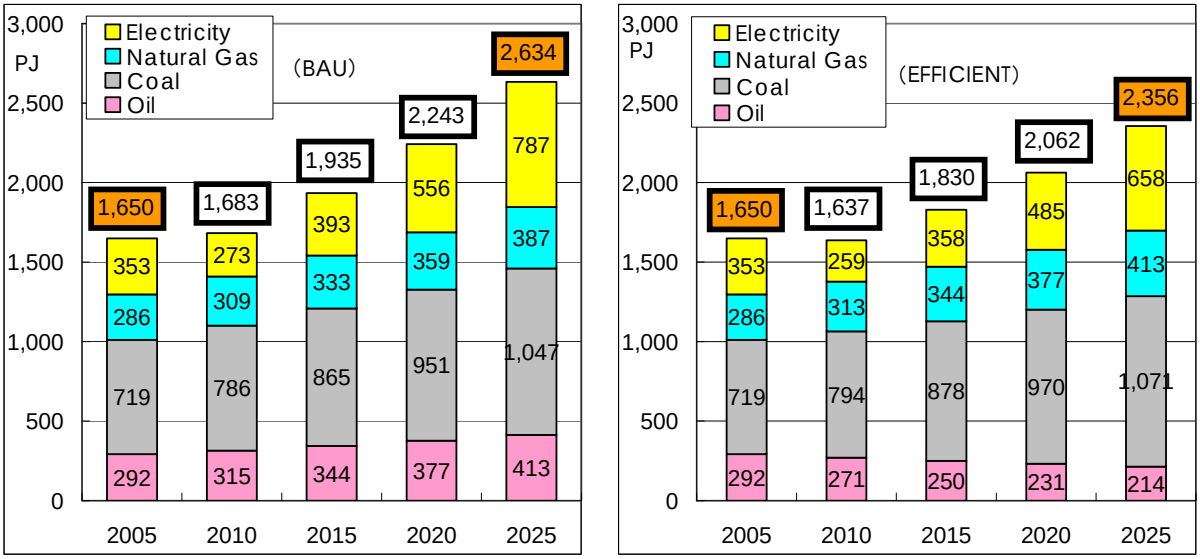
Figure 2.4-2 Energy Consumption and CO2 Emissions of Industry Sector in 2005

(3) Energy Consumption and CO2 Emissions in 2025

According to analyses of the road map, estimated are energy consumption and CO2 emission until 2025 in both BAU (Business As Usual) − the case in which there is no specific efforts to enhance energy efficiency− and EFFICIENT − the case in which there are measures to be taken for improving energy

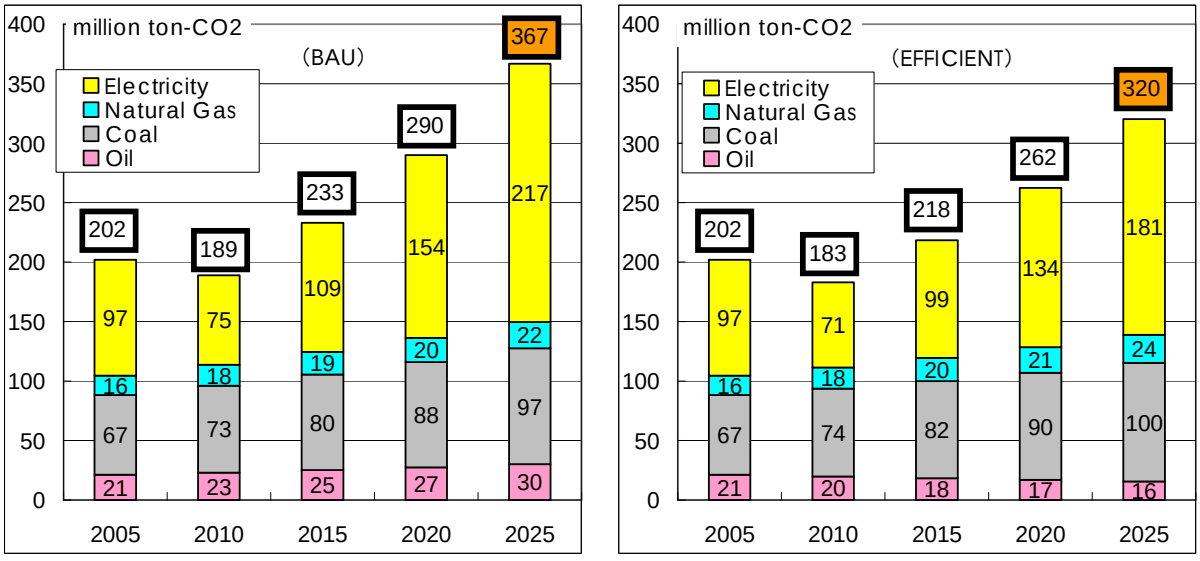
[12] Excluding those originating from non-fossil fuels
CO2 emission coefficient (1,000 tons/PJ) – Oil: 73, Coal: 93, Natural Gas: 57, Electricity: 276

efficiency. Figure 2.4-3 and Figure 2.4-4 illustrate the estimations: energy consumption in 2025 is estimated to be 2,634 PJ in BAU and 2,356 PJ in EFFICIENT, while CO2 emissions in 2025 are estimated to be 367 million tons in BAU and 320 million tons in EFFICIENT. Thus, the values in EFFICIENT are 11% less for energy consumption and 13% less for CO2 emissions than in BAU.



Source: ROAD MAP, Ministry of Industry

Figure 2.4-3 Prospects for Energy Consumption of Industry Sector for Roadmap (BAU & Efficient)



Source: ROAD MAP, Ministry of Industry

Figure 2.4-4 Prospects for CO2 Emissions of Industry Sector for Roadmap (BAU & Efficient)

Table 2.4-2 Estimation of Energy Demand of Each Sector in Roadmap (2005-2025)

	Energy	Unit	BAU					Efficient				
			2005	2010	2015	2020	2025	2005	2010	2015	2020	2025
Non metal & Cement	Oil	1,000kL	728	776	827	882	940	728	673	623	576	533
	Coal	mm ton	11	13	14	16	18	11	12	14	15	17
	Natural Gas	mm cf	16,562	19,088	21,998	25,352	29,218	16,562	18,155	19,901	21,815	23,914
	Electricity	TWh										
Steel	Oil	1,000kL	713	777	874	983	1,106	713	660	610	564	522
	Coal	mm ton	1	1	1	1	1	1	1	1	1	1
	Natural Gas	mm cf	81,752	88,393	95,573	103,337	111,731	81,752	89,615	98,234	107,681	118,038
	Electricity	TWh										
Pulp & Paper	Oil	1,000kL	1,262	1,375	1,547	1,740	1,957	1,262	1,167	1,080	999	924
	Coal	mm ton	6	6	7	8	8	6	7	7	8	9
	Natural Gas	mm cf	31	34	36	38	41	31	34	38	41	45
	Electricity	TWh										
Textile	Oil	1,000kL	461	492	524	559	595	461	427	395	365	337
	Coal	mm ton	1	1	1	1	1	1	1	1	1	2
	Natural Gas	mm cf	207	224	242	261	283	207	227	248	273	298
	Electricity	TWh										
Fertilizer	Oil	1,000kL	767	851	1,003	1,182	1,394	767	709	656	607	561
	Coal	mm ton	6	7	7	8	9	6	7	7	8	9
	Natural Gas	mm cf	33,395	35,046	35,169	35,291	35,415	33,395	36,607	40,128	43,987	48,218
	Electricity	TWh										
Others	Oil	1,000kL	3,725	3,971	4,233	4,511	4,809	3,725	3,446	3,187	2,947	2,726
	Coal	mm ton	3	3	3	4	4	3	3	4	4	5
	Natural Gas	mm cf	114,354	123,643	133,687	144,546	156,288	114,354	125,352	137,408	150,623	165,109
	Electricity	TWh										
Total	Oil	1,000kL	7,657	8,241	9,007	9,857	10,801	7,657	7,082	6,550	6,058	5,603
	Coal	mm ton	28	31	34	37	41	28	31	34	38	42
	Natural Gas	mm cf	246,302	266,427	286,704	308,826	332,975	246,302	269,990	295,957	324,421	355,622
	Electricity	TWh	98	76	109	155	219	98	72	100	135	183

Source: ROAD MAP, Ministry of Industry

Note: Oil 0.0382 PJ/1,000 kL, Coal 25.7 PJ/mm ton, Natural Gas 0.00116 PJ/mm cf, Electricity 3.6 PJ/TWh

CHAPTER3. CURRENT SITUATION AND ISSUES OF ENERGY CONSERVATION IN INDONESIA

Indonesia is promoting energy conservation by reducing energy consumption. To reduce energy consumption, Indonesia has conducted energy audits since 2003. Besides, a national budget for energy conservation was established in 2006. Now, Indonesia is aggressively implementing energy conservation following regulation No. 70 November 2009 of energy conservation.

3.1 Progress of Climate Change Program Loan and Energy Conservation

Recent studies indicate that CO2 emissions from the energy sector in Indonesia will continue to climb in the future, because of its high growth rate of energy consumption and reliance on domestic fossil fuel resources. Thus it is crucial to introduce effective mitigation measures, whose main pillars are energy diversification, energy conservation, and implementation of clean technology.

Considering these circumstances, the CY 2009 Actions set the anticipated outcomes of energy sector as follows: (1) enhanced geothermal power development; (2) enhanced utilization of renewable energy; (3) improving energy efficiency (reduction of energy intensity); and, (4) enhanced access to energy, including electricity, using renewable energy in rural villages.

(1) Enhanced Geothermal Power Development

Geothermal energy development through private investment is to be implemented. According to the long-term target, the capacity is to be expanded from 857 MW in 2007 to 9,500 MW in 2025 (approximately equal to 57.9 million ton/year of CO2 reduction).

(2) Enhanced Utilization of Renewable Energy

According to the long-term targets, the share of renewable energy (including biomass fuel but except for geothermal) should be at least 10% of total energy supply by 2025, reducing CO2 emissions as well as improving energy efficiency by 17% from BAU in 2025.

(3) Improving Energy Efficiency (Reduction in Energy Intensity)

Reduction of energy intensity by 1% every year has been set to the short-term target. Furthermore, energy elasticity should be less than one by 2025 and energy intensity is to be reduced by12-18% in 2025.

The indications defined by the policy action of 2009(CY) and their current status of progress are as follow:

1) Issuance of Government Regulation on 'Energy Conservation

The draft Government Regulation of MEMR has been finalized and submitted to the State Secretary. However, due to the long-run negotiations among the relevant ministries and organizations, the issue was delayed, and at last it was effect as of November 2009 after the final signature of the President.

2) Designing Mid-term Energy Audit and Efficiency Program

This program includes Medium-term Targets, Incentive Mechanisms, and Monitoring and Evaluation Framework. JICA Study on mid-term energy audit and efficiency program should be finalized by July 2010.

3) Energy Audit of 40 Firms

Energy audits of 40 firms were carried out in 2009. Procurement of consultants for implementation was completed in June 2009, and the results were expected to be delivered by early December of the same year.

4) Issuance of Ministerial Regulation for Energy Efficiency Labeling System

MEMR has prepared a technical guide for Compact Fluorescent Lamps (CFL), TVs, and refrigerators regarding labeling system and is currently being reviewed by the Legal Unit within the MEMR prior to a Ministerial Degree, while putting high priority on energy efficient labeling to facilitate the review process. Additionally, the MEMR plans to amend the existing national standard on household appliances to include an energy efficiency performance component as a substitute measure for the Minimum Energy Performance Standard introduced in various countries.

5) Issuance of Ministerial Regulation on CO2 Roadmap

MOI selected the cement and steel industry sectors as the primary targets in 2008. As for cement sector, a technical guide for the CO2 roadmap has been finalized, while a technical guide for the CO2 roadmap for steel industry sector is still under preparation due to the longer time required for stakeholder consultations over each sector's reduction target. The process of drafting technical guidance and subsequent issuance of ministerial regulation for the sector are not finalized yet and are expected to be completed by 2010.

6) Designing the CO2 Roadmap Implementation Program

The program includes Incentive Mechanisms and Monitoring and Evaluation Framework. METI (Japan) as well as AFD (France) has provided technical assistance to re-examine and improve the existing roadmap, with the aim of further improving the contents. On the one hand, the METI study, primarily focusing on the steel and cement industry sectors, was launched in October 2009, and its analysis and results of site visits in both industries were be presented at a workshop in March 2010. Also, GTZ has provided support to the industrial sectors for the BAPPENAS Roadmap. On the other hand, the AFD study, primarily focusing on the cement sector, conducted the first stage from July to August 2009, and the second stage was scheduled to be launched in January 2010 to include setting targets for reducing CO2 emissions in the sector.

(4) Access to Energy, including Electricity, is enhanced Using Renewable Energy in Rural Villages

The Energy Self Sufficient Village Program, which is a part of the overall Poverty Reduction Program supervised by the Ministry of Social Welfare and implemented in co-operation with the Coordinating Ministry of the Economy and other related ministries such as the MOA, the Ministry of Home Affairs, the MEMR, and the MOI, began in February 2007, and was implemented in 300 villages during 2009. The DME program has two categories: biofuel based (Jetrofa, palm and sugarcane) and non-biofuel based (micro hydro, solar, wind, biogas).

3.2 Current Situation of Energy Conservation Policy and Institutions in Indonesia

3.2.1 Overview of Existing Energy Conservation Policy

(1) Legal System

The legal system in Indonesia has the following structure:

a. Constitution of 1945 and its amendments
b. Resolution of the People's Consultative Assembly
c. Laws instituted by the Pepole's Representaive Council
d. Government regulations
e. Presidential decrees
f. Ministerial decrees
g. Regional regulations

In addition, there are also Presidential Instructions and other regulations.

Under the legal system in Indonesia, laws generally state guidelines in a summary form only and specific details on how they are implemented are authorized in the form of regulations within several years after enactment. The actual implementation of laws depends on such regulations and Presidential or Ministerial decrees.

(2) Decentralization

After President Suharto resigned in 1998, a decentralization process has progressed in Indonesia. On one hand, LAW No. 22 in 1999 establishes local governments' authority to supervise their own communities' affairs, including the formulation of local energy policies and plans. On the other hand, LAW No. 25 in 1999 ordains each allocation of 15% of net revenues from oil and 30% of those from natural gas to regional administrations.

Since then, LAW No. 22 has been amended by LAW No. 32, and LAW No. 25 by LAW No. 33, in order for a higher level of government to be able to make decisions regarding commodities that now have high strategic values at the national level. These amended laws also clarify the responsibilities of the central government and the local governments in the energy sector. Accordingly, the responsibilities and authority of the central government are mainly as follows: issuance of laws; stipulation of national policy; stipulation and implementation of standards; and, stipulation of procedures. The main responsibilities and authority of provincial governments are defined as the following: issuance of provincial regional regulations; fostering and supervision of operations within their jurisdiction; and, stipulation of policy of management within their jurisdictions. The main responsibilities and authority of district/city governments are as follows: issuance of district/city regional regulations; fostering and supervision of operations in districts and/or cities; and, stipulation of policy of management in districts and/or cities.

(3) Legal System and Policies Related to Energy Conservation

The basic principles in Indonesia for energy policies set forth promoting domestic use of alternative energy sources to oil and encouraging energy conservation as measures to control increasing energy needs. The history of energy conservation policies may be summarized as follows:

1) KEN: National Energy Policy (KEN) 2003-2020

It was issued as a ministerial decree (No. 9883K/16/MEM/2004) of the Ministry of Energy and Mineral Resources (MEMR). It set some objectives for 2020 as the main policies for "Enhanced Capacity of Energy Supply," "Optimized Energy Supply," and "Energy Conservation." Some of the principal objects are:

a. Electrification of 90% by 2020

b. Share of renewable energy except large-scale hydroelectric of 5% or more by 2020

c. Annual reduction of 1% of energy consumption per GDP

d. Reduction of dependence on overseas energy through increased use of domestic resources and utilization of domestic human resources

2) Blueprint of National Energy Management 2005-2025

It was issued as a ministerial decree of the Ministry of Energy and Mineral Resources. The main targets include achieving an energy elasticity of 1 or less by 2025 based on predicted energy demand by 2025 and evaluation of implementation of individual technology development and optimization of composition ratio of primary energies (2025.)

(Composition ratio of primary energies: 2025)

a. Oil: 26.2%, coal: 32.7%, natural gas: 30.6%

b. Hydro: 2.4%, geothermal: 3.8%, others: 4.4% (biomass: 2.1%, nuclear: 1.9%, solar: 0.02%, wind: 0.03% and others)

It also incorporates the Energy Law and implementation of energy conservation initiatives.

3) Presidential Decree No. 5 of 2006 on National Energy Policy

Compared to the preceding two ministerial decrees, this decree was issued as a presidential decree to strengthen its legal basis. It set the objective of a ratio of oil at 20% or less and modified the targets set out in the Blueprint of National Energy Management in an effort to further promote alternatives to oil[13].

a. Oil: 20%, coal: 33%, natural gas: 30%

b. Renewable energy: 15% (biomass: 5%, geothermal: 5% and others: 5%)

4) Energy Law No.30 of August 2007

Energy-related laws had been drawn up and established separately for each area: Oil Law, Gas Law, Electricity Law, and Geothermal Power Generation Law, and there were no master laws controlling the entire energy sector. The Energy Law was enacted in August 2007 as a comprehensive energy law designed to secure consistency among these individual laws.

The law may be summarized as follows:

a. Establishment of the National Energy Council

The National Energy Council (DEN) will be set up within six months with the President as chairman. It aims to design and plan a national energy policy as the successor of the Energy

[13] The composition of primary energy in 2004 was as follows: oil 53%, coal 21%, and natural gas 19%.

Coordination Committee (BAKOREN*[14]).

b. Formulation of the Comprehensive National Energy Plan

The DEN formulates the Comprehensive National Energy Plan (RUEN) (draft prepared by the Ministry of Energy and Mineral Resources and reviewed by DEN) and decides the basic principles for energy policies.

c. Establishment of Presidential Regulations and Ministerial Decrees

The detailed stipulations for implementation of the Energy Law will be stated in the Government Regulations and Ministerial Decrees that will be enacted within one year after the law is enacted.

d. Energy Conservation (Article 25)

The Energy Law states that "energy conservation is the responsibility of all energy sectors," and gives incentives to those users who make effective use of energy and manufacturers of high-efficiency apparatus, while it is stipulated that disincentives are imposed on those who do not promote energy conservation. The specific provisions of these incentives are to be set out in Government and Regional Regulations.

e. Energy Price (Article 7)

The law states that the "energy price is set based on fair economic value," and it also states that a "subsidy is granted to poor citizens."

5) Presidential Instruction No.10/2005 Relating to Implementation of Energy Conservation

In July 2005, a Presidential Decree focusing on energy conservation sparked by a sudden depletion of oil stockpiles was issued, and concrete instructions regarding the promotion of energy conservation were given to all sectors including government (central and local) and private sectors. The "Energy-saving Guideline" was issued on the basis of these instructions.

6) Decrees of the Minister of Energy and Mineral Resources No.31/2005

The Minister of Energy and Mineral Resources set up the Regulations of the Minister of Energy and Mineral Resources No. 0031/2005 for energy conservation procedures in 2005 to implement the stipulations of Article 4 of the Presidential Instruction regarding energy conservation. The decrees consist of nine articles in total and provide specific rules for commercial buildings, government offices, households, transportation, industry, and others.

They are outlined below.

a. Commercial buildings (Article 2)

[14] The council is chaired by the Minister of Energy and Mineral Resources and its secretariat is composed of the ministers of ministries and agencies related to electricity. Its main tasks include: (1) coordination among government agencies in terms of energy administration and (2) formulation of energy development policy and supply and demand plan.

- The minimum temperature setting of air conditioners is to be 25°C
- Indoor lighting is to be reduced to 15 W/m^2 max.
- Operation of air conditioners and moving staircases is to be from starting time to one hour before closing time
- Elevators are to stop at every two floors

b. Government agencies and offices (Article 3)

- The minimum temperature setting of air conditioners is to be 25°C
- Indirect lighting is to be cut
- Operation of air conditioners and moving staircases is to be from starting time to one hour before closing time
- Elevators are to stop at every two floors

c. General households (Article 4)

- Energy-saving bulbs are to be used
- At least 50 W of electricity is to be reduced during peak load hours from 17:00 to 22:00
- The minimum temperature setting of air conditioners is to be 25°C

d. Transportation (Article 5)

- Pertamax is to be used as fuel for private cars with a displacement of 2,000 cc or more, especially in Sumatra, Java, and Bali
- Use of gas fuel is to be promoted for public vehicles

e. Industry (Article 6)

- Energy audit is to be conducted at industry sites where a large quantity of energy is consumed
- Energy-saving equipment and technology is to be used

f. Others (Article 7)

- High-efficiency lighting system is to be used for lighting public roads, advertisements, and other facilities
- Diesel oil is to be eliminated from oil fuel mixtures

3.2.2 Organizations Related to Energy Conservation

a. Ministry of Energy and Mineral Resources (MEMR)
b. Ministry of Industry (MOI)
c. National Development Planning Agency (BAPPENAS)
d. Coordinating Ministry for Economic Affairs
e. Indonesian Electric Company (PLN)
f. Energy Management Indonesia (EMI)
g. Agency for Assessment and Application of Technology (BPPT)
h. Education and Training Center for Energy and Mineral Resources (ETCEMR)

i. Center for Data & Information on Energy & Mineral Resources
j. Ministry of Cooperatives and Small and Medium Enterprises (MOCSMEs)
k. National Nuclear Energy Agency (BATAN)
l. National Energy Council (DEN): the successor organization of BAKOREN

3.3 Overview and Issues of Government Regulation No.70 of Nov 2009 (Energy Conservation)

3.3.1 Overview of Government Regulation No.70 of Nov 2009 (Energy Conservation)

The Government Regulation No. 70/2009 regarding Energy Conservation was issued in November 2009 about one year and three months later than was expected to take effect immediately. It has superseded and rescinded the Presidential Decree No. 43/1991 regarding Energy Conservation Regulation. This regulation (Government Regulation regarding Energy Conservation) consists of eight chapters and thirty-one articles, and has a relatively simple structure. Some clauses that should have been included were postponed until they are stipulated in a ministerial decree of the Minister of Energy and Mineral Resources (MEMR) following negotiations with stakeholders. Therefore, specific rules for enforcement depend on the promulgation of the ministerial decree. Chapter 1 consisting of an article presents general rules. Chapter 2 consists of seven articles, and states the responsibilities of central government, local governments, industries, and citizens for energy conservation. Chapter 3, composed of six articles, presents stipulations on specific implementation and management of energy conservation. Chapter 4 has three articles that deal with standards and labeling of energy-saving equipment. Chapter 5 presents stipulations on incentives and disincentives, and has eleven articles. Chapter 6, with a single article, deals with guidance and supervision by central and local governments. Chapter 7 has an article in which transition rules are presented. Chapter 8 has two articles stating some arrangements for nullity of previous regulations.

The main articles are summarized below.

(1) Master Plan (Articles 2 and 3)

It is stated that the master plan for energy conservation is formulated by the minister and includes at least main objectives and policies, programs, and means for energy conservation. It is also stated that the master plan for energy conservation should comply with the Comprehensive National Energy Plan, and that it takes into consideration the comments of agencies concerned, local governments, business leaders, and citizens. The master plan for energy conservation is formulated for a period of five years, and it may be reviewed each year as appropriate.

(2) Responsibilities and Roles of Central and Local Governments (Articles 4, 5, and 6)

The responsibilities and roles of central and local governments for implementing energy conservation are shown below. Central government is responsible for:

a. Planning and making decisions on energy conservation policy, strategy, and program
b. Development of qualified human resources in the field of energy conservation
c. Comprehensive and integrated communications for using energy-saving technology
d. Assignment of research, arrangements, planning, and budget for the policy necessary to implement energy conservation programs
e. Provision of accommodation and/or incentives for implementing an energy conservation program
f. Provision of technical guidance on energy conservation to business and energy users
g. Implementation of prescribed energy conservation programs and activities
h. Provision of guidance and supervision of implementation of energy conservation programs

State governments are responsible for the following under the jurisdiction of states:

a. Planning and making decisions on energy conservation policy, strategy, and program
b. Development of qualified human resources in the field of energy conservation
c. Comprehensive and integrated communications for using energy-saving technology
d. Assignment of budget necessary to implement energy conservation programs
e. Provision of accommodation and/or incentives for implementing energy conservation programs
f. Provision of technical guidance on energy conservation to business and energy users
g. Implementation of energy conservation programs and activities
h. Provision of guidance and supervision for the implementation of energy conservation programs

Prefectural and city governments are responsible for the following under the jurisdiction of a prefecture/city:

a. Planning and making decisions on energy conservation policy, strategy, and program
b. Development of qualified human resources in the field of energy conservation
c. Comprehensive and integrated communications for using energy-saving technology
d. Assignment of budget necessary to implement energy conservation programs
e. Provision of accommodation and/or incentives for implementing energy conservation programs
f. Provision of technical guidance on energy conservation to business and energy users
g. Implementation of energy conservation programs and activities
h. Provision of guidance and supervision for the implementation of energy conservation programs

(3) Responsibilities of Energy Producers (Article 10)

Energy producers (individuals, entities, and permanent corporate structures) assume obligations for energy conservation during their production activities that include:

a. Planning directed toward using energy-efficient technology

b. Selection of infrastructure, facilities, equipment, materials, and processes using energy that is directly or indirectly efficient
c. Operation of energy-efficient systems

(4) Responsibilities of energy conversion operators (Article 11)

Energy conversion operators (individuals, entities, and permanent corporate structures) assume obligations to save energy in their conversion operations including energy sources and operations related to energy.

(5) Responsibilities of energy users (Articles 12 and 13)

Energy users are obliged to achieve energy efficiency and savings, and those users of energy of 6,000 toe or more are obliged to conserve energy through energy management. Energy management takes the following forms:

a. Nomination of energy manager
b. Formulation of energy conservation programs
c. Implementation of periodic energy audits
d. Implementation of recommendations based on energy audit
e. Annual reporting of status of actual energy conservation under the jurisdiction of minister, state governor, or prefectural governor/mayor

An energy audit is conducted by an internal energy auditor or certified organization. The energy manager and auditor are required to have competency certification based on laws and regulations. The energy conservation program is formulated by an energy manager appointed by an energy user and must include at least the following information:

a. Implementation plan
b. Types of energy and consumption
c. Use of energy efficient equipment
d. Measures related to energy conservation
e. Quantity of products produced or services provided

Energy conservation reports are formulated in accordance with the energy conservation program.

(6) Standards and Labeling (Articles 15 and 16)

The adoption of energy-efficient technology is based on provisions of law and implemented through establishment and application of energy performance standards for energy-utilizing facilities. Application of

energy performance standards for energy-utilizing facilities is conducted in the form of the labels of energy efficiency level, and these labels is, according to the registration of labeling procedures, written down by manufacturers and importers of energy-utilizing in stages

(7) Information services and education (Article 17)

The central and/or local governments extend facilities so that domestic energy users committed to energy conservation and manufacturers of energy-saving equipment may obtain the following services:

a. Access to information on energy conservation technology, specifications, and methods/measures
b. Consulting services related to energy conservation methods/measures

(8) Provision of incentives (Article 18)

Central and/or local governments provide incentives to the following beneficiaries who have achieved energy conservation targets within a certain period.

a. Energy users who use energy of 6,000 toe or more annually and
b. Domestic manufacturers of energy conservation facilities

(9) Success Criteria (Article 19)

The success criteria for energy conservation to energy users who use energy of 6,000 toe or more annually are the following to be reduced within a certain period:

a. Specific energy consumption and/or
b. Elasticity of energy consumption

The success criteria for energy conservation to domestic manufacturers of energy conservation facilities are as the following to be achieved.

a. Production of energy-saving facilities that provide higher energy efficiency than a predetermined benchmark, and
b. Descriptions on labels that indicate energy efficiency level conforms to the current standard

(10) Implementation of Incentive Method (Article 20)

Incentives for energy users who use energy of 6,000 toe or more annually are as follows.

a. Preferential taxation for energy-saving facilities
b. Reduction or exemption of local tax for energy-saving facilities
c. Preferential tariff for energy-saving facilities
d. Low-interest loans for energy conservation investments, and/or

e. Energy audit based on partnership sponsored by the government

Incentives for domestic manufacturers of energy conservation facilities are as follows:

a. Preferential taxation for parts, spare parts, and raw materials used in the manufacture of energy-saving facilities
b. Reduction or exemption of local tax for parts, spare parts, and raw materials used in the manufacture of energy-saving facilities
c. Preferential tariff for parts, spare parts, and raw materials used in the manufacture of energy-saving facilities and/or
d. Statutory low-interest loans for investments to manufacture energy conservation facilities

(11) Subsidy for audit costs (Article 21)

An incentive in the form of government-sponsored energy audits under a partnership may be provided not only to energy users who use energy of 6,000 toe or more annually, but also to energy users who use energy of less than 6,000 toe annually and have succeeded in energy conservation.

(12) Disincentives (Articles 22 - 27)

The following disincentives are imposed by the minister, state governor, or prefectural governor/mayor under their respective authority to energy users who use energy of 6,000 toe or more annually, and do not commit to energy conservation through energy management.

a. Written warning
b. Announcement through media
c. Fines and/or
d. Reduction of energy supply

The written warning is issued three times at maximum with a grace period of one month. The name of an energy user who has received three warnings is made public through media by the minister, state governor, or prefecture governor/mayor under their respective authority. If the energy user does not commit to energy conservation within one month after its name is made public by media, a fine is levied on the user that equals twice the energy consumption wasted. The fine is paid to the national/local treasury in accordance with relevant regulations. Also, if the energy user does not pay the fine within one month after it is levied, the minister, state governor, or prefecture governor/mayor may decide to reduce energy supplies under their respective authority subject to approval by the minister. Notwithstanding such reduction of energy supply, the user remains obliged to pay the fine.

(13) Guidance and supervision (Article 28)

Central and local governments provide guidance and supervision under their respective authority. Guidance is provided through:

a. Education and training
b. Technical guidance
c. Diffusion of knowledge
d. Circulation of information through printed or electronic media, forum, and expositions
e. Encouragement and/or promotion of R&D activities on energy conservation

Supervision is provided through:

a. Assignment of energy manager
b. Planning of energy conservation programs
c. Periodic energy audits

The cost incurred for guidance and supervision by the central government is borne by the national budget and that by local governments is borne by the respective local budget.

The practical problem of the Government Regulation regarding Energy Conservation is that ministerial regulation required for implementation has not been set out yet. This is because details of the following are to be specified in a separate ministerial regulation:

a. Planning of energy conservation programs and reporting procedures
b. Steps, procedures, and types of labeling on energy-utilizing facilities
c. Requirements and criteria of energy users who are eligible for the energy audit financed by the government
d. Disincentive procedures

While an energy manager is to be appointed for energy audits at consumers of energy of 6,000 toe, it is also problematic that the starting time is not stated. In addition, both central and local governments are authorized to appoint energy managers with different appointment criteria.

3.3.2 Comparison with Legislative Institution of Japan and ASEAN Countries

(1) Comparison with Laws Relating to Energy Conservation in Japan and Thailand

Section 3.3.1 outlines the Government Regulation regarding Energy Conservation in Indonesia. A comparison of systems has been conducted with Thailand which that has the second largest GDP, population, and consumption of primary energies after Indonesia among ASEAN countries and Japan. Table 3.3-1 summarizes fundamental data and energy conservation systems of these countries.

1) Position of Indonesia

Indonesia has a population of about 230 million, Thailand has 67 million inhabitants, and Japan has a population of about 130 million, which means that Indonesia has a population about 3.4 times larger than Thailand. The GDP of Indonesia was about 230 billion dollars as of 2000, which is about 1.3 times more than that of Thailand, which totaled 174 billion dollars (the GDP of Japan is about 22 times more than that of Indonesia). Consumption of primary energies per GDP amounts to 593 toe/million US$, which is about 1.2 times more than Thailand with 493 toe/million US$ (consumption in Japan is about one-sixth that of Indonesia.) This shows that Indonesia and Thailand are at similar levels in terms of the magnitude of energy consumption.

2) Energy Conservation Policies

It was in 1979, immediately after the second oil crisis, that Japan instituted the Energy Conservation Law, while Thailand established an equivalent law in 1992 and Indonesia enacted one in 2009 as mentioned in 3.1.1. Both Thailand and Indonesia seem to have studied the Energy Conservation Law and its system in Japan methodically before establishing and implementing their legal systems (while adapting them to their specific circumstances), thus many similarities may be found when compared the structure of Japan's Energy Conservation Law.

a. Designated Energy Management Factory

The main items to be implemented by companies subject to energy management are "appointment of energy manager," "formulation of medium- and long-term energy conservation programs (targets)," "implementation of energy conservation activities," and "yearly reporting of the status of energy use," which are common to all three countries.

The scale of designated energy management factories is set at about 1,387 toe/year in Japan, while it is 478 toe/year in Thailand and 6,000 toe/year in Indonesia. As mentioned in 3.1.1, the lower limit, which is a relatively loose criterion for the scale of designated factories, reduces the number of target companies and may obscure the intent of energy management. Given the present circumstances, however, it is considered that initial implementation and establishment of the energy conservation system should be prioritized, and that regulation should be strengthened in line with the progress achieved, because the quantitative assessment of the actual consumption of energy is incomplete, restrictions on the methods for managing energy conservation being taken into consideration.

b. Incentives and Disincentives

Table 3.3-1 shows the evaluation criteria of energy conservation by energy users, incentives, and disincentives involved with the implementation of energy conservation. As regards evaluation criteria, Japan and Thailand focus on how energy conservation targets that are set voluntarily can be achieved by the parties concerned through original and ingenious ideas, and do not necessarily emphasize the penalties imposed when those targets are not attained.

On the other hand, Indonesia stipulates the targets for reducing energy consumption and base units in the energy conservation plan (middle term) that is formulated following the "Energy Audit" as stated in the articles of the law, and sets out stringent sanctions (announcement, fines, and reduction of energy supply) to be applied if targets are not achieved, and puts the focus on non-achievement rather than on achievement. Thus, some differences are visible that are based on the state of affairs in each country. All three countries have almost the same stipulations in terms of incentives.

Table 3.3-1 Comparison of Laws Relating to Energy Conservation in Three Countries

Item1	Item2	Indonesia	Japan	Thailand
Basic Data (2007)	Population	226 millions	128 millions	67 millions
	GDP	233 billion US$(2000 price)	5,206 billion US$(2000 price)	174 billion US$(2000 price)
	Primary Energy Consumption	138 Mtoe	514 Mtoe	86 Mtoe
	Primary Energy Consumption / GDP	593 toe/million US$	99 toe/million US$	493 toe/million US$
Legal Framework	Name	Government Regulation of the Republic of Indonesia Number 70 of 2009 Regarding Energy Conservation	Act on the Rational Use of Energy	The Energy Conservation Promotion Act
	Year of publication	2009	1979	1992
	Year of enforcement	2009	1979	1998
Condition of Energy Management Factory	Energy Consumption	≧6,000 toe/Year	≧1,387 toe/Year	>478 toe/Year
Energy Management	Main Content (Energy Utilization)	① the appointment of energy manager ② developing energy conservation programs ③ application energy audits on a regular basis ④ application the recommendations of energy audits ⑤ reporting the implementation of energy conservation every year	① the appointment of energy managers ② developing mid-term and long-term plans ③ reporting the state of energy use every year ④ endeavoring to promote the rational use of energy	① appointment of personnel responsible for energy ② developing targets and plans for energy conservation ③ reporting energy production, consumption, and conservation ④ conserving energy, auditing and analyzing energy utilization to achieve such targets and plans for energy conservation
Criteria for successful implementation of energy conservation	for energy users	① specific energy consumption and / or ② elasticity of energy consumption	① reducing their energy consumption intensities by 1% or more on annual average in the medium-to-long term (3-5 years)	①conserving energy, auditing and analyzing energy utilization to achieve such targets and plans for energy conservation
Incentives	promotion and assistance of energy conservation for energy user	① tax facilities ② tax relief or reduction and local tax exemptions ③ import duty facilities ④ low interest rate funds ⑤ energy audits are financed by the Government	no description ・taxation incentive ・subsidy	① Exemption from paying surcharges ② Grant or subsidy from the Fund no description ・taxation incentive ・low interest loan
Disincentives (Penalty)	If energy user does not carry out energy conservation	① written warning ② announcements in the media ③ fines and / or ④ reduction of energy supply	① instruction ② publication ③ order	① fines

(2) Current Situation of Financial and Monetary Support for Energy Conservation in Japan

The financial and economic support for energy conservation in Japan is roughly divided in subsidies, preferential taxation, and low-interest loans, of which the main support schemes instituted by the

government, its pertinent authorities, and industry groups are described below.

Table 3.3-2 Subsidy Schemes for Energy Conservation in Japan

Institute	Program Name or Subsidy Name	Object	Subsidy
New Energy and Industrial Technology Development Organization (NEDO)	Program for Supporting Operators in Rationalization of Energy Consumption	Cost for introducing energy-saving equipment and technology that are expected to offer high energy conservation effect and excellent cost-effectiveness	up to one-thirds of the cost (Ceiling: 500 million yen)
	Program for Promotion of Introduction of High Efficiency Residence and Building Systems	Costs for introducing high efficiency residence and building systems or BEMS to achieve optimum energy management in residences and building	Up to one-thirds of the cost (Ceiling: 100 million yen)
Organization for Small & Medium Enterprises and Regional Innovation, JAPAN	Subsidy for ESCO for medium and small sized companies	Costs of facilities, instruments and construction required for energy conservation programs by medium and small sized companies	Up to a half of the cost (Ceiling: 30 million yen)
Japan Electro-Heat Center	Subsidy scheme for introduction of Ecocute	Purchase cost of Ecocute (heat pump water heater using CO2 cooling medium) to install and use it in residences	41,000 - 850,000 yen for equipment depending on equipment power and capacity
	Support Program for Introduction of High Efficiency Air Conditioners	Cost of introducing high efficiency air conditioner with recognized high energy-saving in commercial and operational buildings	one-thirds of the cost
Town-Gas Promotion Center	Support Program for Promotion of Conversion to Natural Gas for High Energy Consumption Equipment	Cost of equipment modification to convert combustion units such as industrial furnaces and boilers that use coal, coke and oil products (50 kL or more oil equivalent /year) to use natural gas based gas.	up to one-thirds of the cost (Ceiling: 180 million yen)
	Subsidy Scheme for Supporting Introduction of Latent Heater Recovery Water Heater	Cost for introducing latent heat recovery water heaters fueled by town gas	17,000 yen/unit for equipment and 5,000 yen/unit for installation work
	Subsidy Scheme for Supporting Introduction of Gas Engine Water Heater	Cost for introducing gas engine water heaters fueled by town gas	86,000 - 640,000 yen for equipment depending on equipment power and capacity, 38,000 - 66,000 yen/unit for installation
	Subsidy for Model Introduction Programs for Area Use of Natural Gas Type Energy	Cost of model introduction programs to implement area use of natural gas type energy that provides high energy-saving and CO2 reduction effects with combined natural gas cogeneration and heating in household buildings	up to one-thirds of the cost (Ceiling: 200 million yen)

The Conference of LP Gas Associated Organizations	Subsidy Scheme for Promoting Introduction of Latent Heat Recovery Type Water Heater	Cost for introducing latent heat recovery type water heater fueled by LP gas	17,000 yen/unit for equipment and 5,000 yen/unit for installation work
	Subsidy Scheme for Promoting Introduction of Gas Engine Water Heater	Cost for introducing gas engine water heater fueled by LP gas	86,000 - 1,600,000 yen/unit for equipment depending on equipment power and capacity, 38,000 - 214,000 yen/unit for installation work
	Support Program with Subsidy for Introducing High-Efficiency Kitchen Units	Cost for introducing high-efficiency kitchen units fueled by LP gas	12,000 - 30,000 yen
Petroleum Association of Japan	Support Program for Demonstrating Effects of Introduction of Environmentally Compatible Boilers	Cost for introducing professional-use, high efficiency, environmentally compatible boilers (oil-fired small-sized, through flow boilers and water heaters that feature higher efficiency and reduce more NOx emissions than conventional units)	one-fifths of the purchase cost or the ceiling amount (500,000 - 1,400,000 yen depending on the capacity), whichever is smaller
	Support Program with Subsidy for Introducing Latent Heat Type Water Heater	Cost for introducing latent heat recovery type water heaters fueled by oil	17,000 yen/unit for equipment, 5,000 yen/unit for installation work
The Energy Conservation Center, Japan (ECCJ)	Program for Guidance on Introduction of Energy Conservation Measures	Plants (Electric facilities, thermal facilities and common facilities for power and heat) Buildings (heat source and heat transfer facilities, air conditioning and water heater units and electric and lighting facilities)	Diagnosis of energy conservation provided free of charge (basic data investigation -> Survey and analysis of current plant status -> proposal for improvement)

Table 3.3-3 Preferential Taxation for Energy Conservation in Japan

Institute	Taxation System Name	Object	Details of preferential treatment
Ministry of Finance	Taxation System for Promoting Investment to Help Develop Structure of Energy Supply and Demand	Below-mentioned facilities acquired and used within one year 1. Manufacturing facilities that make effective use of energy 2. Auxiliary facilities that make effective use of energy 3. Equalization facilities for demand of electricity and gas 4. Facilities that use new energy 5. Other facilities that use substitute energy for oil 6. Facilities to rationalize use of energy 7. Facilities to control use of energy 8. Multiplexed power distribution facilities	Tax deduction of the amount equivalent to 7% of the base acquisition value or special depreciation up to the amount equivalent to 30% of the base acquisition value in addition to the common depreciation (However, the application of the tax deduction is limited to middle and small sized businesses (with a capital of 100 million yen or less or 1,000 employees or less))

Table 3.3-4 Low-interest Loans for Energy Conservation in Japan

Institute	Sector	Object	Details of preferential treatment
Loan for environmental and energy measures (Development Bank of Japan, Inc.)	Eenergy conservation facilities	Money for equipment necessary for those who install facilities that contribute to energy conservation (50 types of facilities such as heat pump type heat source units) to acquire energy-saving facilities.	Special rate of interest of 1.1 – 2.0% up to 270 million yen (as of February 10, 2010) for a maximum period of fifteen years
	Specific high-performance energy consumption facilities	Money necessary to install specific high-performance energy consumption facilities such as for high-performance industrial furnaces and boilers, or money for equipment necessary to install auxiliary equipment that can raise the performance of the facilities to that of high-performance industrial furnaces and boilers.	Special rate of interest of 0.7 – 1.6% up to 270 million yen (as of February 10, 2010) for a maximum period of fifteen years
	Facilities using substitute energy to oil	Capital investment necessary for those who install equipment required to use energy substituting oil, general gas operators who supply energy substituting oil or general gas operators to acquire facilities using or supplying energy substituting oil.	Special rate of interest of 0.85 - 2.25% up to 270 million yen (as of February 10, 2010) for a maximum period of fifteen years

Note: The eligible parties are limited to small and medium-sized companies
(with a capital of 300 million yen or less or 300 employees or less.)

(3) Outline of Energy Conservation Fund in Thailand

In Thailand, the Energy Efficiency Revolving Fund (EERF) launched by the Department of Alternative Energy Development and Efficiency (DEDE) in cooperation with 11 commercial banks started operation in January 2003. The EERF project comes under the Energy Conservation Promotion Fund, which is financed by a levy on petroleum products.

The EERF has the following main objectives:

1) to stimulate financial sector involvement in energy efficiency projects; and,
2) to simplify project evaluation and financing procedures.

The EERF has, on the one hand, provided capital at no cost to banks located in Thailand, and the banks have, on the other hand, provided low-cost loans to project proponents.[15] Under this scheme, intervention by the Thai government has generally been minimized.

The current characteristics of the EERF are

1) government funds: US$155 million;
2) bank/own funds: US$135 million;

[15] Subsequently, the DEDE decided to charge banks 0.5 percent interest to cover administrative costs.

3) loan period: maximum 7 years;
4) loan channel: commercial banks;
5) eligible borrowers: building, factories, and energy service companies;
6) eligible investment: equipment and installation, consultancy fees, civil works, piping and necessary components, associated costs such as the removal of existing equipment, transportation, and taxes;
7) loan size: maximum US$1.4 million per project; and,
8) interest rate: 4 percent per year or less.[16]

According to the DEDE, 198 factories, 35 buildings, and four ESCOs were implementing projects as of October 2008, with loans approved under the EERF of US$154 million (a combined total investment of more than US$289 million). Also, the numbers of projects that received funding as of April 2008 were food and beverages (71), chemicals (27), textiles (23), non-metallic (20), hospitals (15), and offices (14). In addition, the types of energy efficiency measure implemented as of April 2008 were alterative energy/equipment and replacement (US$99 million), combined cycle power plant (US$72 million), and high-efficiency machine replacement (US$67 million), which together accounted for 80% of the total investment (US$293 million) This resulted in electricity savings of more than 750 million kWh per year, or nearly 200 million liters of oil per year.

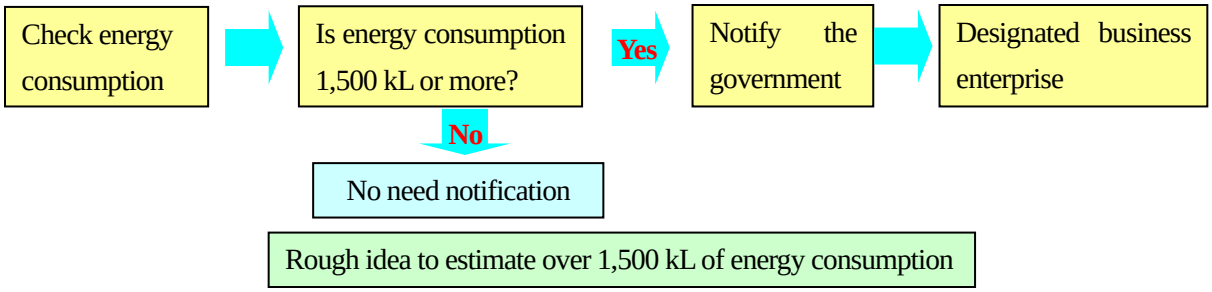
As the EERF model is considered not to rely on factors unique to Thailand, it seems to be easy to apply in other APEC countries. When applying this model, the following factors must be taken into account. First, to provide loans, a revolving pool of funds, which could be directly allocated from government revenues or raised from a dedicated tax, is required. Second, agreement from the finance sector (banks and other financial institutions) to take part in the EERF by providing customers (proponents of energy efficiency projects) with low-interest rates (no more than 4% per annum) is necessary. Third, the number of staff needed to establish a finance model and to carry out a small proportion of the work involved for assessing loan applications, administering loans, and promoting this financial model must exist in a government agency. While the EERF model has the above implications, some of the negative aspects should be resolved first. They include: 1) risks which accompany providing a loan for a worthwhile project when the applicant lacks an adequate return; and, 2) the fact that the EERF model does not really address risk, which leads to the possibility that some project proponents are carrying higher or lower risk than their projects originally warranted.

(4) Management and Operation System on Japan Energy Conservation Act

In Japan, business enterprises that consume energy of 1,500 kL oil equivalent or more are obliged to submit “Notification on Status of Energy Consumption” to the government (Bureau of Economy, Trade and

[16] While interest rate was capped at 4 percent for loans from the EERF, the banks charged a higher rate for the capital put in, normally at the minimum lending rate minus 1 percent (about 6 percent or 7 percent), which was substantially below the prevailing market rate.

Industry). After submission, the government designates the enterprise as a designated business enterprise. If the enterprise does not report and/or makes a false report to the government, the enterprise may be fined up to 500 thousand yen.



Retail store	over 30,000 m2	Convenience-store	over 30-40 stores
Office	over 6 GWh/year	Fast food	25 restaurants
Hotel	over 300-400 rooms	Family restaurant	over 15 restaurants
Hospital	over 500-600 beds	Fitness club	over 8 clubs

Figure 3.3-1 Flow of Notification System for Business Enterprises in Japan

Designated business enterprises have to appoint an "Energy Manager" and submit a "Periodic Report" and "Medium- and Long-term Plan" to the government through the following procedures.

1) The designated business enterprises appoint "Energy Manager" within six months from designation date and submit "Notification on Appointment of Energy Manager" to the government by the end of June of the next fiscal year.
2) The designated business enterprises submit a "Periodic Report" to the government by the end of June each year.
3) The designated business enterprises consuming energy over 3,000 kL per year submit "Medium- and Long-term Plan" to the government by the end of June each year.

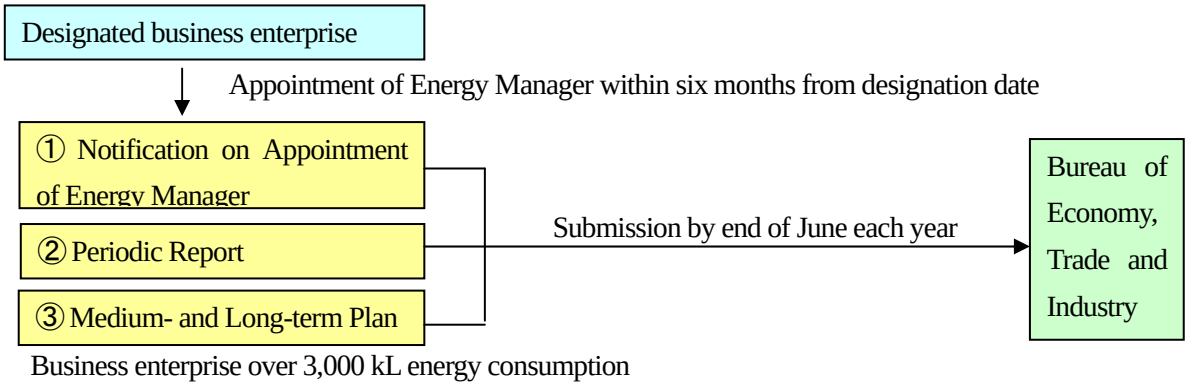


Figure 3.3-2 Flow of Energy Management Documents in Japan

3.3.3 Recommendations from viewpoint of Experience in Japan

From the viewpoint of experience in Japan and other countries, the following crucial points are to be described when implementing Energy Management System.

(1) Reporting System

Reporting system is the first step towards implementing energy management. In Japan, a paper-based periodic report has to be submitted by business enterprises. However, there are more than 14,000 designated factories in Japan. Therefore, the staff who handle all periodic reports have to enter data and information again from the hard-copy report. This requires a huge quantity of work of government officers. It would also be much better for the content of a periodic report not to be complicated if possible. In this regard, we have seen many cases in which developing countries failed to build and manage a reporting system in the past due to the large quantity of information required, and it seems to be difficult for the government to handle such enormous volumes of information at the early stages[17].

Considering the above points, attention needs to be paid to the periodic report and medium- and long-term plan as follows.

1) In the first year, the report is initiated with a simple format and information required is increased year by year.
2) A report is submitted as an electronic file.
3) A deadline is set for report submission
4) Storing data in a main server using online system (Internet) is one way to collect information
5) Staff and organizations are prepared in central and local government in charge of data collection.
6) A pilot project is implemented with participation of a limited number during kick-off period of data collection.
7) After the actual number of designated business enterprises is specified by a field survey, a manpower plan has to be drawn up.
8) Web Page is to be opened for questions from business enterprises.

(2) Monitoring System

Receiving periodic report and medium- and long-term plan alone is not enough to promote energy conservation. It is very important to analyze reports and give feedback to submitters. In Japan, it also takes a lot of time to do analyses. Points for analysis are described below.

[17] For example, the Vietnamese Government requested submission of energy consumption data and information to energy-consuming business enterprises under law. Business enterprises, however, submitted their energy data and information in terms of value and/or physical unit. They did not get a unified response. Also, they did not handle and analyze such data and information because of a lack of staff. Moreover, the collection ratio was low because there were no penalties.

1) Establish tool (evaluation sheet) for analyzing submission report
2) Return feedback on report to business enterprises within three months
3) Describe numerical targets in feedback if not mentioned in the report.
4) Confirm achievement of numerical targets when receiving the report next year.
5) Conduct an on-site inspection to confirm contents of report in a random manner.

(3) Evaluation System

In Japan, designated business enterprises have an obligation to submit "Notification on Status of Energy Consumption," "Periodic Report," and "Medium- and Long-term Plan" to the government under Japanese law. Designated business enterprises are ranked according to evaluation criteria. Points to be evaluated are described below.

1) Organize unit energy consumption in each industry.
2) Compare trends of energy consumption and energy unit consumption.
3) Compare energy unit consumption in the same industry
4) Prepare evaluation manual
5) Prepare evaluation criteria
6) Score reports following evaluation criteria
7) Give advice and implement on-site inspection if necessary.

Points to be checked in the report are as follows.

1) Check calculations.
2) Consider whether energy unit consumption is still appropriate.
3) Consider whether target setting is still appropriate.

(4) Enforceability of Energy Audit System

According to the regulations (Energy Conservation) in Indonesia, business enterprises consuming over 6,000 toe per year of energy are obliged to conserve energy through energy management. According to the results of past energy audits conducted by EMI, most business enterprises were found to have low energy efficiency. Furthermore, investors tend to make investment for energy efficiency with no cost or low cost. Thus, the payback period of investment simply remains at 1-2 years. This type of investment generally achieves only small improvements of energy efficiency even if energy audit system is expanded to increase the number of companies that implement energy conservation. As there is enough potential for saving energy even at under 6,000 toe, it is necessary to encourage business units that consume less than 6,000toe per year to participate in the energy audit program. However, since the cost of energy audit is not low, attentions should be paid to the balance of costs and effectiveness of conducting energy as the number of audited companies increases. Since the regulation covers only a small part of the consumers of energy in the

building sector, various measures need to be taken to encourage business units that consume less than 6,000toe per year of energy to participate in the energy audit program. The following actions are necessary to induce non-committing business enterprises to voluntarily promote energy conservation.

1) Conduct awareness campaign for energy conservation through mass media
2) Advertise incentives such as tax reductions and subsidies for investments on energy conservation.
3) Establish a financial system for small- and medium-sized business enterprises.
4) Establish a low-interest financing fund.
5) Announce energy conservation technologies and financing system.
6) Introduce energy conservation awards (benefits: certificate, certification mark, testimonial, announce awards given by the government)

(5) Public Announcement

To promote energy conservation in Indonesia, it is necessary to change the consciousness of the people. In Japan, consciousness about energy conservation has been raised through various activities. The following are typical activities for promoting energy conservation.

1) Announce actual energy consumption of designated business enterprises through the government Website.
2) Organize energy conservation awards and announce results.
3) Advise on effectiveness for energy conservation through mass media.
4) Hold a national convention for energy conservation.
5) Announce incentives such as tax reductions and subsidies for investments on energy conservation through mass media.
6) Promote activities of The Energy Conservation Center, Japan (ECCJ).
7) Ask for submissions for an energy conservation poster by elementary and junior high school students.

In addition to the above recommendations, it is necessary to disclose the results of model audit cases using the government website. In Japan, the Energy Conservation Center discloses the results of energy audits and its improvement suggestions on its website as examples of successes. Many business enterprises monitor this website to reduce their energy consumption.

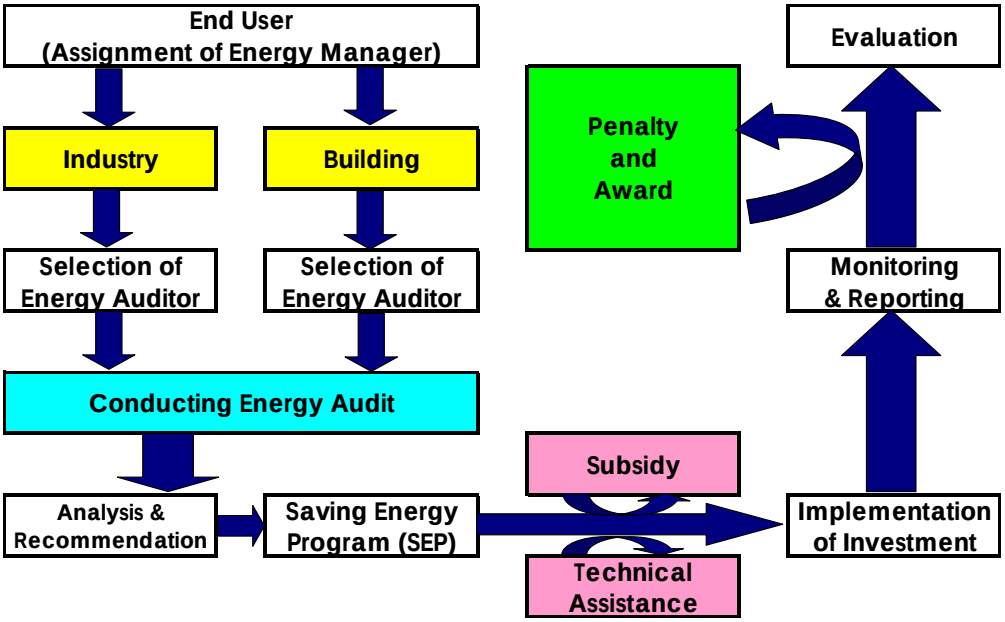
3.3.4 Current Situation of Energy Audits in Indonesia

(1) Outline of Energy Audits (2007-2009)

Energy audits are conducted to help energy users, especially intensive energy users in industry and commercial buildings, to recognize the current status of energy use and energy-saving potential, thus

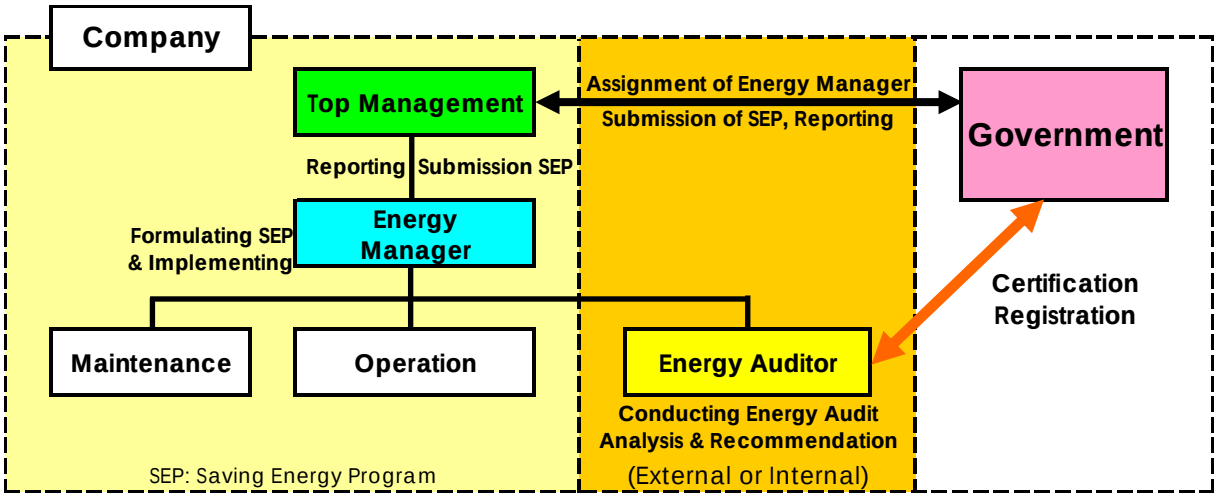
encouraging them to implement investments on saving energy. In Indonesia, the legislative framework for energy audits is, as mentioned in 3.3.1, based on Regulation No. 70 November 2009 (Energy Conservation).

According to Articles 12 and 13, business units and factories that consume more than 6,000 toe have to formulate an energy-saving program after energy audits are conducted by an internal or external auditor and report the results. After receiving approval from the government, they have to implement a practical program for saving energy. Through this series of procedures (so-called energy management),the government demands that they assign an energy manager within their organization to manage and supervise all aspects of saving energy. Figure 3.3-3 shows the flow of the energy audit system and Figure 3.3-4 illustrates the functions and roles of energy management and energy audit. Since the government is at the stage of preparing certificates and an educational system for energy managers, there are currently no certified energy managers at business units. On the other hand, energy auditors, without any official certification mechanism, are already playing an important role on energy-saving activities by participating as auditors for the Governmental Energy Audit Program.



Source: Regulation No. 70 November 2009 (Energy Conservation)

Figure 3.3-3 Flow of Energy Audit System



Source: Regulation No. 70 November 2009 (Energy Conservation)

Figure 3.3-4 Functions and Roles of Energy Manager and Energy Auditor

As stipulated in Article 21 of the regulation, to support energy audit activities, the government provides a free energy audit with volunteers participating in the Energy Audit Partnership Program along with the following steps.

Stage1: Commitment of company to take part in partnership program.

Stage2: Performing energy audit at committed company to identify energy-saving potential.

Stage3: Implementing housekeeping measures, such as improving operation procedures, maintenance, and arranging work schedule for energy-facility tools and loads.

Stage4: Implementing energy conservation measures that need modification, such as installing instruments and improving employee/operator energy conservation skills.

Stage5: Implementing Energy conservation measures that require a high investment, such as replacing equipment or process with a more energy-saving one.

1) Results of past energy audits

Indonesia introduced the energy audit system in 2003. Energy audits in 2003 and 2004 were conducted with funds from PLN. Energy audits funded by the national budget were started from 2006. Therefore, an energy audit was not conducted in 2005. Moreover, an energy audit was not conducted in 2008 because there was not enough time to solicit bids for consultants to conduct energy audits due to a delay in approving the national budget. Table 3.3-5 shows the results of past energy audits in Indonesia. Energy savings acquired in the table mean actual energy savings after implementing appropriate measures for energy conservation.

Table 3.3-5 Results of Past Energy Audits

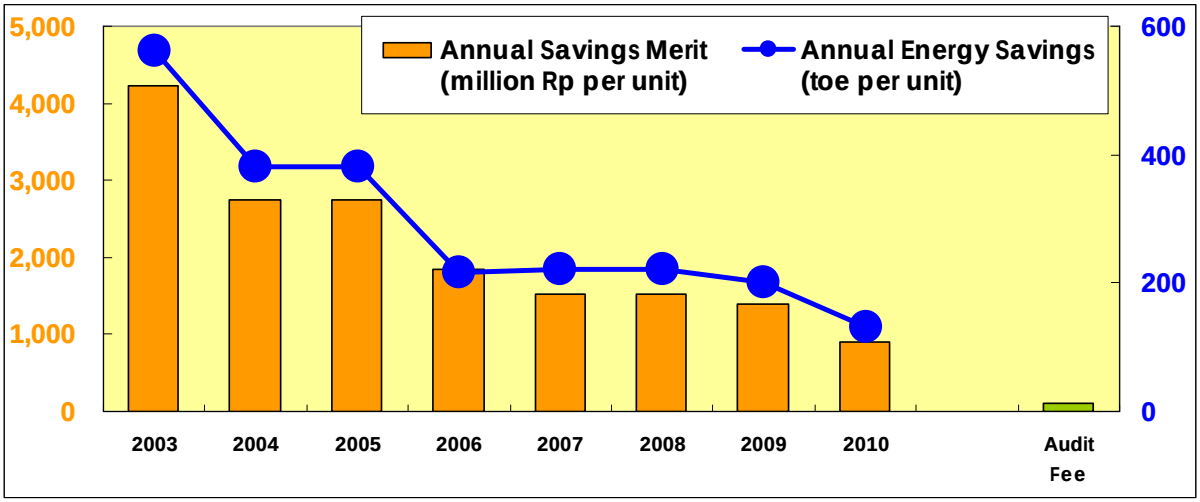
		Energy Audit conducted by Government							
		2003	2004	2005	2006	2007	2008	2009	2010
Total (unit)		11	9		32	200		9	32
Energy Savings (toe per unit)	Potential	562	141		109	223		73	
	Acquired	246	135		81	132		on going	
Savings Merit (mm Rp per unit)	Potential	4,233	767		1,263	1,445		595	
	Acquired	1,850	911		622	844		on going	

Source: Ministry of Energy and Mineral Resources

Figure 3.3-5 shows annual potential and funding for energy saving by an audit entity. This chart shows calculations based on accumulated totals instead of annual data. For example, the potential energy savings in 2006 are calculated as follows: the accumulated potential savings from 2003 to 2006 are divided by the accumulated number of audits to obtain the figures for 2006. The left axis shows the energy savings per one audit (based on accumulated total), while the right axis shows energy savings potential per one audit.

If the number of audits increases, energy-saving effect per audit becomes lower in terms of both quantity and financially. Average costs of an energy audit are 100-120 million Rp for one factory and 80-90 million Rp for one building. If energy audit expenses are about 100 million Rp, cost effectiveness is expected to decrease, becoming a serious problem provided the energy audit is conducted using the government budget according to Article 21 of Regulation of 2009.

At present, MEMR selects factories and buildings of applicants; so far, there are no criteria for selecting target factories and buildings; and there is no burden of expenses on beneficiaries.



	Energy Audit conducted by Government							
	2003	2004	2005	2006	2007	2008	2009	2010
Total (unit)	12	9		32	200		40	160
(accumulated)	12	21	21	53	253	253	293	453

Source: Ministry of Energy and Mineral Resources

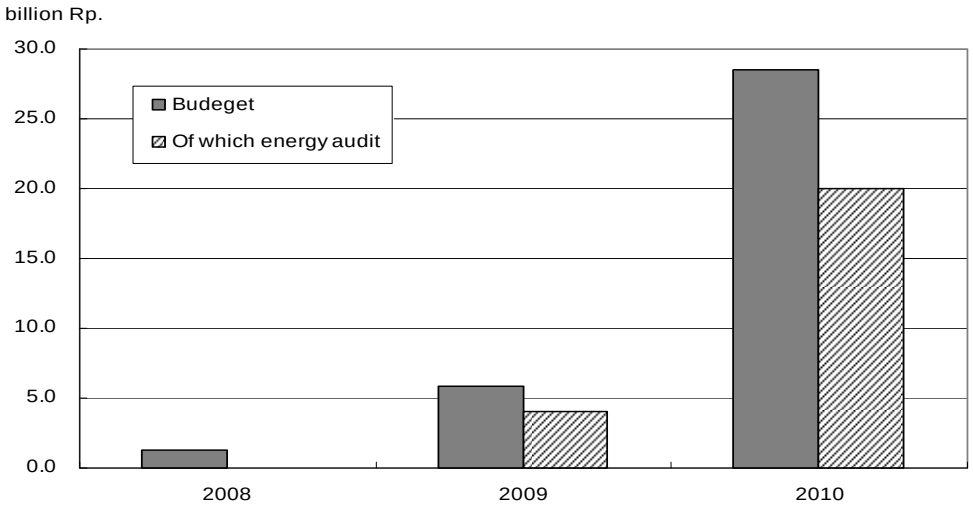
Figure 3.3-5 Trends of Average Saving Merit and Energy Savings Obtained by Energy Audits (Annual per unit on a cumulative basis)

2) Budget and effects on energy conservation

Figure 3.3-6 shows the national budget for energy conservation programs in Indonesia. The budget for energy conservation programs increased rapidly from 1.3 billion Rp in 2008 to 28.5 billion Rp in 2010. Of which, about 70% is spent on energy audits. In 2009, about 4 billion Rp was spent on energy audits. According to the results of past energy audits as shown in Table 3.3-5, the energy-saving potential in 2009 was 23.8 billion Rp.

According to past records of energy audits, durations for implementing an energy audit per building and factory are 21 days and 30 days, respectively. Five persons were required for one energy audit. Therefore, 105 man-days for a building and 150 man-days for a factory are required for an energy audit. In Japan, man-days required are less than in Indonesia. The duration of an energy audit in a factory funded by the Japanese government is only one day[18]. Even if a private company such as an ESCO conducts an energy audit, it takes only one week. It is expected that the man-days required for energy audits will decrease as technical skills improve in the future.

[18] http://www.eccj.or.jp/audit/fct3/fct3_pdf.pdf (written by Japanese)



Note: This national budget was established in 2006. However, the JICA team received data from 2008.

Source: Ministry of Energy and Mineral Resources

Figure 3.3-6 National Budget for Energy Conservation (2008-2010)

(2) Evaluation of Energy Audit conducted by EMI

1) Effectiveness of Energy Conservation

We reviewed the results of energy audits (20 factories and 30 buildings) that were conducted by EMI from 2007 to 2009. The results are shown in Table 3.3-6 and Table 3.3-7. According to these results, 12 factories consumed over 6,000 toe per year, while buildings did not exceed 6,000 toe. 70% of 20 factories had an energy conservation potential of less than 10%, and the ratio of saving energy was only 2.2%.

As regards buildings, the ratio of energy saving potential, 17.8% is a reasonable energy conservation level. This is because most of energy consumption is from the use of electricity for air conditioning, lighting, elevators, fans, and pumps etc., and the evaluating method seems appropriate. On the contrary, the 2.2% of energy saving ratio for factories seems to be the result of insufficient evaluation targets and items for energy conservation potential. First, it appears that the energy conservation for thermal usage was not analyzed and evaluated, even though factories generally require intensive use of heat in from boiler and heating furnace,. Second, it also appears that the advanced level of energy conservation in production processes was not analyzed. However, it is clear that the energy consumption of a factory is much larger than that of a building. For energy conservation in factories to reach the next level, energy management should shift from improvement of the energy use from installed equipments to the introduction of advanced technology in production processes. Government support will become more important as these advanced technologies require high-cost investments.

Table 3.3-6 Comparison of Average Energy-saving Ratio by Sector in Buildings

	Number of Building	Total Floor area per unit	Energy Consumption (toe)	Ratio of Saving Energy
Commercial	8	48,605	838	17.8%
Government	7	9,188	52	29.0%
Hospital	10	21,253	310	15.3%
Hotel	2	18,717	363	14.0%
Social	3	26,188	103	44.7%
Total	30	26,374	386	17.8%

Source: EMI (PT. Energy Management Indonesia)

Table 3.3-7 Comparison of Average Energy-saving Ratio by Sector in Industry

	Unit	Annual Energy Consumption (toe per unit)	Annual Saving Energy (toe per unit)	Ratio of Saving Energy
Steel	6	15,300	245	1.6%
Textile	13	5,473	155	2.8%
Others	1	378	110	29.1%
Total	20	8,166	180	2.2%

Source: EMI (PT. Energy Management Indonesia)

2) Profitability of Energy Audit as a Business and Market Potential

How to carry forward energy conservation starts from the implementation of energy audits and the estimation of their analytical results. In particular, in the case of modification of facilities and replacement, the profitability of energy saving investment, that is, the payback period of an investment, is a decisively important factor for an enterprise or a building owner.

Figure 3.3-7 shows the ratio of investments for energy conservation based on the results of 50 energy audits above by three groups of payback periods: less than 1 year, 1~ 2 years, and more than 2 years. This categorization is based on assumptions of 850 Rp/kWh for buildings and 622 Rp/kWh for industries. The ratio of the first group (less than 1 year) is an overwhelming 80% for factories and 70% for buildings. This result implies that investors mainly invest when they can recoup the costs in a short period. This may well be due to high interest rates or shortage of loans in Indonesia. Also, as mentioned above, it is possible that the contents of energy saving investment are still at relatively low-cost level, and the stage of large-scale investment by means of advanced technology has not been

reached yet in Indonesia. Financial issues and the level of energy saving technology cannot be distinguished by the results of these energy audits.

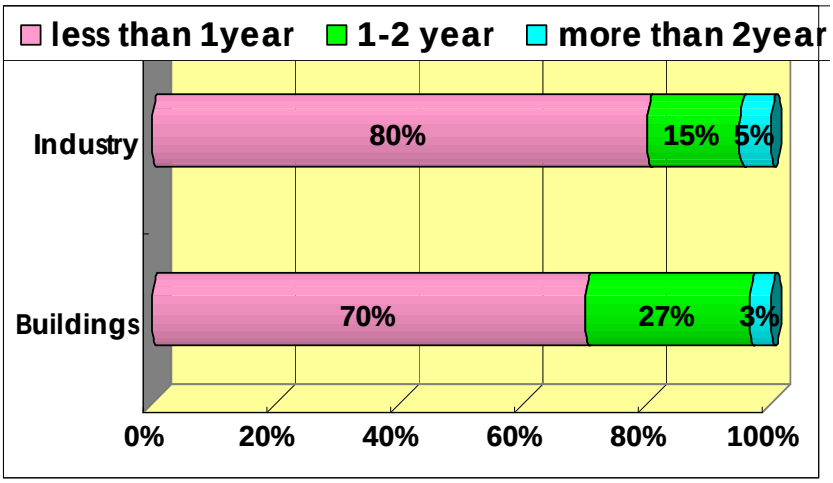


Figure 3.3-7 Payback Period of Improvement Cost [19]

Table 3.3-8 Comparison of Average Payback Period for Buildings

	Number of Building	Total Floor area per unit	Average of Investment Cost	Average of Saving Cost (million Rp)	Payback period (Year)
Commercial	8	48,605	987	1,477	0.67
Government	7	9,188	143	165	0.86
Hospital	10	21,253	303	543	0.56
Hotel	2	18,717	169	258	0.65
Social	3	26,188	299	453	0.66
Total	30	26,374	439	676	0.65

Source: The above figures are modified by IEEJ using data collected from EMI

Table 3.3-9 Comparison of Average Payback Period for Industry

	Unit	Average of Investment Cost	Average of Saving Cost (million Rp)	Payback period (Year)
Steel	6	1,041	1,775	0.59
Textile	13	210	1,069	0.20
Others	1	295	796	0.37
Total	20	464	1,267	0.37

Source: The above figures are modified by IEEJ using collected data from EMI

[19] The above payback years are based on 850 Rp/kWh (Building) and 622 Rp/kWh (Industry).

When analyzing the energy-saving methods proposed by an energy audit, the countermeasures are demand-side management, operation management, and replacement of equipment that require only a small investment in terms of time and money.

In Japan, as short-sighted countermeasures for the oil price hike during the early stages, energy conservation started with process management and operation management and proceeded to replacing equipment. Immediately after it was understood that high oil prices would continue, energy conservation activities shifted toward investment on the installation of new equipment including process modifications from a long-term point of view.

Judging from the experiences in Japan, in the near future, support from the government for investments for energy conservation becomes more important as energy savings in Indonesia shifts from consumers' own efforts to improve operations and process management to replacing equipment that requires large investments.

3) Current Issues

There are many obstacles to the implementation of energy conservation activities. The biggest obstacles to energy conservation activities are a lack of technological knowledge followed by a limited number of employees who are well trained on saving energy in industry. On the other hand, the largest negative influences for commercial buildings are a lack of awareness of the need to save energy followed by a lack of technical knowledge. The primary obstacles to carrying out energy conservation activities in industry are as follows:

For enterprises (including employees);

a. Lack of technical knowledge on energy conservation
b. Limited numbers of employees well trained on energy conservation
c. Lack of ability to evaluate project investments
d. Lack of public awareness of the need for energy conservation
e. Limited budgets
f. Limited data and information
g. No energy conservation program
h. Limited financing opportunities

For Government Policy;

a. Limited supporting policy
b. Limited infrastructure required regarding introducing saving energy technologies
c. Limited data and information

d. No standard for energy conservation

e. No comprehensive and consistent energy conservation program nationwide

f. Low energy Prices

From an analysis of past energy audit data, in the building sector, especially commercial buildings, the level of public awareness of saving energy is becoming higher as energy prices are increasing. Various energy-saving measures have been implemented for commercial buildings, although the focus is on activities involving low cost or no cost. The main obstacles they still are facing are that very few people who are well trained on saving energy and there is a shortage of financial resources.

The energy intensity of most government buildings (especially in the regions) is low, but this does not mean they operate offices efficiently; the energy used is still not enough to provide good working conditions. When there is no-one in charge of energy matters in a unit, energy-consuming equipment is not maintained properly. A lack of technical knowledge, limited numbers of well-trained employees, and budget constraints are still in the major hurdles to be overcome to carry out energy conservation.

CHAPTER4. SELECTION OF MODEL PROJECT

This chapter gives an overview of model projects and their implementation. The model projects are selected from three sectors: cement industry, steel industry, and office buildings. The cement industry in Indonesia is relatively competitive and efficient in energy utilization, and seems to approach the top level internationally. The market structure is close to an oligopoly. Generally, the cement industry is required to implement large investments and introduce more advanced technologies for saving energy. On the other hand, the steel industry has a more complicated structure, and there are so many companies from large to small in the industry. There is also a big difference between large and small companies in competitiveness and/or energy efficiency in the industry. In the case of implementing energy-saving measures, some companies are required to invest as much as the cement industry, while others are taking very basic measures for energy management and improvement. In the third sector, focusing on saving energy for office buildings is very important from a point of view of public awareness and cost effectiveness.

The following sections explain sector structure, analysis of energy efficiency, and selection of model projects and technology, but prior to that we have to discuss present energy prices.

4.1 Preconditions

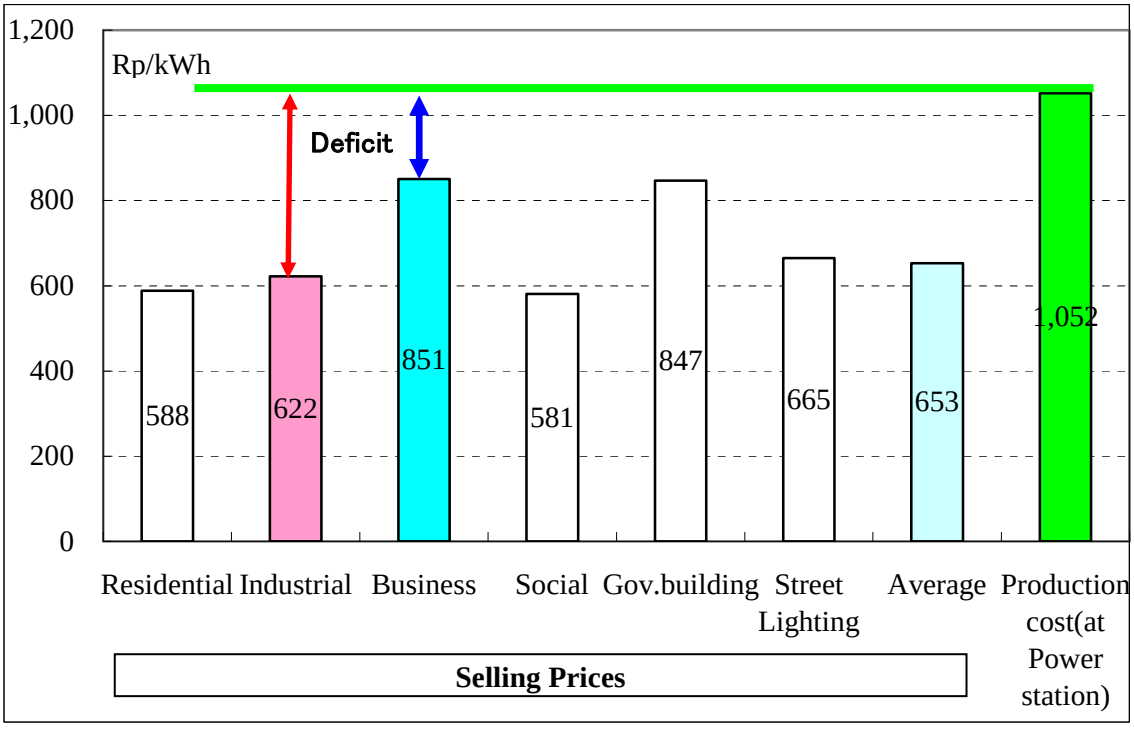
(1) Interest Rate

The conditions for financing from banks are a maximum of a five-year period and approximately 15% interest (inflation rate: 11% in 2008). For capital investments to be profitable, the IRR (Internal Rate of Investment) required exceeds 20% considering taking risks, which is difficult to achieve even for excellent companies. However, this study establishes this requirement as criteria for the profitability of an actual investment.

(2) Energy Prices

1) Electricity Prices

Normally, electric power should be sold at a rate that is above the power-generation cost (transmission end). However, PLN (state-owned electricity company) currently sell electricity to all types of business at the negative spread shown in Figure 4.1-1 and Table 4.1-1. Therefore, it operates at a huge loss, and the government compensates for the loss through fiscal expenditure.



Source: PLN Statistics 2008

Figure 4.1-1 Electricity Prices of PLN by sector

Table 4.1-1 Average Selling Price of Electricity by Sector in 2008

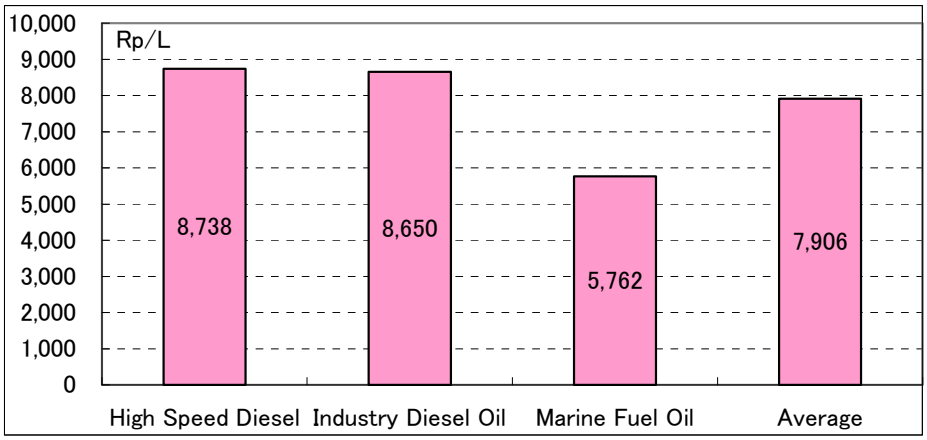
	Residential	Industrial	Business	Social	Gov. Office Building	Publ. Street Lighting	Total
Outside Java	585	643	838	585	914	662	665
Java	588	629	842	580	800	661	650
Indonesia	588	622	851	581	847	665	653

Source: PLN Statistics 2008

2) Gas and Petroleum Products Prices

Subsidized prices of petroleum products for industrial use have been abolished and they are now linked to the market (MOPS: Mean of Platts Singapore) as shown by Figure 4.1-2. The price of natural gas[20] is approximately one fifth of the oil price on a calorie basis thanks to a subsidy (see Table 4.1-2). However, supplies of natural gas are limited to parts of large cities and industrial parks, so subsidy to gas prices is not discussed explicitly in this report.

[20] In case of Japan, the price of city gas for industrial use is approximately 1.2 times higher than oil.



Source: PLN Statistics 2008

Figure 4.1-2 Prices of Petroleum Products (2008)

Table 4.1-2 Comparison of Domestic Energy Prices for Industrial Use, 2008

	Price		Calorific Value		Price per Energy Unit (Rp/MJ)
High Speed Diesel	8,738	Rp/L	9,006	kcal/L	231.8
Industry Diesel	8,650	Rp/L	9,006	kcal/L	229.5
Marine Fuel	5,762	Rp/L	9,341	kcal/L	147.4
Natural Gas	1,029	Rp/m3	9,800	kcal/m3	25.1
Coal	489	Rp/kg	6,139	kcal/kg	19.0

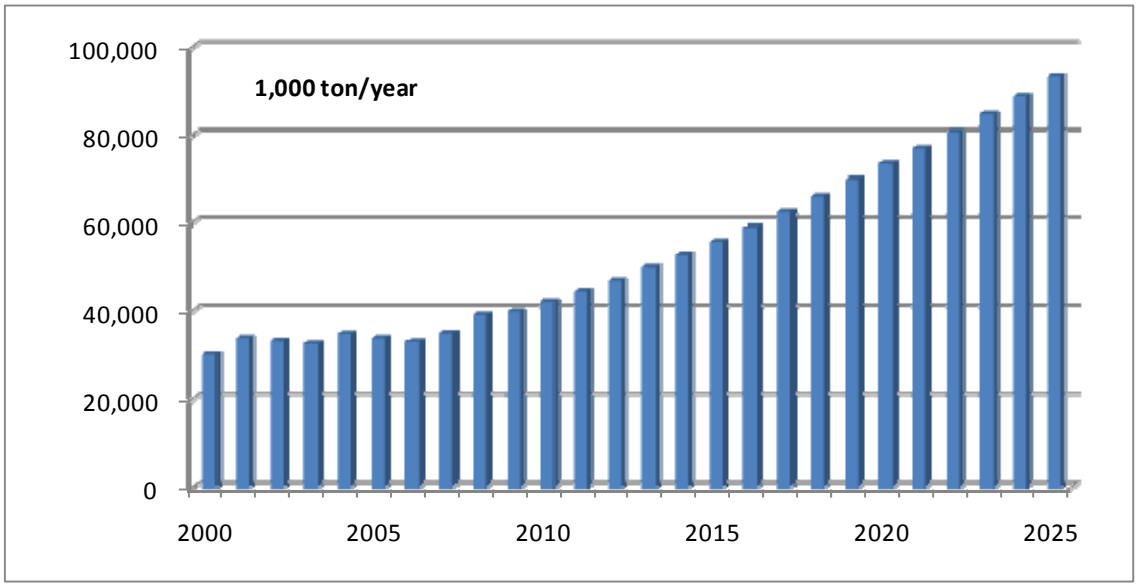
Sources: PLN Statistics 2008

4.2 Selection of a Model Project in the Cement Industry

4.2.1 Industrial Structure

(1) Production Volume Estimate

It is estimated that the production volume led by domestic strong demand will grow by approximately 5% on average between 2010 and 2025, and cement production will expand from 39 million tons (2008) to around 90 million tons (2025). Due to capital investments for capacity enhancement (introduction of state-of-the-art facilities), the energy-saving level will naturally increase on a stock basis.



Source: Projected by IEEJ based on estimation of Cement Association of Indonesia

Figure 4.2-1 Estimation of Cement Production

(2) Industrial Structure

As Table 4.2-1 describes, there is an oligopolistic structure with one state-run group (Gresik) [21]consisting of three companies and two private companies Holcim (Swiss) and Indocement (German) accounting for approximately 90% of total domestic sales volume. Although price competition and competition for share are tough, the financial health of the sector has been good[22]. Figure 4.2-2 draws the basic process flow of the cement industry.

[21] Government induced three national companies to merger into a single national group holding a strong leadership in the domestic market against two competitive private companies.

[22] According to the 2008 financial report of PT SEMEN PADANG of the Gresik Group, the ROE was 31.2% (up 2.2% from the previous term) and the ROA was 20.5% (up 1.4% from the previous terms).

Table 4.2-1 Production Capacity and Supply-demand Balance in the Cement Industry (2008)

	Start of Run	Share Holders	Site Location		Plant	2008 (1,000 t/y)									
						Capacity		Production		Export		for Domestic		Domestic Sales	
					(Unit)	Cement	Clinker	Cement	Clinker	Cement	Clinker	Clinker	Clinker Factor	Cement	Share
Semen Gresik Group															
PT Semen Padang	1910	Government 51% (1995)	Padang	West Sumatera	4	5,900	5,000	5,840	5,289	895	0	5,289	0.91	5,124	13.4%
PT Semen Gresik	1957		Gresik	East Java	3	8,600	6,600	8,875	7,550	0	0	7,550	0.85	8,351	21.8%
PT Semen Tonasa	1968		Pangkep	South Sulawesi	3	3,500	3,320	3,456	3,359	0	0	3,359	0.97	3,180	8.3%
(sub-total)					10	18,000	14,920	18,172	16,198	895	0	16,198	0.89	16,655	43.4%
PT Holcim Indonesia	1975	Holcim 77% (Switzerland)	Clieungsi	West Java	2	-	-	-	-	-	-	-	-	-	-
			Cilacap	Central Java	1	-	-	-	-	-	-	-	-	-	-
					3	8,500	7,800	5,808	5,969	537	1,045	4,923	0.85	5,373	14.0%
PT Indocement Tunggal Orakarasa, Tbk	1975	HC Indocement GmbH 65% (2001) (Hiedelberg Cement)	Citeurep	West Java	6	11,900	-	-	-	-	-	-	-	-	-
			Cirebon	West Java	2	2,600	-	-	-	-	-	-	-	-	-
			Tarjun	South Kalimantan	1	2,600	-	-	-	-	-	-	-	-	-
					9	17,100	14,800	12,544	12,773	111	2,226	10,546	0.84	12,324	32.1%
Top 3 Group					22	43,600	37,520	36,524	34,940	1,543	3,272	31,668	0.87	34,352	**89.6%**
PT Semen Baturaja	1980	Government 100%	Batu Raja	South Sumatera	1	1,250	1,200	1,050	1,002	0	0	1,002	0.95	1,063	2.8%
PT Semen Andalas	1982	Cemntia Holding AG 88%	Lhok Nga	Ache	-	-	-	-	-	-	-	-	-	1,551	4.0%
PT Semen Bosowa	1999	National Private Company 100%	Maros	South Sulawesi	1	1,800	1,710	1,349	1,333	118	58	1,275	0.95	1,358	3.5%
PT Semen Kupang	1984	Government 100%	Kupang	Timor	1	570	300	24	26	11	0	26	1.05	21	0.1%
Others					3	3,620	3,210	2,423	2,361	129	58	2,303	0.95	3,993	10.4%
Total					**25**	**47,220**	**40,730**	**38,947**	**37,301**	**1,672**	**3,330**	**33,971**	**0.87**	**38,345**	**100.0%**

Source: ROAD MAP, Penangan Perubahan Iklim Sektor Industri by GTZ in 2009, Energy Audit Report by Taiheiyo Engineering (NEDO) in 2007 and Indonesian Cement Association

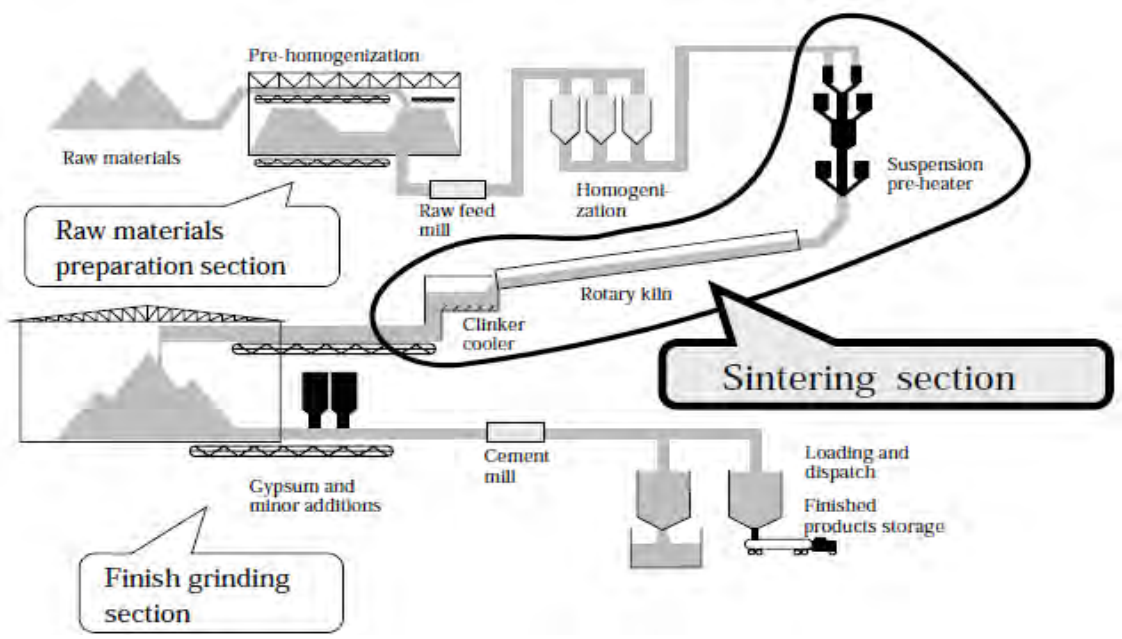


Figure 4.2-2 Production Process of Cement

4.2.2 Energy-saving Level

(1) Energy Intensity

The energy input per ton of cement produced is 3,972 MJ, which is approximately 1.15 times greater than 3,444 MJ[23] recorded in Japan. In comparison to other Asian countries and Western countries, the energy-saving level of Indonesia is relatively high[24], indicating that the country has modernized to a considerable degree.

Although significant improvements of energy efficiency cannot be expected, it can be expected that the following three options will have great effects from the viewpoint of reducing CO2 emissions[25]. The problem is that they are costly in the facilities and the profitability of the investments is insufficient.

1) Alternative fuel

Co-firing coal and biomass in kilns (maximum ratio is 25% on a weight basis)

2) Blended cement

Raw material substitution for clinker (from CF[26] = 0.87 [present] to approx. 0.75)

3) Self-power produced by waste heat recovery

Taking into consideration the economics of the ratio of power produced to total electricity, approximately 20% of total power demand is set to produce power by collecting combustion exhaust heat from clinker. Figure 4.2-3 shows the basic process flow of self-power produced by waste heat recovery.

[23] Website of the Japan Cement Association; the figure is for 2005.
[24] Figure from the result of an energy audit (conducted by Taiheiyo Engineering) of NEDO in 2007
Almost the same as the value obtained through interviews during a recent visit to PT Semen Padang. According to the report (2009) by GTZ (Germany), the CO2 emission basic unit (per ton of cement) in 2005 was 0.921 ton. When we visited PT SEMEN PADANG, the estimated basic unit of the 4th unit (Indarung 4) obtained through interviews was 3,280 MJ/cement-ton (result in 2009), which exceeds the energy-saving level (average) of Japan in 2005.
[25] Thermal efficiency of combustion by the use of biomass is generally lower than coal. But CO2 emission from the use of biomass is far less because of the definition that the emission originating from biomass is counted as zero.
[26] CF: rate of conversion from clinker to cement

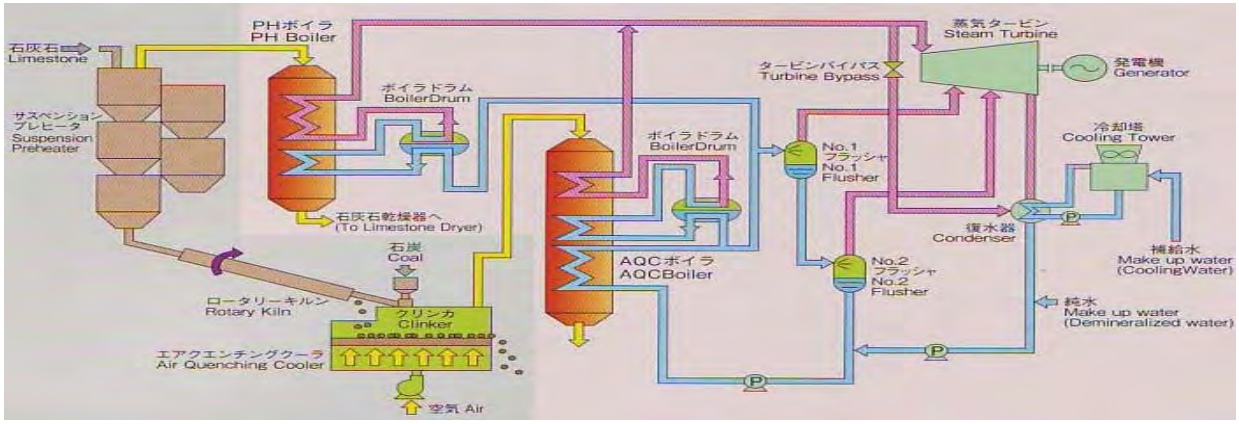


Figure 4.2-3 Flow of Self-power Produced by Waste Heat Recovery

4.2.3 Selection of a Model Project and CO2 Reduction Effect

(1) Selection of a Model Project

As Table 4.2-2 indicates, four key items – experience in other countries, external constraints outside the cement industry in the case of adopting the technology options, application to other sectors, and cost and effect on investment - are picked up as criteria for selecting technologies.

The summary of these three options is the following. First, the coal used for baking to make clinker should be replaced with a mixture of coal and biomass. In other words, alternative fuels should be used. Secondly, the base material of cement is clinker. If some of the clinker can be reduced by mixing fly ash or sludge, it would reduce CO2 emissions. In other words, it should be mixed cement. Finally, reducing purchased power enables CO2 emissions to be reduced. If fossil fuel is used to produce power, it will increase CO2 emissions. Thus, the method called "self-power produced by waste heat recovery" is proposed to reduce CO2 emissions.

There are many successful examples overseas of these three options, and there are some examples of them being applied in Indonesia. If technological applicability to other sectors is taken into consideration, co-firing with biomass and "self-power produced by waste heat recovery" are typical methods. On the contrary, mixed cement is unique to the cement industry.

When external constraints on selecting technology options are examined, biomass co-firing requires infrastructure development to procure it (for production, collection, and transportation). In the case of mixed cement, there are some constraints on material procurement (for example, importing ash fly is banned). There are various adjustments and cost obligations to be discussed with stakeholders outside the cement industry. On the other hand, "self-power produced by waste heat recovery" is a stand-alone technology without almost any interaction with outside, as long as there is recyclable unused waste heat.

Finally, as for cost effectiveness, the result of co-firing biomass varies greatly depending on how the cost of infrastructure development is approached. The cost effectiveness of "self-power produced by waste heat recovery" depends largely on the economic efficiency of unused heat recovery. Although it is unique to Indonesia, the purchase unit price of electricity is much lower than the average power generation cost of PLN, generating a big deficit for PLN, with the government covering the deficit.

Given this situation, self-power generation or reducing purchased power is beneficial for the government's finances (by diminishing the deficit); so if this effect is considered, self-power generation is very attractive. In summary, if these three options are evaluated in terms of the four items, "self-power produced by waste heat recovery" is selected.

In addition, leading private companies such as Indocement[27] have started to work on the above-mentioned options 1) and 2). Also, the option 3) is under construction in PT Semen Padang (see Figure 4.2-4).

Table 4.2-2 Energy-saving Technologies in the Cement Industry

Technological Options	Experience in other countries	External Constraints	Applicable to other sectors	Cost and Benefit (EIRR)
Alternative of Fuel (Biomass)	EXCELLENT	INAPPROPRIATE (Needs for building of supply infrastructure)	GOOD	FAIR
Blended Cement	EXCELLENT	FAIR (Constraint of material availability)	INAPPROPRIATE (Specified to Cement sector)	GOOD
Self power produced by Waste Heat Recovery	EXCELLENT	GOOD (Stand Alone)	EXCELLENT	EXCELLENT (including Avoided Cost of PLN)

Figure 4.2-4 Photograph of a Plant of PT Semen Padang

[27] Two CDM projects are registered. In an alternative fuel project (registered on September 29, 2006), the credit period is seven years from January 2005 and the annual CO2 reduction is 144,000 tons. In a blended cement project (registered on October 27, 2006), the credit period is ten years from January 2005 and the annual CO2 reduction is 470,000 tons.

(2) CO2 Reduction Effect

The CO2 reduction effect of the exhaust heat power generation project is expected to be approximately 1.46 million tons, or 1.5% (from BAU) per year with a total power generation of 210,000 kW (in 2025)[28]. This is, as Table 4.2-3 indicates, slightly inferior to option 1) Fuel conversion: approximately 4.8 million tons or 5.4% (from BAU) and option 2) Raw material substitution: 8 million tons or 9.1% (from BAU), which GTZ presented in 2025. However, given that the power generation project does not require building infrastructure outside the cement industry, 1.4 million ton can be regarded as a reasonable level even in comparison to option 1) and option 2).

Table 4.2-3 CO2 Reduction Effect Obtained by Technologies

1000 ton

	Year	Calcination	Fossil Combustion	Electricity	Total	(Comparison with BAU)
Actual	2005	17,815	10,112	3,321	31,248	-
BAU	2025	45,169	25,639	8,641	79,449	-
Efficient		45,169	23,950	8,072	77,191	-2,827
Co-firing (Biomass use)		45,169	20,133	9,010	74,312	-4,767
Blended Cement		40,325	22,889	8,430	71,644	-8,016

Source: GTZ Report

4.3 Selection of a Model Project in the Steel Industry

4.3.1 Industrial Structure

(1) Industrial Structure

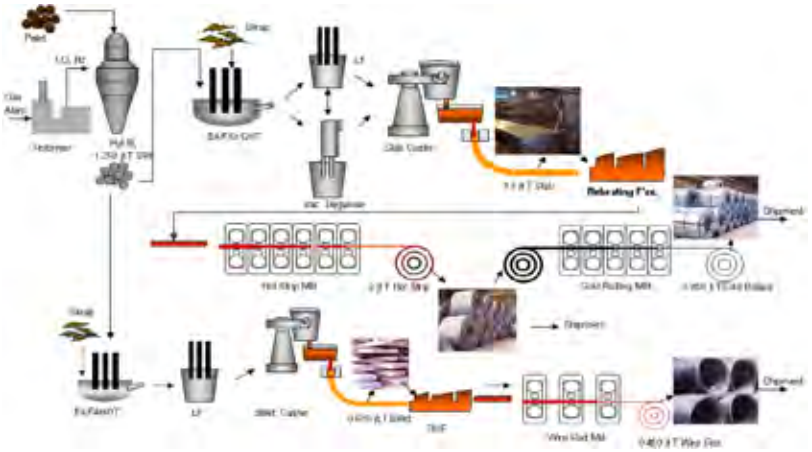
Basically, the structure is divided into two steelmaking-rolling integrated systems: major private groups take the lead in the steel bar sector: and a national company with a steelmaking-rolling system. Table 4.3-1 shows the main steel making and rolling companies. The basic process flow is shown in Figure 4.3-1.

1) State-run Krakatau Steel (direct reduction furnace): integrated system (slabs and steel plates)

2) Private companies (nine companies of five big groups[29], eight independent companies): steelmaking-rolling integrated system (billet-bloom and steel bars) using scrap as raw material

[28] 21 power generation units with a capacity of 10,000 kW each.
[29] Master Steel, Jakarta Steel, Mittal Group, Mannugal Steel, Gunung Steel.

3) Emerging small to medium-size companies (18 companies): induction-furnace-rolling system using scrap as raw material (billet)



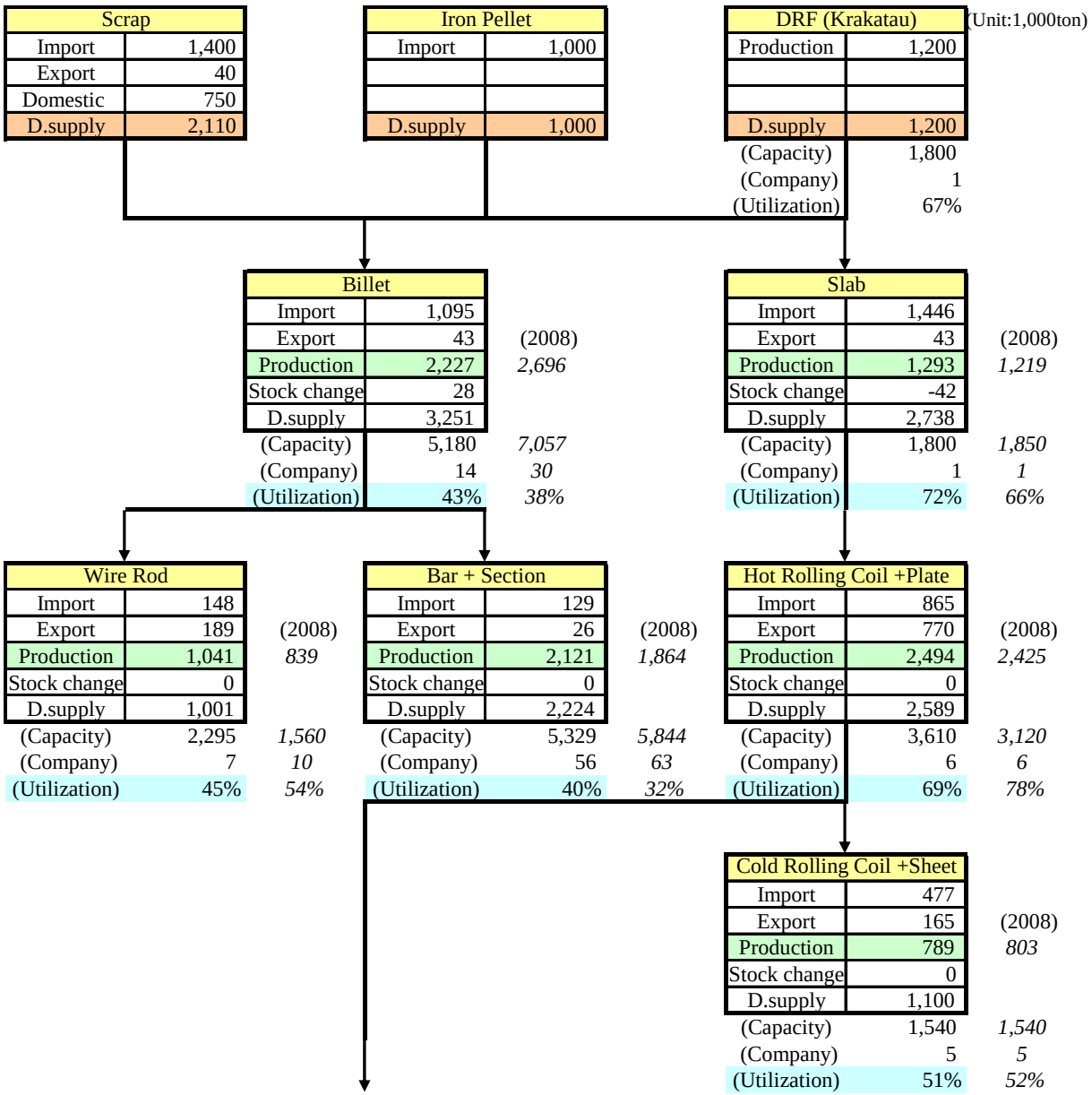
Source: ROAD MAP, Ministry of Industry

Figure 4.3-1 Process Production of Steel

Table 4.3-1 Major Steel Companies (Billet)

Group Name	No.	Company Name	Steel Making Capacity (1000 Ton/y)	Group total	Type of Furnace
National Steel	1	Krakatau Steel PT	675	675	Arc Electric Furnace / Reduction Furnace
Master Steel Group	2	Pangeran Karang Murni PT	403	683	Arc Electric Furnace
	3	Pulogadung Steel PT	80		
	4	Kesa Inditama PT	200		
Jakarta Steel Group	5	Jakarta Steel Megahutama PT	300	300	
Mittal Group (India)	6	Ispat Indo PT	700	700	
Mannugal Group	7	Jakarta Cakratunggal Steel PT	420	420	
	8	Budidharma Jakarta PT	0		
Gunung Steel Group	9	Gunung GahapI Sakti PT	300	550	
	10	Gunung Garuda PT	250		
Independent	11	Growth Sumatera Ind PT	330	1,475	
	12	Hanil Jaya Metal Works PT	160		
	13	Inter World Steel Mill PT	65		
	14	Inti General Yaja Steel PT	160		
	15	Jatim Taman Steel PT	200		
	16	Pabril Besi Barawaja PT	40		
	17	Toyogiri Iron & Steel PT	120		
	18	Jakarta Central Asia Steel PT	400		
(sub-total)			4,803	4,803	
Others	19	Sanex Steel Indonesia PT	150	1,797	Induction Furnace
	20	Bromo Panuluh Steel PT	125		
	21	Bintang Timur PT	30		
	22	Gramitrama Jaya Steel PT	81		
	23	Manna Jaya Makumur PT	40		
	24	Abadi Jaya Manunggal PT	18		
	25	Tunggal Jaya Steel PT	100		
	26	Citra Baru Steel PT	400		
	27	Central Steel Indonesia PT	200		
	28	Mandiri Union Sejati PT	30		
	29	Asean Profile Indonesia PT	20		
	30	Lautan Steel Indonesia PT	240		
	31	Putra Baja Deli PT	70		
	32	Sms STEEL PT	52		
	33	Indobaja Dayatama PT	86		
	34	Hua Hing Steel Indonesia	86		
	35	Hasil Karya PT	17		
	36	SINAR Pembangunan Abadi PT	52		
(sub-total)			1,797	1,797	
TOTAL			6,600	6,600	

Source: MOI, IISIA



Source: The Steel Industry in Asia: Development and Restructuring by IDE-JETRO (2008)
Directory 2009 by IISIA (The Indonesian Iron and Steel Industry Association)

Figure 4.3-2 Material Balance Flow (Iron and Steel Making to Rolling Process) in 2006[30]

(2) Estimate of Crude Steel Consumption

It is estimated that consumption will grow in line with economic growth[31] in the future. However, because of the influx of inexpensive Chinese products (semi-finished and finished products), there is heavy downward pressure on the utilization rate of domestic facilities.

[30] The above material flow is formulated by IEEJ based on JETRO, IISIA and MOI information.
[31] 2010-2025: GDP 7% (ROAD MAP).

(3) Recent trends

Since 2006, there has been a rapid increase in the number of new companies producing rolled steel at very low prices using imported induction furnaces, which were already out of date and had been scrapped overseas. Due to such newcomers, steel-making capacity has grown by approximately 30%[32]. Therefore, the supply-demand environment faced by the industry (upstream sector) seems to be difficult with a falling utilization rate, oversupply, and price competition pressure, and it is unlikely that the environment will improve for the time being.

(4) Conclusion

The market has a heterogeneous structure with a large number of companies divided into a group of relatively competitive companies, including leading private companies, and another group consisting of various small to medium-size companies competing with low prices by using aged and low-cost facilities. This study mainly discusses steelmaking-rolling integrated system with electric furnace.

4.3.2 Energy Efficiency

(1) Energy Intensity

According to Table 4.3-2 and Figure 4.3-3, energy efficiency is classified into a high-efficiency group, a medium-efficiency group, and a low-efficiency group under an electric furnace-rolling integrated structure with 4,105 MJ, 5,470 MJ, and 7,512 MJ, respectively (5,626 MJ in an average), per ton. This energy intensity is 1.2 to 2.3 times greater than the 3,320 MJ of Japan (2008), and there is an extremely low level of efficiency. The differences between companies in energy efficiency are huge.

[32] According to the steel association (IISIA) with a membership of major companies, as of 2009, the steelmaking capacity of 18 companies was approximately 1.8 million tons (without capacity enhancement of other companies), and billet (steel bar) production capacity was approximately 6.6 million tons.

Table 4.3-2 Energy Consumption and CO2 Emissions by Steel Plant Category in Indonesia (2008)

Category of Factors	Steel Making					Reheating Process					Total	
	Coal	Electricity	Oxygen	Sub-total		Heavy OiL	Electricity	Natural Gas	Sub-total			
				Energy Cons-umption	CO2 Emission				Energy Cons-umption	CO2 Emission	Energy Cons-umption	CO2 Emission
	kg/t	kWh/t	Nm^3/t	MJ/t	kg-CO_2/t	L/t	kWh/t	Nm^3/t	MJ/t	kgCO_2/t	MJ/t	kgCO_2/t
High Effeciency (EAF)	15	550	40	2,587	597		80	30	1,518	149	4,105	746
Middle Effeciency (EAF)		850		3,060	843		100	50	2,410	215	5,470	1,058
Low Effeciency (Induction Furnace)		1,300		4,680	1,290	60	150		2,832	317	7,512	1,606
Avarage											5,626	1,116
Japan (2008)	20	400	50	2,230	464		75	20	1,090	121	3,320	584

Source: Modified by IEEJ based on MRI Interim Report (2010)[33]

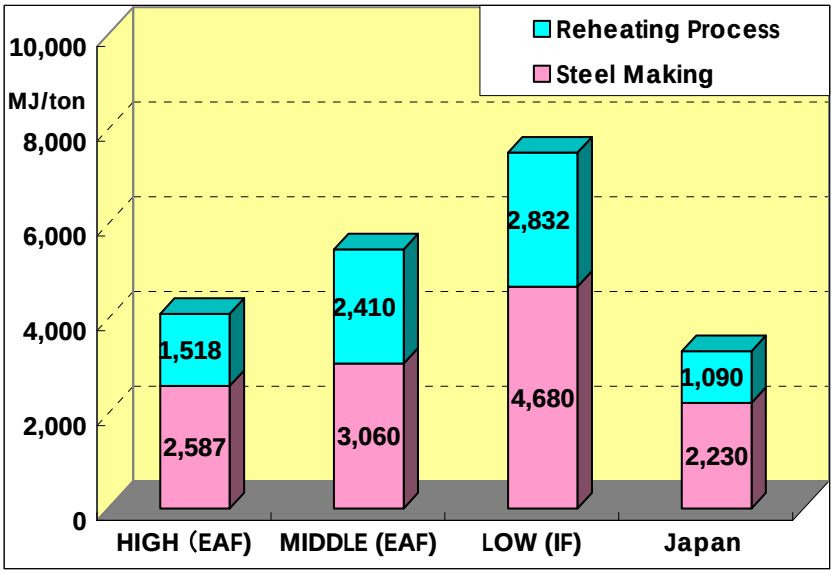


Figure 4.3-3 Energy Consumption and CO2 Emissions by Plant Category in Indonesia (2008)

Note: EAF=Electric Arc Furnace, IF=Induction Furnace

(2) Energy-saving Technologies

To increase energy efficiency, it is necessary to build up various improvements in both electric furnaces and rolling. Table 4.3-3 shows representative technology options for steel making (electric furnace) and rolling processes : in the steel making process there are scrap pre-heater, oxygen lancing, and ladle

[33] Heat Content and CO2 Emissions by Energy Source

	Heat Content		CO2 Emission	
Coal	26	MJ/kg	93	CO2-g/MJ
Natural Gas	41	MJ/m3	57	CO2-g/MJ
Heavy Oil	38	MJl/l	73	CO2-g/MJ
Electricity*	3.6	MJ/kWh	276	CO2-g/MJ
			992	CO2-g/KWh

* CO2 emission coefficient at user, including own use in a power station and transmission loss, calculated by IEEJ based on Energy Balance (2008) by Center for Data Information of MEMR

pre-heater: and in rolling process hot charge of billets and regenerative burners. These options are all introduced for the purpose of improving thermal efficiency, and preventing or reducing heat loss between cooling and heating.

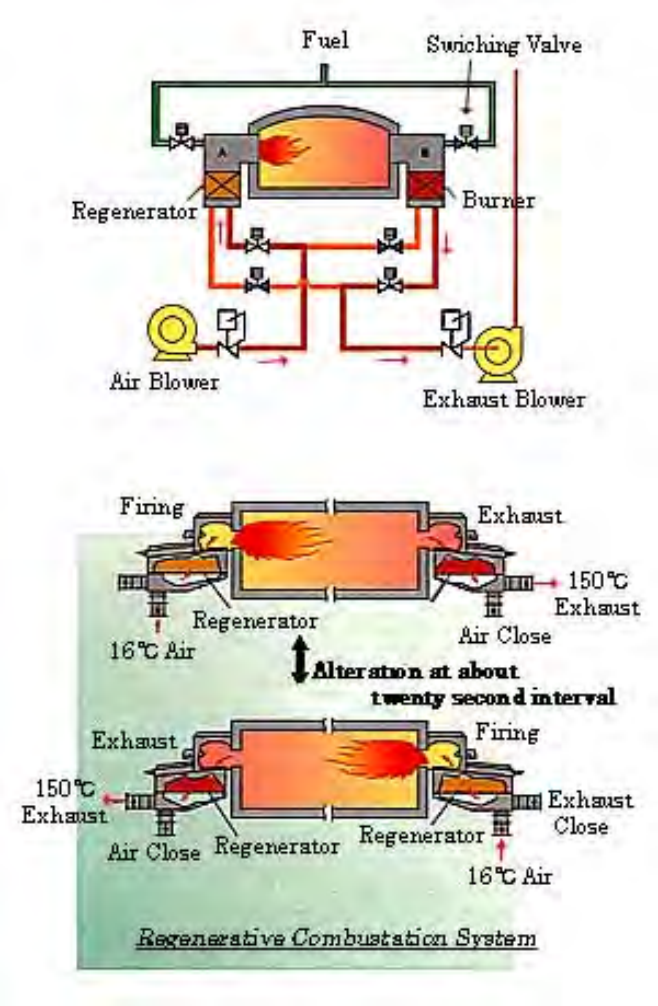
Table 4.3-3 Energy-saving Technologies for Steel Making and Rolling

	Technological Options	Experience in other countries	External Constraints	Applicable to other sectors	Cost and Benefit (EIRR)
Steel Making	Scrap Preheater	EXCELLENT	GOOD	INAPPROPRIATE (Specified to Steel sector)	GOOD
	Oxygen Lancing	EXCELLENT	FAIR (Needs for availability of Oxygen)	INAPPROPRIATE (Specified to Steel sector)	FAIR
	Ladle Preheater	EXCELLENT	GOOD	INAPPROPRIATE (Specified to Steel sector)	GOOD
Rolling	Hot Charge of Billets	EXCELLENT	FAIR (Needs for adjustment of production process)	INAPPROPRIATE (Specified to Steel sector)	EXCELLENT
	Regenerative Burners	EXCELLENT	EXCELLENT (only Replacement)	EXCELLENT	EXCELLENT

4.3.3 Selection of Model Project and CO2 Reduction Effect

(1) Selection of a Model Project

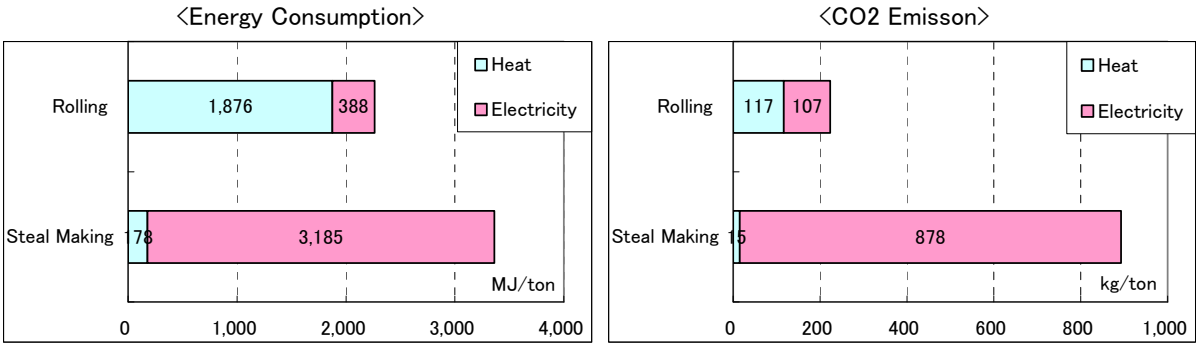
All technological options listed on Table 4.3-3 are adopted around the world and evaluated highly. In terms of application to other sectors and investment profitability, they are in the same evaluation. In particular, introduction of regenerative burners is preferable because it only requires a burner change and partial modification with a short downtime. Therefore, regenerative burners are selected as introductory models. Figure 4.3-4 illustrates the basic concept of regenerative burners.



Source: PT Gunung Garuda

Figure 4.3-4 Flow of Regenerative Burners

If narrowed down to the rolling process, heat represents approximately 83% of energy consumption and accounts for approximately 52% of CO2 emissions (see Figure 4.3-5).



Source: Modified by IEEJ based on MRI Interim Report (2010)

Figure 4.3-5 Energy Consumption and CO2 Emissions by Process of the Steel Industry in Indonesia (2008)

The energy-saving rate is expected to be more than approximately 30%, and the payback period of investment is extremely short. Application of high-performance furnaces to other industries[34] can be expected. There are a large number of plants and facilities of medium to large sizes to be set as a target for the installation (IISIA statistics: 84 plants in 2006). In addition, regenerative burners can be introduced into facilities from small to large-scale by increasing the number of burners (two-pairs at minimum).

We visited PT Gunung Garuda (installing 12-pair regeneration burners; annual throughput: 300,000 tons), which introduced NEDO's model plant, and conducted interviews which confirmed that the company has achieved an energy-saving effect of approximately 35%, and the payback period of investment is very short (approximately one year) when factors such as reduction of raw material losses and increased production efficiency are taken into account[35].

Figure 4.3-6 Photograph of PT Gunung Garuda Mill

(3) CO2 Reduction Effect

Assuming 18 units of 12-pair burners (for large plants with a capacity 300,000 tons/year), 33 units of two-pair burners (for small to medium-scale plants with a capacity of 50,000 tons/year) and energy-saving ratio of 30%[36], annual CO2 emission reduction in 2025 is estimated to be approximately 342 thousand tons (6.4%).

[34] Non-iron refining/processing, glass manufacturing, etc
[35] In Japan, in addition to interviews at the NEDO head office and Osaka Gas, we performed site investigations of rolling and forging plants.
[36] Assuming that the rolled volume is approximately 8.60 million tons (2025) and CO2 emissions from the electric furnace/rolling sections are approximately 5.10 million tons.

4.4 Selection of a Model Project of in Office Buildings

4.4.1 Status of Energy Consumption at Office Buildings

The analysis of 30 energy audit results by EMI (2007) indicates the following.

(1) Status of Energy Consumption at Office Buildings

The annual electricity consumption per unit total floor area (m2) is approximately 170 kWh (hereafter "electricity intensity") and the energy-saving rate is approximately 18%. Since a major of energy consumption in most office buildings with the exception of hotels and hospitals can be considered power consumption, the average figure at office buildings (18%) is close to the originally expected figure before this study.

Table 4.4-1 Results of Energy Audit for Office Buildings

	Total floor area		Number of Building	Total floor area per unit (㎡)	Energy Consumption		Ratio of Saving Energy
	(㎡)	(%)			(toe/unit,y)	(kWh/㎡,y)	
Commercial	388,841	49.1%	8	48,605	838	201	17.8%
Government	55,126	7.0%	7	9,188	52	65	29.0%
Hospital	212,526	26.9%	10	21,253	310	170	15.3%
Hotel	56,150	7.1%	2	18,717	363	226	14.0%
Social	78,564	9.9%	3	26,188	103	46	44.7%
Total	791,207	100%	30	26,374	386	170	17.8%

Source: EMI report (2007-2008)

(2) Energy-saving Commercial Buildings

Figure 4.4-1 illustrates there are statistically the correlation between saving energy merit and total floor area (m3) of each office building when plotting all the data on Table 4.4-1.The dotted line on Figure 4.4-1 indicate the least square regression line regarding saving energy merit and total floor area (m3) of each office building.

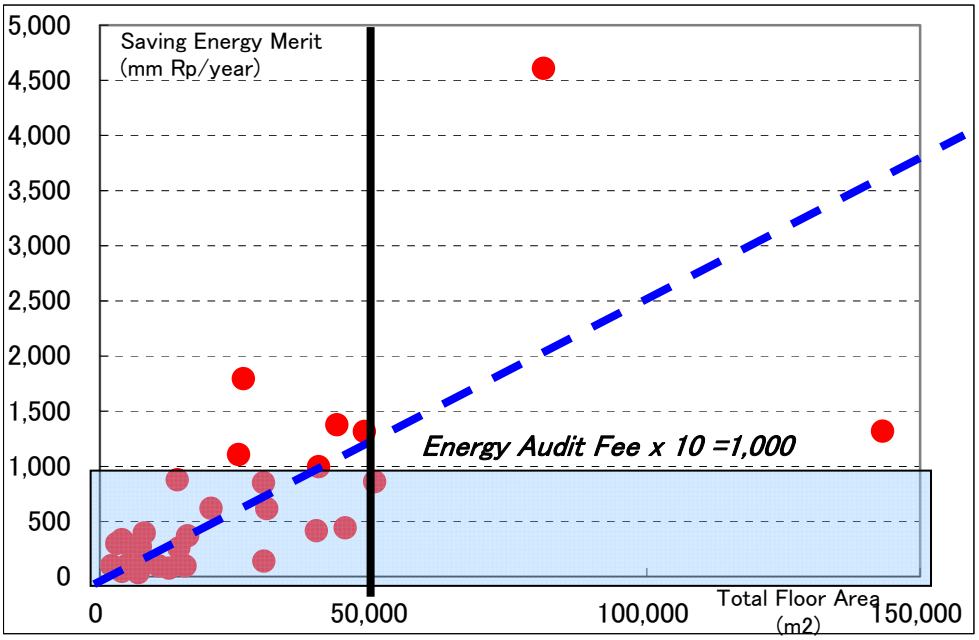
1) If the total floor area is 50,000 m2:

The annual energy consumption is approximately 8.45 million kWh (approx.700 toe). Assuming that the energy-saving rate is 18% and the electricity price (for commercial) is 851 Rp/kWh[37], the annual energy-saving merit would be approximately 1.3 billion Rp. Assuming that the single payback period is

[37] Electricity price is set at the price for commercial buildings (851 Rp/kWh) according to PLN Statistics 2008.

three years at maximum, the investment cost would be within around 3.9 billion Rp. If just 3% of the investment cost (corresponding to F/S cost in general) is energy audit fee per entity, it equals to be 120 million Rp. Roughly speaking, approximately 10% of the annual merit (130 million Rp) is almost the same as 100 to 120 million Rp of energy audit fee. That is why this value might be a maximum of energy audit fee.

Figure 4.4-1 Relationship Between Energy Saving and Floor Area



2) If the total floor area is below 50,000m2

The blue zone from 1,000 million Rp to zero on Figure 4.4-1 indicates that energy audit fee is more than 10% of annual energy saving merit. Judging from cost effectiveness that the expected annual energy saving merit is 10 times larger than the energy audit fee, it is unlikely that an energy audit can be conducted and investment on energy savings can be implemented in buildings with a total floor area of less than 50,000m2. If electricity prices were raised to approximately 1.5 times the present price, buildings with total floor areas of 30,000 to 50,000 m2, would possibly be targeted for energy audit and investments on saving energy.

4.4.2 Estimation with Office Buildings Subject to Energy Audit

(1) Sizes of Office Buildings

We conducted a survey in cooperation with EMI to extract commercial buildings subject to energy

saving and estimate the stocks of total floor areas, and the following results were obtained.

1) Overall stock: approx. 47 million m2 (approx. 2,300 buildings)
2) 50,000 m2 or more: approx. 10 million m2 (50 to 200 buildings)
3) 30,000 m2 to below 50,000 m2: approx. 9 million m2 (200 to 250 buildings)

Table 4.4-2 Situation of Office Building in Indonesia

Unit: m3

Section	Commercial	Other	Total
-30,000m2	18,060	9,570	27,630
30,000-50,000m2	6,240	2,600	8,840
50,000m2-	9,220	820	10,040
Total	33,520	12,990	46,510

Source: EMI report

(2) Remarks on Office Buildings Subject to Energy Audit

Under the present energy-saving regulations, commercial buildings consuming 6,000 toe or more per year are subject to an energy audit. In terms of total floor area, this consumption level is equivalent to approximately 400,000 m2. There seem to be only several buildings that exceed this value. We judge that the scope would cover the increase the number of buildings if the total floor area were lowered at least to approximately 50,000 m2 (700 toe).

Assuming that the period ends in 2025, it would be necessary to presume that the office building stock will expand depending on economic growth, population growth, and urban planning. However, for this study, we did not take the stock increase into account because it is rather difficult to estimate a future increase of the stock.

4.4.3 Selection of Model Project and CO2 Reduction Effect

(1) Overview of ESCO Models

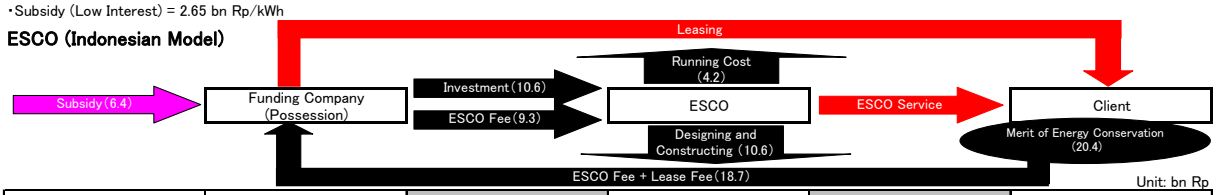
The ESCO system consists of two models: Shared Saving Model and Guaranteed Saving Model. Because of avoiding issues concerning credit risk of client and ESCO firms, we consider adopting the so-called “Indonesian Model,” in which the funding company controls the whole Shared Saving Model, for Indonesia (for the respective service and monetary flow, see Figure 4.4-2).

With normal investments, the client can take all the profit (pays interest from the merit if finance is provided by a financial institution) gained through energy-saving investment (replacement of air conditioner in this case). Under the ESCO system, the profit gained through energy-saving investment (replacement of the air conditioner in this case) is allocated among the stakeholders (client, ESCO, and financial institution). Amortization and operating costs are deducted from the annual energy-saving merit to leave earnings. The financial institution takes the profit from earnings first, then the remaining portion is allocated between ESCO and client. Although the allocation method depends on the content of each contract, the major premise is that neither the ESCO firm nor the client will suffer a loss.

Conditions

・The Profit of Designing and Constructing is 0.
・The Possession of equipment is Funding Company in ESCO Business Model .
・Share of ESCO fee to Total Merit of Energy Conservation is 40%.
・Office Building (Total Floor Area = 50,000m2)
・Unit Price (Electricity) = 1,052Rp/kWh
・Subsidy (Low Interest) = 2.65 bn Rp/kWh

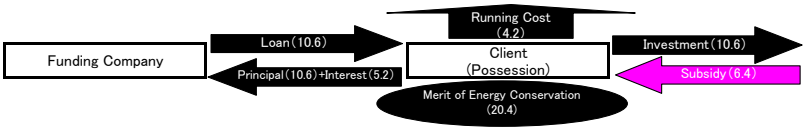
ESCO (Indonesian Model)



Unit: bn Rp

Investment	−10.6		10.6		---
Designing and Constructing	---		−10.6		---
Merit of Energy Conservation	---		---		20.4
ESCO Fee + Lease Fee	18.7		---		−18.7
Subsidy	6.4		---		---
ESCO Fee	−9.3		9.3		---
Running Cost	---		−4.2		---
Profit (Case4)	5.2		5.1		1.7

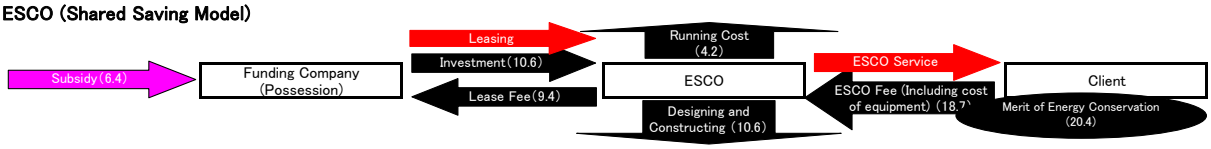
General Investment



Unit: bn Rp

Loan	−10.6		10.6		
Investment	---		−10.6		
Merit of Energy Conservation	---		20.4		
Principal	10.6		−10.6		
Interest	5.2		−5.2		
Subsidy	---		6.4		
Running Cost	---		−4.2		
Profit (Case4)	5.2		6.8		

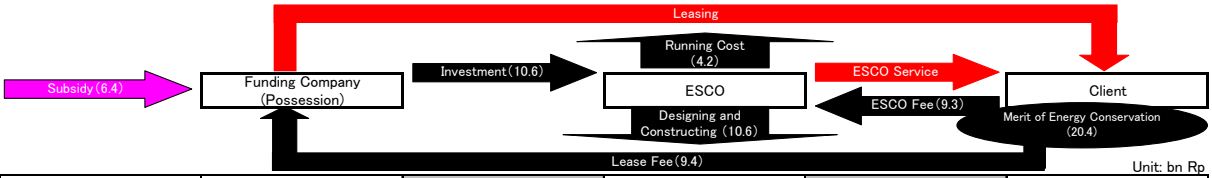
ESCO (Shared Saving Model)



Unit: bn Rp

Investment	−10.6		10.6		---
Designing and Constructing	---		−10.6		---
Merit of Energy Conservation	---		---		20.4
ESCO Fee (Including cost of equipment)	---		18.7		−18.7
Lease Fee	9.4		−9.4		---
Subsidy	6.4		---		---
Running Cost	---		−4.2		---
Profit (Case4)	5.2		5.1		1.7

ESCO (Guaranteed Saving Model)



Unit: bn Rp

Investment	−10.6		10.6		---
Designing and Constructing	---		−10.6		---
Merit of Energy Conservation	---		---		20.4
ESCO Fee	---		9.3		−9.3
Lease Fee	9.4		---		−9.4
Subsidy	6.4		---		---
Running Cost	---		−4.2		---
Profit (Case4)	5.2		5.1		1.7

Figure 4.4-2 Comparison of ESCO Model (Electricity Price = 850 Rp/kWh, Low Interest)

(2) Selection of Model Project and CO2 Reduction Effect

We set the conditions for making energy-saving investments for office buildings as indicated below, and assume the ESCO system, not a direct system by the firm, as the investment model. This is because if the increase of the power price (850 Rp/kWh) for commercial buildings to the power generation cost (1151 Rp/kWh) is taken into account in the future (2025), original and ingenious ideas in the private sector and effective use of the finance would become more realistic.

(Conditions for office buildings)

a. Total floor area: 50,000 m2 (effective area of air-conditioning: 75%), annual operating time: 2,000 hours
b. Air-conditioning capacity (cooling): approx. 1,200 refrigeration tons (approx. 4,200 kW), replacement of old with new
c. COP (new): 4.7; COP (old, obsolete): 2.0
d. CO2 reduction volume: approx. 474 thousand tons per year (total floor area: approx. 10 million m2)[38]

Figure 4.4-3 Photograph of a Commercial Building

[38] If the total floor area is 50,000 m2 per building, the annual CO2 reduction volume would be approx. 2,370 tons, and the number of relevant buildings would be 200.

CHAPTER5. FINANCIAL POLICY FOR ENHANCING ENERGY EFFICIENCY BY THE GOVERNMENT

In the previous chapter, three model projects are selected for three sectors. The model projects in the cement industry and office buildings focus on reducing the electricity purchased from PLN. In order to implement the investment, the government needs to provide some kind of subsidy for investments to companies and building owners from a viewpoint of investment profitability. Investments spurred by this government subsidy would reduce the amount of electricity PLN sells to consumers at a price below the average production cost, thereby reducing electricity subsidies provided by the government. Therefore, investment subsidies for energy conservation would not require additional financial resources from the government, but it would only re-allocate some of the costs by the government. Subsidy for investment on energy efficient technologies and subsidy for electricity price have a trade-off relationship. Accordingly, the evaluation of financial support for investment has to be reviewed from the viewpoint of re-allocating the two subsidies. Saving petroleum products in the steel industry could lead to saving foreign currency used for importing products due to the shortage of domestic refining capacity.

The following Section 5.1.1 states the relation between investment subsidies recommended by this study and electricity subsidies, and Section 5.1.2 dictates the mechanism for saving petroleum products and reducing imports of products. Finally, the orientation and outline of various financial supports to be implemented by Government in the near future are discussed in Section 5.2.

5.1 Financial Resources for Energy-saving Investment from a viewpoint of the whole country

5.1.1 Subsidy for Electricity Price and Deficit of PLN

Because PLN sells electricity to users at prices below the averaged power generation cost, PLN has huge deficits. The deficits are financed by the government, which is meant as a subsidy from the government to consumers by way of PLN. The following gives how much the subsidy could be reduced if the model projects are to be implemented.

(1) Estimation for cement model project

With the transmission losses added, if the user obtained electricity of 1 kWh, PLN would post a deficit of 529 Rp/kWh (per sales volume).The following shows the details of the calculations.

(Sales price for industry and power generation cost)

Unit selling price for industry[39]: 622 Rp/kWh (per sales volume for user of 1 kWh)

PLN power generation unit price: 1052 Rp/kWh (per electricity generated [transmission end[40]] of 1 kWh)

(Deficits of PLN)

Sales price (622 Rp/kWh) - power generation cost (1052 Rp/kWh) = 430 Rp/kWh

Power generation cost (1052 Rp/ kWh [transmission end]) x 9.4%[41] = 99 Rp/ kWh

Total 529 Rp/ kWh (per sales volume)

If one unit (10 MW) in the model project is operated for one year, the electricity generated is 70 GWh, and PLN would resolve a deficit equivalent to 37 billion Rp. If this investment is collected over 10 years[42], a deficit of 370 billion Rp would be resolved. If the government compensates for the deficit of PLN through direct fiscal expenditure, how much can be the financial resources secured? According to Figure 5.1-1, the government can secure 370 billion Rp while new subsidy for the investment (90 billion Rp) is required for maintaining the profitability of investment (IRR=20%). That is why the government can reduce the subsidies by 260 billion Rp as a whole.

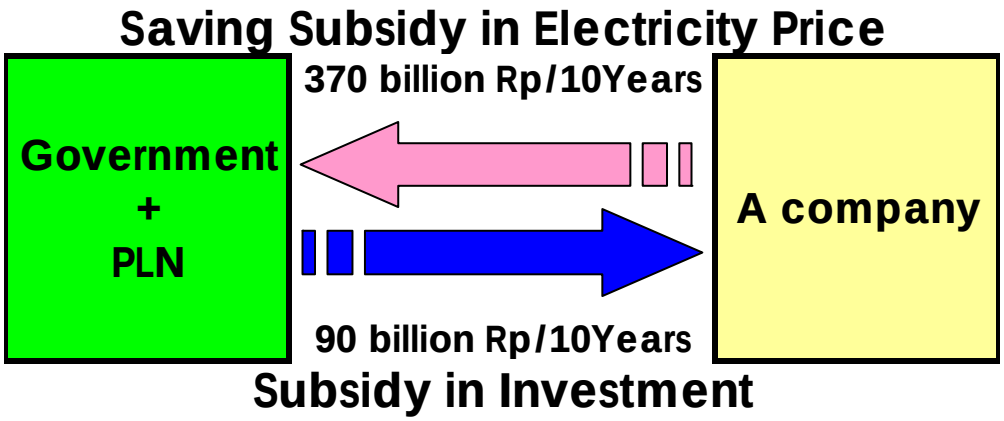


Figure 5.1-1 Reallocation of Subsidy in Cement Industry by Government

With the whole project at 210 MW (21 units), an income balance improvement of 7.8 trillion Rp would be achieved.

(2) Estimation for Office Building Model Project

With transmission losses added, if the user obtained 1 kWh of electricity, PLN would post a deficit of 301 Rp/ kWh (per sales volume). The following shows the details of the calculations.

[39] See PLN STATISTICS 2008.

[40] Transmission end means electricity generated at the power station (excluding self-consumed electricity). In terms of the end user, the electricity generated is further decreased by transmission/distribution losses.

[41] If the transmission losses of the power generating section (including self-generating businesses) are calculated based on the energy-balance table (2008) in the HANDBOOK of Energy & Economics Statistics of INDONESIA (2009), MEMR, 8.6% on a transmission end basis and 9.4% from the user end would be estimated.

[42] The actual power generation system is capable of generating power for a further five to ten years until replacement after maintenance including overhaul. Therefore, this merit (deficit reduction) would further increase.

(Sales price for commercial buildings and power generation cost)

Unit selling price for commerce[43]: 850 Rp/kWh (per sales volume for user of 1 kWh)

PLN power generation unit price: 1052 Rp/kWh (per electricity generated [transmission end[44]] of 1 kWh)

(Deficits of PLN)

Sales price (850 Rp/kWh) - power-generation cost (1052 Rp/kWh) = 202 Rp/kWh

Power generation cost (1052 Rp/kWh [transmission end]) x 9.4%[45] = 99 Rp/ kWh

Total 301 Rp/kWh (per sales volume)

The electricity reduced per building with a total floor area of 50,000 m2 in a commercial building business project would be 2.4 GWh[46] (approx. 0.72 billion Rp). If the investment period is 10 years, a deficit of 7.2 billion Rp would be resolved (see Figure5.1-2). According to Figure 5.1-2, the government can secure 7.2 billion Rp while new subsidy for the investment (6.4 billion Rp) is required for maintaining the profitability of investment (IRR=20%). That is why the government can reduce the subsidies by 0.8 billion Rp as a whole.

With a total project of 10 million m2 (200 buildings), an income balance improvement of 1.4 trillion Rp would be achieved.

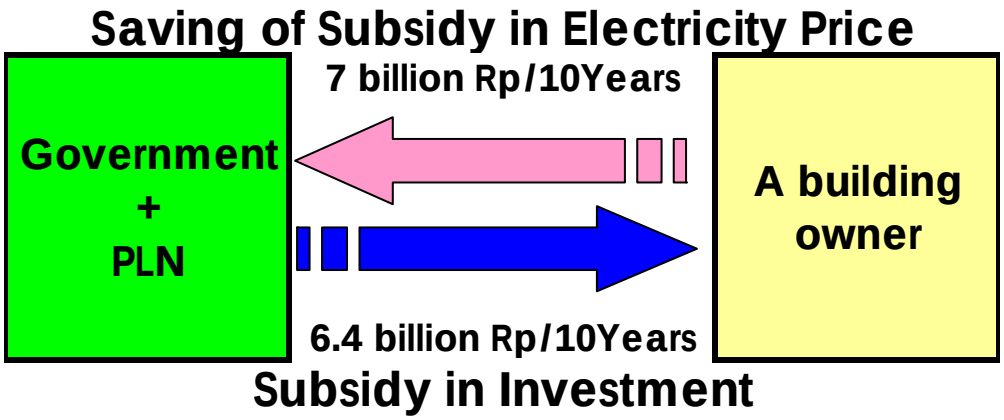


Figure 5.1-2 Reallocation of Subsidy in Commercial Building by Government

[43] See PLN STATISTICS 2008.

[44] Transmission end means electricity generated at the power station (excluding self-consumed electricity). In terms of end user, the electricity generated is further decreased by transmission/distribution losses.

[45] The transmission losses of the power generation sector based on the energy balance sheet (2008) provided in the HANDBOOK of Energy & Economics Statistics of INDONESIA (2009), MEMR, are estimated at 8.6% on a transmission end basis or 9.4% from a user's point of view.

[46] The electricity reduced per year by air conditioner replacement would be 2,390 MWh/50,000 m2. Therefore, with 10 million m2 (200 buildings), the electricity reduced per year would be 480 million kWh.

5.1.2 Reduction of Import Petroleum Products

(1) Preconditions

Subsidies for petroleum products for industrial use have been abolished and their prices are linked to international market prices. Therefore, the merit of resolving deficits would not be generated against electricity price. However, the refining capacity of the state-run oil company (Pertamina) has limits, and if all fuels for industrial use are imported from Singapore, there would be the merit of saving foreign currency.

(2) Estimation for Steel Model Project

Assuming that the imported cost from Singapore is 5,510 Rp/L[47], the delivered price to a user comes to 5,760 Rp/L[48], adding to it approximately 250 Rp/L of domestic transportation costs plus the oil terminal charges.

The amount of fuel reduced if a 12-pair burner (one unit) in the model project is operated for one year would be approximately 5,220 kL, and the company would gain a merit equivalent to approximately 30.1 billion Rp. If the investment evaluation period is ten year, the company would gain a merit of 301 billion Rp, from which domestic transportation cost (13 billion Rp) is deducted to give imported cost (288 billion Rp).Thus, If Pertamina (the national oil company) has to import petroleum products because of a shortage of refining capacity, Indonesia can save foreign currency due to the reduction of petroleum products (see Figure 5.1-3).

[47] This price includes import duty, but it is eliminated here.
[48] The price in PLN STATISTICS 2008: Mobile Fuel Oil is used.

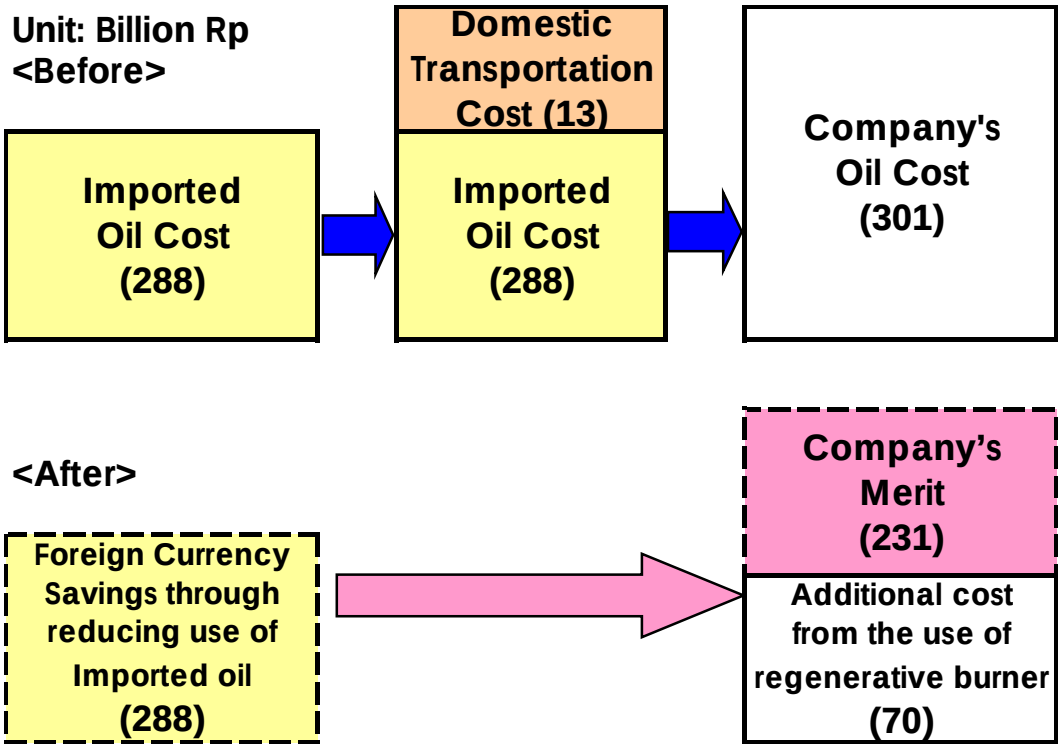


Figure 5.1-3 Foreign Currency Savings

In the case of this project as a whole, the following calculation would apply.

12-pair burners (17 units): annual oil consumption about 296,000 kL

2-pair burners (33 units): annual oil consumption abouy 96,000 kL

Total : 392,000 kL

=> Reduced oil consumption: Approx. 118,000 kL (by 30%)

Merit for a user: 118,000 kL x 5,760 Rp/L = approx. 680 billion Rp

Merit of foreign currency saving: 118,000 kL x 5,510 Rp/L = approx. 650 billion Rp[49]

5.2 Framework of Financial Support Provided by the Government

5.2.1 Support Measures of the Government in the Industrial Sector

Although the energy-saving investment in energy-intensive sectors would have a major effect, it would involve a risk[50] from introducing technologies because the amount invested would be large. In addition, the initially planned energy saving (cost saving) may not be achieved because the product price and the production

[49] The difference of approx. 30 billion Rp between the merit for the user and the merit of foreign currency savings would be a demerit for the domestic carrier.

[50] Exhaust heat power generating facilities and high-efficiency industrial burners (regeneration burners) are established technologies that have been introduced in a large number of countries including Japan. A NEDO model plant built in Indonesia uses these technologies. Thus, the risk is relatively low.

volume (availability ratio) could decrease due to changes in the market environment[51] of the company. For these reasons, when introducing an energy-saving facility, it is necessary to make a careful examination (including energy audit) in advance. In addition, adequate skills and capacity will be required for operating and maintaining the system after it is introduced. Therefore, if the government provides support (inputs a tax), it will assume an obligation to supervise and instruct the support receiver to ensure that an energy-saving investment will be made and the effects of introduction will be achieved sufficiently. Consequently, patterns in which the government and the company make decisions through consultation and review face-to-face are normal and favorable from the viewpoint of a consistent industrial policy.

It is appropriate mainly to use immediate support (subsidy) from the government and combine it with an option[52] such as a low-interest loan, exemption from customs duty, reduction of corporate tax/enterprise tax. The reference figures as the criteria for financial are as follows:

1) Maximum subsidy of approximately 30% for facilities and machines (excluding civil engineering works.)[53]
2) Exemption from customs duty for machines (for imports)
3) Low-interest loans (approx. 5% at maximum[54] compared to the normal interest rate of 15%)
4) Reduction of corporate tax/enterprise tax[55]

5.2.2 Measures to Support Energy Savings in Office Buildings

Concerning energy-saving investment for commercial buildings, the buildings themselves do not produce added value even though they provide services, except building lease businesses. In addition, there are various forms of building ownership such as owners, including corporate bodies and the general public. Introduction of energy-saving facilities generally requires the F/S study, post-installation operation and maintenance as with the industrial sector, but their technologies are conventional and many of them are standardized. Though the goal of the investment is to achieve a certain reduction of energy costs, the fluctuation of investment risk is smaller than in the industrial sector.

Therefore, when the government provides support for energy-saving investment, it seems to be more efficient in terms of policy implementation to provide some indirect support through private energy-saving

[51] The risk evaluation by companies and financial institutions providing loans naturally differs between the cement industry where supplies are mainly for steadily growing domestic use and, therefore, high utilization rates can be maintained and the steel industry where utilization rates fluctuate substantially due to factors such as competition with imports and price competition in the country.
[52] In the estimation of cost effectiveness described later, we set the prerequisites of a subsidy of 30%, customs duty of 0%, interest subsidy of 5%, and corporate tax of 20% (for the 32% basis).
[53] In case of a subsidy for a domestic project by NEDO
[54] If the inflation rate is approximately 10%
[55] The tax reduction effect varies depending on whether the project is considered to be an independent project or a company-related project.

service providers than to provide direct financial support[56]. As a scheme for achieving this, a business model combining the ESCO firm and the financial institution (fund) that provides finance should be effective. Thus, it seems important to provide financial support to build the system. As financial support, it is appropriate to provide low-interest loans as necessary: it means to give a merit of around 5% at maximum compared to the normal interest rate of 15%.

[56] It is unlikely that buildings owned by the government or by state-run large companies fall under this category.

CHAPTER6. ANALYSIS OF COST EFFECTIVENESS

This chapter explains that the investment profitability, so called IRR (Internal Rate of Return), in the model projects is evaluated by calculating the cash-flow and simulating of each case in reference to 20% of IRR. In order to maintain 20% of IRR in the model project, some measures to be taken, as are mentioned in the previous chapter, are examined quantitatively.

6.1 Cost Effectiveness of the model projects in Industrial Sector

6.1.1 Cement Industry (Exhaust Heat Power-generating Facilities)

(1) Preconditions

Amount invested: 200 billion Rp (10,000 kW/facility); electricity price: 622 Rp/kWh; investment evaluation period: 10 years

(2) Case Setting

The following three cases indicate the calculated results of for companies in the cement industry.

1) CASE 1

Figure 6.1-1 shows that IRR for a basic case (present electricity price, no fiscal or financial support) is 9.3% and investment profitability is low.

Conditions

1.Capacity of Power Generation	10 MW
2.Initial Cost	200 bn Rp
3.Production of Electricity	69,920 MWh/Year
4.Merit(Electricity Cost Reduction)	43.5 bn Rp/Year
Unit Price (Electricity)	622 Rp/kWh

(Unit: bn Rp)

YEAR (Start of Investment :0 YEAR)	-1	0	1	2	3	4	5	6	7	8	9	10	11	
Energy Audit	-0.3													0.0
FS	-2.0													0.0
Construction		-50.0												-50.0
Equipment			-150.0											-150.0
Import Duty			-10.5											-10.5
Subsidy			0.0											0.0
Initial Investment		-50.0	-160.5											-210.5
Expenditure before Investment														
Fuel Cost				43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	434.9
Increase in Unit Price (Electricity)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance cost				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Others				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total<A>				43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	434.9
Expenditure after Investment														
Fuel Cost				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance cost				1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	16.1
Operation cost				1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	16.1
Insurance				0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1.6
Depreciation				21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	210.5
Total<B>				24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	244.2
Project Merit<A>-<B>=<C>				19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	190.7
Initial Investment		-50.0	-160.5											-210.5
Project Merit<C>				19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	190.7
Corporate Tax Rate				-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-61.0
Depreciation				21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	210.5
Cash Flow		-50.0	-160.5	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	129.7
Accumulation (Investment, Cash Flow)		-50.0	-210.5	-176.5	-142.5	-108.4	-74.4	-40.4	-6.4	27.6	61.6	95.7	129.7	
PV (Investment, Cash Flow)		-50.0	-139.6	25.7	22.4	19.4	16.9	14.7	12.8	11.1	9.7	8.4	7.3	-41.1

IRR	9.3 %
NPV	-41.1 bn Rp
Payback Period	7.2 Year

Figure 6.1-1 Self-power Produced by WHR (CASE 1)

(Electricity Price = 622 Rp/kWh without Subsidy)

2) CASE 2

In order to raise the IRR to 20% (see Figure 6.1-2), a subsidy of approximately 90 billion Rp, accounting for approximately 43% of the whole facility, is required.

(Unit: bn Rp)

YEAR (Start of Investment :0 YEAR)	-1	0	1	2	3	4	5	6	7	8	9	10	11	
Energy Audit	-0.3													0.0
FS	-2.0													0.0
Construction		-50.0												-50.0
Equipment			-150.0											-150.0
Import Duty			-10.5											-10.5
Subsidy			90.0											90.0
Initial Investment		-50.0	-70.5											-120.5
Expenditure before Investment														
Fuel Cost				43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	434.9
Increase in Unit Price (Electricity)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance cost				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Others				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total<A>				43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	434.9
Expenditure after Investment														
Fuel Cost				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance cost				1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	16.1
Operation cost				1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	16.1
Insurance				0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1.6
Depreciation				12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	120.5
Total<B>				15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	154.3
Project Merit<A>-<B>=<C>				28.1	28.1	28.1	28.1	28.1	28.1	28.1	28.1	28.1	28.1	280.6
Initial Investment		-50.0	-70.5											-120.5
Project Merit<C>				28.1	28.1	28.1	28.1	28.1	28.1	28.1	28.1	28.1	28.1	280.6
Corporate Tax Rate				-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0	-89.8
Depreciation				12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	120.5
Cash Flow		-50.0	-70.5	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	31.1	190.8
Accumulation (Investment, Cash Flow)		-50.0	-120.5	-89.4	-58.3	-27.1	4.0	35.1	66.3	97.4	128.6	159.7	190.8	
PV (Investment, Cash Flow)		-50.0	-61.3	23.5	20.5	17.8	15.5	13.5	11.7	10.2	8.9	7.7	6.7	24.5

IRR	20.0 %
NPV	24.5 bn Rp
Payback Period	4.9 Year

Figure 6.1-2 Self-power Produced by WHR (CASE 2)

(Electricity Price = 622 Rp/kWh with Subsidy)

3) CASE 3

If the electricity price is equal to the average power-generating cost of PLN (see Figure 6.1-3), the IRR is 23.4%, indicating that the investment could be implemented.

More importantly, we have to distinguish the situation in which the electricity price of Case 3 remains 1,151Rp/kWh since before the investment and the situation in which the electricity price will be changed from 622Rp/kWh to 1,151Rp/kWh. Accordingly, since a price rise from 622Rp/kWh to 1,151Rp/kWh means an annual loss of approximately 170 billion Rp as a whole, the circumstances would change significantly.[57]

(Unit: bn Rp)

YEAR (Start of Investment :0 YEAR)	−1	0	1	2	3	4	5	6	7	8	9	10	11	
Energy Audit	−0.3													0.0
FS	−2.0													0.0
Construction		−50.0												−50.0
Equipment			−150.0											−150.0
Import Duty			−10.5											−10.5
Subsidy			0.0											0.0
Initial Investment		−50.0	−160.5											−210.5
Expenditure before Investment														
Fuel Cost				43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	434.9
Increase in Unit Price (Electricity)				37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	369.9
Maintenance cost				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Others				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total<A>				80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	804.8
Expenditure after Investment														
Fuel Cost				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance cost				1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	16.1
Operation cost				1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	16.1
Insurance				0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1.6
Depreciation				21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	210.5
Total<B>				24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	244.2
Project Merit<A>−<B>=<C>				56.1	56.1	56.1	56.1	56.1	56.1	56.1	56.1	56.1	56.1	560.6
Initial Investment		−50.0	−160.5											−210.5
Project Merit<C>				56.1	56.1	56.1	56.1	56.1	56.1	56.1	56.1	56.1	56.1	560.6
Corporate Tax Rate				−17.9	−17.9	−17.9	−17.9	−17.9	−17.9	−17.9	−17.9	−17.9	−17.9	−179.4
Depreciation				21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	210.5
Cash Flow		−50.0	−160.5	59.2	59.2	59.2	59.2	59.2	59.2	59.2	59.2	59.2	59.2	381.2
Accumulation (Investment, Cash Flow)		−50.0	−210.5	−151.3	−92.2	−33.0	26.2	85.3	144.5	203.7	262.9	322.0	381.2	
PV (Investment, Cash Flow)		−50.0	−139.6	44.7	38.9	33.8	29.4	25.6	22.2	19.3	16.8	14.6	12.7	68.7

IRR	23.4 %
NPV	68.7 bn Rp
Payback Period	4.6 Year

Figure 6.1-3 Self-power Produced by WHR (CASE 3)
(Electricity Price = 1,151 Rp/kWh without Subsidy)

(3) In Terms of the Whole Country (per Facility)

Figure 6.1-4 shows the IRR for Government including PLN. As PLN electricity sales amount decreases due to the increase in self-produced power generation at a cement factory, PLN deficits could be reduced by around 370 billion Rp; and the revenue from import duties of machines and the parts increase. On the other hand, the payment of the subsidy for investment will be increased by 90 billion Rp. When calculating the IRR based on these figures, it comes to 57.2%

[57] Because the electricity charge contained in the cement manufacturing cost is approximately 20%, the manufacturing cost would increase by approximately 34% if the electricity charge increases 1.7 fold. In a highly competitive market, it is difficult to pass this cost increase on to consumers.

To sum up, IRR of the cement company is 20% and IRR of the government plus PLN is 57.2%. And what is IRR of the whole country? It corresponds to EIRR (Economic Internal Rate of Return), which includes values of benefits to the economy as a whole country. In this case, taxes and subsidies can be terminated as internal trades from a viewpoint of the whole country. As is indicates in Figure 6.1-5, EIRR is as high as 33.6%. That is why this type of investment means that creating added value using unused and free waste heat is economically important.

(Unit: bn Rp)

YEAR (Start of Investment :0 YEAR)	−1	0	1	2	3	4	5	6	7	8	9	10	11	
Energy Audit	−0.3													0.0
FS	0.0													0.0
Construction		0.0												0.0
Equipment			0.0											0.0
Import Duty (A Company⇒)			10.5											10.5
Subsidy (⇒A Company)			−90.0											−90.0
Initial Investment		0.0	−79.5											−79.5
Expenditure before Investment														
Fuel Cost				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subsidy (Electricity Price)				37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	369.9
Maintenance cost				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Others				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total<A>				37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	369.9
Expenditure after Investment														
Fuel Cost				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance cost				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operation cost				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Insurance				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Depreciation				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total<B>				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Project Merit<A>−<B>=<C>				37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	369.9
Initial Investment		0.0	−79.5											−79.5
Project Merit<C>				37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	369.9
Corporate Tax Rate (A Company⇒)				9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	89.8
Depreciation				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cash Flow		0.0	−79.5	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	380.2
Accumulation (Investment, Cash Flow)		0.0	−79.5	−33.5	12.5	58.5	104.4	150.4	196.4	242.3	288.3	334.3	380.2	
PV (Investment, Cash Flow)		0.0	−69.1	34.8	30.2	26.3	22.9	19.9	17.3	15.0	13.1	11.4	9.9	131.5

IRR	57.2 %
NPV	131.5 bn Rp
Payback Period	2.7 Year

Figure 6.1-4 Self-power Produced by WHR (Government + PLN)

(Unit: bn Rp)

YEAR (Start of Investment :0 YEAR)	−1	0	1	2	3	4	5	6	7	8	9	10	11	
Energy Audit	−0.3													0.0
FS	−2.0													0.0
Construction		−50.0												−50.0
Equipment			−150.0											−150.0
Import Duty			0.0											0.0
Subsidy			0.0											0.0
Initial Investment		−50.0	−150.0											−200.0
Expenditure before Investment														
Fuel Cost				80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	804.8
Subsidy (Electricity Price)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance cost				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Others				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total<A>				80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	80.5	804.8
Expenditure after Investment														
Fuel Cost				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance cost				1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	16.1
Operation cost				1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	16.1
Insurance				0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1.6
Depreciation				20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	200.0
Total<B>				23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	233.7
Project Merit<A>−<B>=<C>				57.1	57.1	57.1	57.1	57.1	57.1	57.1	57.1	57.1	57.1	571.1
Initial Investment		−50.0	−150.0											−200.0
Project Merit<C>				57.1	57.1	57.1	57.1	57.1	57.1	57.1	57.1	57.1	57.1	571.1
Corporate Tax Rate				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Depreciation				20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	200.0
Cash Flow		−50.0	−150.0	77.1	77.1	77.1	77.1	77.1	77.1	77.1	77.1	77.1	77.1	571.1
Accumulation (Investment, Cash Flow)		−50.0	−200.0	−122.9	−45.8	31.3	108.4	185.5	262.6	339.8	416.9	494.0	571.1	
PV (Investment, Cash Flow)		−50.0	−130.4	58.3	50.7	44.1	38.3	33.3	29.0	25.2	21.9	19.1	16.6	156.1

IRR	33.6 %
NPV	156.1 bn Rp
Payback Period	3.6 Year

Figure 6.1-5 Self-power Produced by WHR (EIRR)

6.1.2 Steel Industry (Regenerative Burner)

(1) Preconditions

Amount invested: 33 billion Rp[58] (12-pair burner[59]); fuel price: 1,960 Rp/L[60]; investment evaluation period: 10 years

(2) Case Setting

In the basic case (no financial support by the government), the calculated IRR is 17.2% (see Figure 6.1-6), indicating that investment profitability would be achieved with a small amount of support provided: exemption from import duty, and a subsidy at the first stage of the introduction.

If the fuel is a petroleum product (5,760 Rp/L), the IRR would be 59.9% (see Figure 6.1-7), indicating that the investment is very practical. However, support of approximately 10% of the equipment cost (approximately 10% on average; although a subsidy of approximately 30% would be necessary at the initial stage of introduction, it would become unnecessary if the equipment becomes widely diffused) would be necessary as an incentive at the early stage of introduction.

[58] Because it is the price after the equipment becomes widely available (approx. 20% cost reduction), a certain level of support will be required at the early stage of introduction.
[59] We assumed 5 billion Rp in the case of two pairs of burners.
[60] Natural gas supply price in case of oil equivalent conversion. The actual price of fuel to the industry (equivalent to A heavy oil) is 5,760 Rp/L.

Conditions

1.number of installment unit	1 unit
2.Initial Cost	33 bn Rp
3.Rolling Tonnage	300 1000 t/Year
4.Fuel Cost	34.1 bn Rp/Year
Unit price (Oil)	1,960 Rp/L

(Unit: bn Rp)

YEAR (Start of Investment :0 YEAR)	-1	0	1	2	3	4	5	6	7	8	9	10	
Energy Audit	-0.3												0.0
FS	-0.3												0.0
Construction		-8.3											-8.3
Equipment		-24.8											-24.8
Import Duty		-1.7											-1.7
Subsidy		0.0											0.0
Initial Investment		-34.7											-34.7
Expenditure before Investment													
Fuel Cost			34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	341.0
Maintenance cost			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operation cost			0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	2.6
Others			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total<A>			34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	343.7
Expenditure after Investment													
Fuel Cost			23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	238.7
Maintenance cost			0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	7.9
Operation cost			0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	2.6
Insurance			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Depreciation			3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	34.7
Total<B>			28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	284.3
Project Merit<A>-<B>=<C>			5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	59.4
Initial Investment		-34.7											-34.7
Project Merit<C>			5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	59.4
Corporate Tax Rate			-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-19.0
Depreciation			3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	34.7
Cash Flow		-34.7	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	40.4
Accumulation (Investment, Cash Flow)		-34.7	-27.2	-19.7	-12.2	-4.7	2.8	10.3	17.8	25.4	32.9	40.4	
PV (Investment, Cash Flow)		-34.7	6.5	5.7	4.9	4.3	3.7	3.2	2.8	2.5	2.1	1.9	3.0

IRR	17.2 %
NPV	3.0 bn Rp
Payback Period	4.6 Year

Figure 6.1-6 Regenerative Burners (CASE 1)

(Fuel Price = 1,960 Rp/L [Gas])

(Unit: bn Rp)

YEAR (Start of Investment :0 YEAR)	-1	0	1	2	3	4	5	6	7	8	9	10	
Energy Audit	-0.3												0.0
FS	-0.3												0.0
Construction		-8.3											-8.3
Equipment		-24.8											-24.8
Import Duty		-1.7											-1.7
Subsidy		0.0											0.0
Initial Investment		-34.7											-34.7
Expenditure before Investment													
Fuel Cost			100.2	100.2	100.2	100.2	100.2	100.2	100.2	100.2	100.2	100.2	1,002.2
Maintenance cost			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operation cost			0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	2.6
Others			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total<A>			100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5	1,004.9
Expenditure after Investment													
Fuel Cost			70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	701.6
Maintenance cost			0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	7.9
Operation cost			0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	2.6
Insurance			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Depreciation			3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	34.7
Total<B>			74.7	74.7	74.7	74.7	74.7	74.7	74.7	74.7	74.7	74.7	747.2
Project Merit<A>-<B>=<C>			25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	257.7
Initial Investment		-34.7											-34.7
Project Merit<C>			25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	257.7
Corporate Tax Rate			-8.2	-8.2	-8.2	-8.2	-8.2	-8.2	-8.2	-8.2	-8.2	-8.2	-82.5
Depreciation			3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	34.7
Cash Flow		-34.7	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	175.3
Accumulation (Investment, Cash Flow)		-34.7	-13.7	7.3	28.3	49.3	70.3	91.3	112.3	133.3	154.3	175.3	
PV (Investment, Cash Flow)		-34.7	18.3	15.9	13.8	12.0	10.4	9.1	7.9	6.9	6.0	5.2	70.7

IRR	59.9 %
NPV	70.7 bn Rp
Payback Period	1.7 Year

Figure 6.1-7 Regenerative Burners (CASE 2)

(Fuel Price = 5,760 Rp/L [Oil])

(3) Obstacles to Investment

Large companies such as PT Gunung Garuda, where we recently performed a site investigation, have capabilities to accept and manage energy-saving facilities. However, some companies may not have adequate capabilities. Thus it is more important to conduct an investigation of actual conditions at the site than to make an economic calculation, t seems to be a requisite to perform a reliable energy audit in advance.

6.2 Cost Effectiveness for Office Buildings

6.2.1 Confirmation of Investment Profitability

First, it is necessary to measure how the merits gained by an energy-saving investment (air conditioner replacement in this case) can be attained, and to allocate them among the stakeholders (client, ESCO, and financial institution). The amortization and operating costs are deducted from annual energy-saving merits to leave earnings—the principal to be allocated. The financial institution will take profit from earnings in the form of interest, and the remaining portion can be allocated between the ESCO and the client. The critical point is that the amount calculated by deducting interest from earnings gained can supply an ESCO with sufficient profit (enough to continue this business) and the client with some profit, not a loss. These factors are discussed using the following three cases.

The following three cases indicate the calculated results of the investment profitability for building owners in office buildings.

Case 1: present electricity price (850 Rp/kWh)

Figure 6.2-1 illustrates IRR for a building owner without a subsidy under the current conditions.

Case 2: present electricity price (850 Rp/kWh) + external low-interest loan

Figure 6.2-2 illustrates IRR for a building owner with subsidy under the current conditions.

Case 3: level comparable to power generation cost (1,151 Rp/kWh)

Figure 6.2-3 illustrates IRR for a building owner when increasing the electricity price to 1,151 Rp/kWh.

Conditions

1.Required Capacity (AC)	4,160 kW
Total Floor Area	50,000 m2
COP (after Installation)	4.7
COP (before Installation)	2.0
2.Initial Cost	10.6 bn Rp
3.Required Electricity Consumption (AC)	1,770,000 kWh/Year
Running Hours (AC)	2,000 h/Year
4.Merit (Electricity, Cost Reduction)	2.04 bn Rp/Year
Unit Price (Electricity)	850 Rp/kWh
Reduction Electricity (AC)	2,390,000 kWh/Year

General Investment (Unit: bn Rp)

YEAR (Start of Investment :0 YEAR)	-1	0	1	2	3	4	5	6	7	8	9	10	Total
Energy Audit	-0.10												0.00
Equipment + Construction		-10.60											-10.60
Initial Investment		-10.60											-10.60
Expenditure before Investment													
Energy Cost			3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	35.40
Total<A>			3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	35.40
Expenditure after Investment													
Energy Cost			1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	15.00
OP cost + Add Maintenance Cost			0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	3.18
Insurance			0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	1.06
Subsidy (Low Interest)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depreciation			1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	10.60
Total <B>			2.98	2.98	2.98	2.98	2.98	2.98	2.98	2.98	2.98	2.98	29.84
Project Merit<A>-<B>=<C>			0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	5.56
Initial Investment		-10.60											-10.60
Project Merit<C>			0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	5.56
Depreciation			1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	10.60
Cash Flow		-10.60	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	5.56
Accumulation (Investment, Cash Flow)		-10.60	-8.98	-7.37	-5.75	-4.14	-2.52	-0.90	0.71	2.33	3.94	5.56	
PV (Investment, Cash Flow)		-10.60	1.41	1.22	1.06	0.92	0.80	0.70	0.61	0.53	0.46	0.40	-2.49

IRR	8.5 %
NPV	-2.49 bn Rp
Payback Period	6.6 Year

Figure 6.2-1 Office Building (CASE 1)

(Electricity Price = 850 Rp/kWh)

The calculated IRRs are 8.5% in Case 1, 20.0% in Case 2, and 17.6% in Case 3. If a low-interest loan is provided after the level of Case 2 is reached, investment profitability would be almost achieved.

General Investment (Unit: bn Rp)

YEAR (Start of Investment :0 YEAR)	-1	0	1	2	3	4	5	6	7	8	9	10	Total
Energy Audit	-0.10												0.00
Equipment + Construction		-10.60											-10.60
Subsidy		0.00											0.00
Initial Investment		-10.60											-10.60
Expenditure before Investment													
Energy Cost			3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	35.40
Total<A>			3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	35.40
Expenditure after Investment													
Energy Cost			1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	15.00
OP cost + Add Maintenance Cost			0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	3.18
Insurance			0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	1.06
Subsidy (Low Interest)			-1.28	-1.28	-1.28	-1.28	-1.28	0.00	0.00	0.00	0.00	0.00	-6.40
Depreciation			1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	10.60
Total <B>			1.70	1.70	1.70	1.70	1.70	2.98	2.98	2.98	2.98	2.98	23.44
Project Merit<A>-<B>=<C>			1.84	1.84	1.84	1.84	1.84	0.56	0.56	0.56	0.56	0.56	11.96
Initial Investment		-10.60											-10.60
Project Merit<C>			1.84	1.84	1.84	1.84	1.84	0.56	0.56	0.56	0.56	0.56	11.96
Depreciation			1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	10.60
Cash Flow		-10.60	2.90	2.90	2.90	2.90	2.90	1.62	1.62	1.62	1.62	1.62	11.96
Accumulation (Investment, Cash Flow)		-10.60	-7.70	-4.81	-1.91	0.98	3.88	5.49	7.11	8.73	10.34	11.96	
PV (Investment, Cash Flow)		-10.60	2.52	2.19	1.90	1.66	1.44	0.70	0.61	0.53	0.46	0.40	1.80

IRR	20.0 %
NPV	1.80 bn Rp
Payback Period	3.7 Year

Figure 6.2-2 Office Building (CASE 2)

(Electricity Price = 850 Rp/kWh + low-interest loan)

General Investment (Unit: bn Rp)

YEAR (Start of Investment :0 YEAR)	-1	0	1	2	3	4	5	6	7	8	9	10	Total
Energy Audit	-0.10												0.00
Equipment + Construction		-10.60											-10.60
Initial Investment		-10.60											-10.60
Expenditure before Investment													
Energy Cost			4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	47.90
Total<A>			4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	47.90
Expenditure after Investment													
Energy Cost			2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	20.40
OP cost + Add Maintenance Cost			0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	3.18
Insurance			0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	1.06
Subsidy (Low Interest)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depreciation			1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	10.60
Total <B>			3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	35.24
Project Merit<A>-<B>=<C>			1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	12.66
Initial Investment		-10.60											-10.60
Project Merit<C>			1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	12.66
Depreciation			1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	10.60
Cash Flow		-10.60	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	12.66
Accumulation (Investment, Cash Flow)		-10.60	-8.27	-5.95	-3.62	-1.30	1.03	3.36	5.68	8.01	10.33	12.66	
PV (Investment, Cash Flow)		-10.60	2.02	1.76	1.53	1.33	1.16	1.01	0.87	0.76	0.66	0.57	1.07

IRR	17.6 %
NPV	1.07 bn Rp
Payback Period	4.6 Year

Figure 6.2-3 Office Building (CASE 3 = IRR)

(Electricity Price = 1,151 Rp/kWh)

General Investment (Unit: bn Rp)

YEAR (Start of Investment :0 YEAR)	-1	0	1	2	3	4	5	6	7	8	9	10	Total
Energy Audit	-0.10												0.00
Equipment + Construction		0.00											0.00
Initial Investment		0.00											0.00
Expenditure before Investment													
Subsidy (Electricity Price)			0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	7.19
Total<A>			0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	7.19
Expenditure after Investment													
Energy Cost			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OP cost + Add Maintenance Cost			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insurance			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subsidy (Low Interest)			1.28	1.28	1.28	1.28	1.28	0.00	0.00	0.00	0.00	0.00	6.40
Depreciation			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total <B>			1.28	1.28	1.28	1.28	1.28	0.00	0.00	0.00	0.00	0.00	6.40
Project Merit<A>-<B>=<C>			-0.56	-0.56	-0.56	-0.56	-0.56	0.72	0.72	0.72	0.72	0.72	0.80
Initial Investment		0.00											0.00
Project Merit<C>			-0.56	-0.56	-0.56	-0.56	-0.56	0.72	0.72	0.72	0.72	0.72	0.80
Depreciation			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Flow		0.00	-0.56	-0.56	-0.56	-0.56	-0.56	0.72	0.72	0.72	0.72	0.72	0.80
Accumulation (Investment, Cash Flow)		0.00	-0.56	-1.12	-1.68	-2.24	-2.80	-2.08	-1.36	-0.64	0.08	0.80	
PV (Investment, Cash Flow)		0.00	-0.49	-0.42	-0.37	-0.32	-0.28	0.31	0.27	0.24	0.20	0.18	-0.68

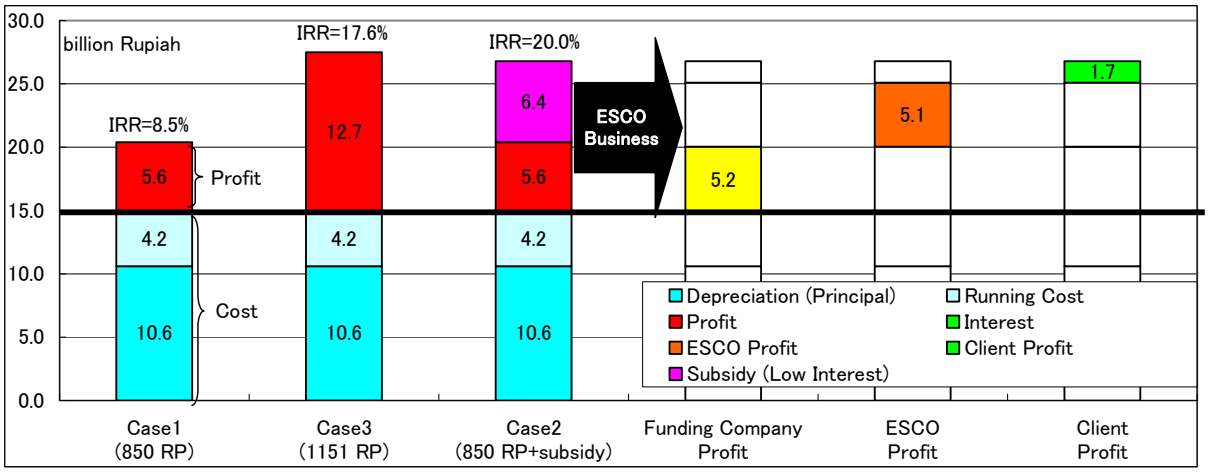
IRR	5.1 %
NPV	-0.68 bn Rp
Payback Period	8.9 Year

Figure 6.2-4 Office Building (Government + PLN)

6.2.2 Allocation of Earnings in the ESCO Project

Regarding Case 2 in Figure 6.2-5(with an interest subsidy of around 640million Rp on an annual basis), when the allocation ratio between an ESCO and the client is set at 3:1, a financial institution would firstly take the interest payment (5.2 billion Rp) from the total of saving energy merit, and the remaining would be split into around 640 million Rp for an ESCO and around 510 million Rp for 170 million Rp.

In this case, an ESCO would gain earnings accounting for approximately 50% of the invested amount in return for guaranteeing energy savings, while the client would not only gain earnings without taking any risk, but would also acquire the equipment 10 years later. Thus, the project would provide sufficient merits to both parties, and be sufficiently feasible.



Office Building (Total Floor Area = 50,000m2)

Figure 6.2-5 Office Building: Allocation of ESCO's Earnings

CHAPTER7. REVIEW OF 2009 REGULATION FOR EXPANDING ENERGY AUDIT SYSTEM

In Chapter 5 and Chapter 6, investment profitability of saving energy and expenditure required of the Government and its financial resources, when implementing the model projects, are analyzed in detail to be clearly understandable. This chapter shows required the modifications and additions of provision of the energy-saving regulation regarding manpower and institutions in order to implement the model projects.

7.1 Flow of Implementation of Model projects

Figure 7.1-1 shows an overall picture of model project selection and implementation. This figure is very similar to Figure 3.3-3, but has some modifications. The sectors involved are cement industry, steel industry, and office buildings. As for energy audits, cement has 21 internal audits, steel has 18 internal and 65 external audits, and office buildings have 442 cases conducted by ESCOs. Considering investment profitability together with technical and financial support from the government, the number of actual investments will be 21 from cement, 51 from steel, and 200 from office buildings

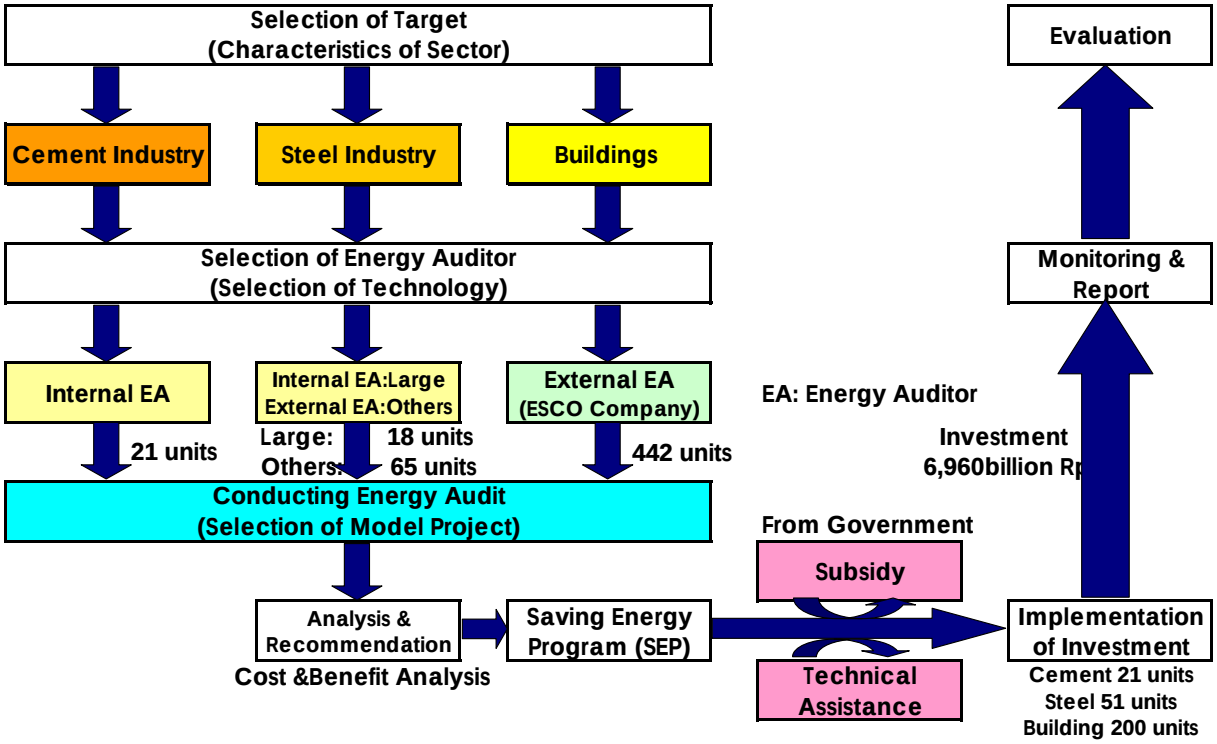


Figure 7.1-1 Flow of Implementing Investment for the Proposed Model Projects

7.2 Demarcation of Energy Manager and Energy Auditor, and Development of Energy Auditor

Table 7.2-1 indicates the functional level of technical skills that energy managers, energy auditors, and ESCOs should have. The levels of the required technologies are classified into three: advanced technologies linked to production processes, general-purpose energy-saving technologies, and basic energy-saving technologies for overview and knowledge of energy-saving management. An energy manager is not considered to be well-versed into all of energy-saving technologies as an expert, and is rather expected to control and manage the organization to promote energy saving as explained in Chapter 3.

It is also necessary to clarify the functional levels of technical skills required for energy auditors. Energy auditors include internal auditors and external auditors. It is important to classify external auditors into two types: Grade A engaged in advanced technologies and Grade B engaged in general-purpose technologies. Currently, most of external auditors in Indonesia are considered to fall under Grade B. For companies that are already making use of internal auditors, they are selected in-house and are generally familiar with production processes. Therefore, they can be narrowed down to Grade A. To sum up, the case in which an internal audit is possible refers to major companies and the case in which external audit is required refers to small and medium-size companies. Finally, ESCO can be effective for companies which energy conservation at the level of external audit Grade B suffices. This means that office buildings do not generally require advanced industrial energy-saving technologies.

Table 7.2-1 Demarcation of Energy Manager and Energy Auditor, and ESCO

	Energy Manager	Enegy Auditor			ESCO Company
		External		Internal	
		GRADE A	GRADE B		
Highly advanced technology (linked to production process)	Not Required	Required	Not Required	Required	Not Required
Conventional technology for Saving Energy	Not Required	Required	Required	Required	Required
Basic knowledge for Saving Energy Management	Required	Required	Required	Required	Required

Table 7.2-2 shows classifications of the functional levels of the technical skills that companies hold inside theirs. The cement industry has the capability of coping with all the three levels, and in the steel industry large companies also can do in the same way like the cement industry. But some medium and small companies in the steel industry can not always follow advanced technologies. And very few owners in office buildings can fully understand the saving technologies and have general information and knowledge about saving energy.

Table 7.2-2 Categorization of Functional Level of three Technical Skills in Cement and Steel Industries, and Office Buildings

	Cement Industry	Steel Industry			Building Owner
		Large Company	Medium Company	Small Company	
Highly advanced technology (linked to production process)	Sufficient	Sufficient	insufficient	insufficient	insufficient
Conventional technology for Saving Energy	Sufficient	Sufficient	Case by case	insufficient	insufficient
Basic knowledge for Saving Energy Management	Sufficient	Sufficient	Sufficient	Case by case	Case by case

Table 7.2-3 shows what type of experts (an energy manager, an energy auditor and ESCO company) can be available within each of the above three sectors, based on Table 7.2-1 and Table 7.2-1. First, in the cement industry there are many persons who could be found and appointed as an energy manager and an internal auditor inside their companies. Secondly, in the steel industry, medium and small companies need to depend on an external auditor of Grade-A outside while a large company is in the same situation as cement companies. Finally, since few owners in office buildings could find a right person to do business as an energy auditor and even an energy manager inside, an ESCO company will be possibly in charge of energy management and energy auditing instead.

Table 7.2-3 Availability of Energy Manager, Energy Auditor, and ESCO in Three Sectors

	Energy Manager	Enegy Auditor			ESCO Company
		External		Internal	
		GRADE A	GRADE B		
Cement Industry	Available	-	-	Available	-
Steel Industry	Available	Dependent	-	Available	-
Building Owner	-	-	-	-	Dependent

7.3 Introduction of ESCO Model to Energy Audit System

Although energy-saving regulations in Indonesia oblige the planning and implementation of energy saving based on an energy audit, the exemption of most office buildings from legal obligation seems inconsistent and wasteful from the viewpoint of spreading and promoting energy saving. In near future, a numerical increase means increasing governmental efforts and expenses, such as for the assignment of energy managers and audit expenses. Therefore, as shown in Figure 7.3-1, if ESCO model is introduced into the existing energy audit system, the government or owners can save “manpower and cost” in the aspect of dealing with the bulk of audits, paying the associated expenses, and planning and implementation of energy saving

option. This is because an ESCO company undertakes as a profitable business, various works and the payments for energy saving in the place of the government and owners, which leads to the least of all over the costs covering energy audit system as a whole.

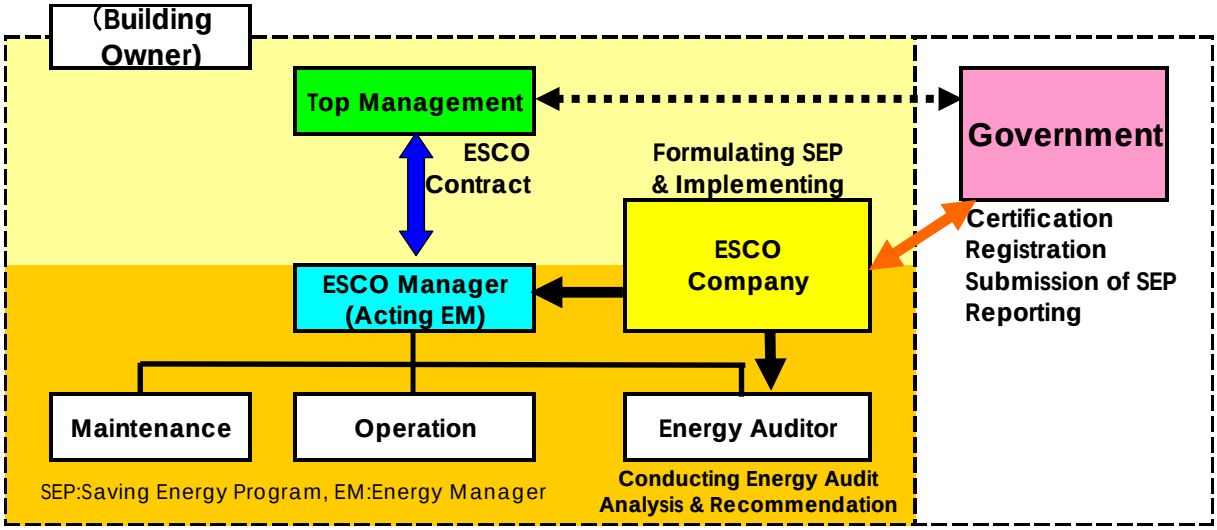


Figure 7.3-1 Introduction of ESCO Model to Energy Audit System

7.4 Expansion of target and scope covered by the 2009 Regulation

Table 7.4-1 indicates that the designated unit consumes energy of more than 6,000 toe is required to conduct energy audit and describes the distribution of the number of business units and factories in relation to the volume of energy consumption. It is estimated that 710 of about 20,000 companies in the industrial sector , 15 of 18 power generators, and 35 of 3,400 office buildings are included in such a category. In terms of the number of business locations, 1.942 of 25,639 must be included, and those entities account for about 10% of total energy consumption. In buildings, the coverage of only 35 office buildings, which is 1% of the total, is very small.

Table 7.4-1 The Number of User Covered by Article 12 (more than 6,000 toe)

Annual Energy Consumption (toe)			less than 6,000	6,000 ~ 12,000	12,000 ~ 16,000	more than 16,000	Total	Subject to Energy Audit
Number (Unit)	Company	Industry	19,568	305	96	309	20,278	710
		Power Plant	3	1	0	14	18	15
		Buildings	3,366	35	0	0	3,401	35
		Total	22,937	341	96	323	23,697	760
	(Business Unit)		23,697	760	419	763	25,639	1,942
Share (%)	Company	Industry	96.5%	1.5%	0.5%	1.5%	100.0%	3.5%
		Power Plant	16.7%	5.6%	0.0%	77.8%	100.0%	83.3%
		Buildings	99.0%	1.0%	0.0%	0.0%	100.0%	1.0%
		Total	96.8%	1.4%	0.4%	1.4%	100.0%	3.2%
	(Business Unit)		92.4%	3.0%	1.6%	3.0%	100.0%	7.6%

Source: J-power Report (JICA study 2009)

Figure 7.4-1 shows the relation between office energy consumption and total floor area (TFA). 6,000 toe defined under the energy-saving regulation is equivalent to 400,000 m^2 of total floor area. Annual energy consumption for a building in the 50,000 m^2 class is approximately 700 toe.

On the other hand, the relation between sizes, distribution status, and number of cases of office buildings is shown in Figure 7.4-2. TFA is less than 30,000 m^2 in 80% of the total. Considering the cost effectiveness of energy-auditing expenses for energy-saving amount, 50,000 m^2 is calculated to be the lower limit. The coverage is about 2%. If TFA is more than 30,000 m^2, some 10% will be covered.

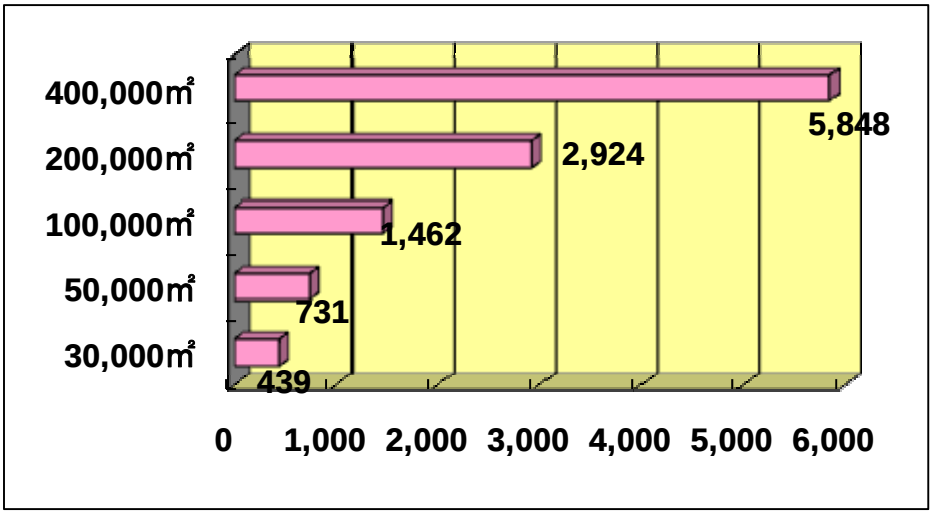


Figure 7.4-1 Relation between TFA and Energy Consumption

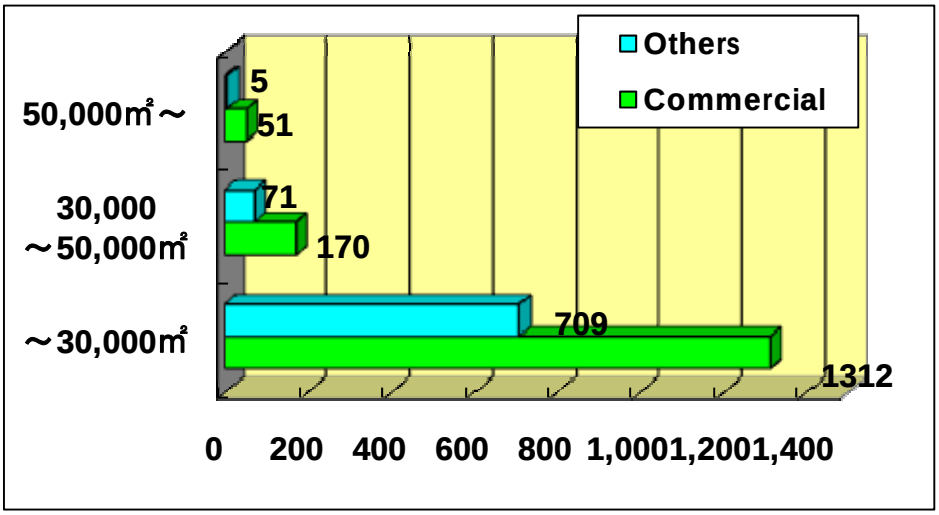


Figure 7.4-2 Relation Between TFA and Unit of Office Building

7.5 Creation of Specified Saving–energy Institution

As stated above, we explained the extended range of energy audit, classification of energy managers and energy auditors, stratified energy auditors, institutional introduction of ESCO model.

At the same time, various assistance systems covering options such as technological support and subsidies when implementing the investments are necessarily discussed as are mentioned in Chapter4, Chapter5, and Chapter6. Besides, personnel training and man-power development of energy auditors as experts are urgent issues. As financial support to implement the investment for saving energy is essential, it is very important that concrete procedures are performed smoothly and in a consistent manner.

This is because the following should be paid an attention to when implementing the investment. First. so many projects will be proposed to the government and all projects require complicated procedures; and second, when providing loans for projects, it is necessary to examine them thoroughly to avoid inappropriate burden of investments risks, and credit risks of ESCO companies and clients. If multiple government agencies performed these processes at the same time, it would likely lead to confusions and troubles over the framework of energy ocnservation, and therefore, a new unified institution for energy efficiency is required.

We think that one new institution with such a specific energy-saving mission is required. An Indonesian version of NEDO + ECCJ (Energy Conservation Center) + revolving fund is necessary.

CHAPTER8. CONCLUSION AND NEXT STAGE

This chapter is divided into three parts; Section 8.1 summarizes as the mid-term target (2010-2025), the results of implementing the model projects, which are selected in Chapter 4, with various subsidies as indicated in Figure 6.1-2, Figure 6.1-6, and Figure 6.2.2, as well as Figure 6.2-5 in Chapter 6; and Section 8.2 focuses on expenditure (incentives) and return of Government, when implementing the model projects, to be discussed from the viewpoint of not only government expenditure but also cost and benefits for the whole nation; and, Section 8.3 concludes with measures to be taken to extend the energy audit system by implementing the model projects, and raises the next issues to be addressed.

8.1 Mid-term Target (2010-2025)

Table 8.1-1 summarizes the number of audit and investment programs, as well as investment amounts. For the cement industry, it is planned to carry out a model project to invest in waste heat recovery power-generation plants. There will be 21 internal audit programs and 21 investment programs in total.

According to Table 8.1-2, the total investment will be 4.2 trillion Rp. For the steel industry, it is planned to introduce regenerative burners. There will be 18 internal audits for major companies and 65 external audits for small and medium-sized companies. There will be 18 large-scale investments with 12 pairs of burners and 33 small-scale investments with two pairs of burners. The total investment will be 760 billion Rp.

As for office buildings, 442 audits and 200 investments will be carried out. The total investment will be 2 trillion Rp.

Briefly, during the period from 2010 to 2025, 546 energy audits in total will be conducted, and 272 investments will be made. The total investment will be 6.96 trillion Rp, while CO2 emissions will be reduced annually by about 2.3 million toe, and this is the medium-term target.

Table 8.1-1 Mid-term Target

Item		Duration	Target
Conducting Energy Audit	1) Cement Industry	2010-2025	21 units
	2) Steel Industry		83 units
	3) Buildings		442 units
	Total		546 units
CO2 Reduction		2025	2.3million ton/Year

Table 8.1-2 Investment

Item		Duration	Investment
Implementation of Investment	Cement Industry (Auto power producing by using Waste heat recovery)	2010-2025	21 units
			(4,200 billion Rp)
	Steel Industry (Regenarative Burners)	2010-2025	51 units
			(760 billion Rp)
	Buildings (ESCO Business)	2015-2025	200 units
			(2,000 billion Rp)

8.2 Expenditure (Incentives) and Return for Government

Table 8.2-1 shows the cost to be subsidized by the government, i.e. incentives. An energy audit will cost 200 million Rp per industrial object and 100 million Rp per office building, respectively while the energy audit cost in 200 office buildings will be borne by ESCO companies themselves. It means that the amount of subsidy the government is required to pay, is equivalent to those ones regarding only 346 entities consisting of 104 projects in the industry and 242 in office buildings (442 minus 200).

As already analyzed in Chapter 6, about 1.95 trillion Rp is required as a subsidy for investing in equipment in the industry sector and about 1.28 trillion Rp as low-interest loans for ESCO programs for office buildings. In addition, exemption of tariffs on imported equipment, devices, and parts will be about 260 billion Rp, so the total subsidy will amount to about 3.54 trillion Rp. Accordingly, as the deficit of PLN will be reduced by about 9.2 trillion Rp by waste heat recovery power generation and other energy-saving measures, the government will be successfully secure 5.666 trillion Rp of subsidy, in other words, profits, as a whole.

Table 8.2-1 Expenditure (Incentives) and Return for Government

		Duration	Amount of Value
Government Expenditure (Incentives)	Fee of Energy Audit	Before decision making	55 billion Rp
	Direct Subsidy	After investing	1,947 billion Rp
	Indirect Subsidy	10 Years in operation	1,280 billion Rp
	Import Duty Exemption	When imported	260 billion Rp
	Total	-	3,543 billion Rp
Return	Saving deficits of PLN (Electricity)	10 Years in Full Operation	9,209 billion Rp

However, the deficit of PLN will be reduced by about 9.2 trillion Rp by waste heat recovery power generation and other energy-saving measures. Table 8.2-2 summarizes this relation. From this table, it is obvious that CO2 emissions can be reduced by about 2.3 million toe if about 6.96 trillion Rp is invested in energy-saving programs. In this connection, the government must pay a subsidy incentive (i.e., fiscal spending) of about 3.5 trillion Rp for energy-saving investments, but a subsidy of about 9.2 trillion Rp for power supply (i.e., fiscal spending for PLN) can be cut, resulting in a fiscal surplus of about 5.7 trillion Rp.

Table 8.2-2 Re-allocation of current Expenditure for Government

	Without the Project	With the Project
Government Expenditure (Incentives)	BAU	BAU +3,543
Subsidies to PLN	BAU	BAU -9,209
Outgoing Cash flow	BAU	BAU -5,666

While we summarized the model project in Table 8.2-2 from the viewpoint of fiscal spending by the government, here we focus on its merits for Indonesia as a whole. With reference to Figure 8.2-1, the left column means that the investment on the model project is 6.96 trillion Rp, while the right column shows the effects expected from the investment listed such as reduction of CO2 emissions, reduction of petroleum product imports by investing in regenerative burners, reduction of subsidy for electric rates, and a ten-year cost merit of waste heat recovery power generation of 11.4 trillion Rp (for companies).

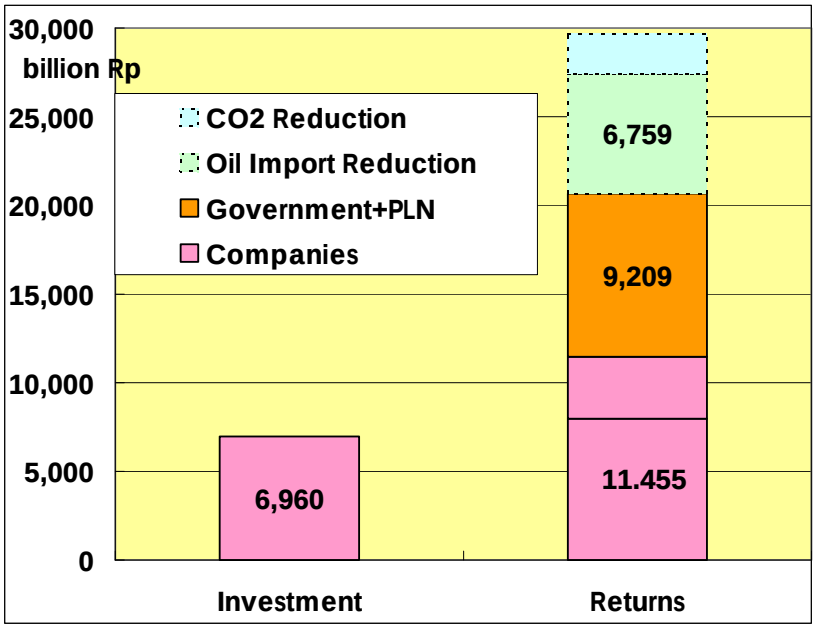


Figure 8.2-1 Effects of Proposed Model Project (All Indonesia)

If all of these investment effects are evaluated, significant advantages could be gained from them.

However, as for an individual company itself, deducting payment of 15% loan interest would increase the above-mentioned cost merit to 4.55 trillion Rp. Actually, the company must depreciate equipment investment of 4.2 trillion Rp, for example, over ten years, resulting in a surplus of only 0.35 trillion Rp. Considering the corporate tax also to be paid, the investment is no longer profitable. Therefore, it is necessary to increase the investment return ratio (IRR) by granting an appropriate subsidy to a company investing in energy-saving equipment.

8.3 Conclusion and Next Stage

8.3.1 Conclusion

To extend the energy audit system by implementing the model project, the three following measures are to be taken:

(1) Review of Regulation No.70 of November 2009

a. Demarcation between Energy Manager and Energy Auditor
b. Skills Required of Energy Auditor are divided into two Grades
(Expert A: Advanced technologies, Expert B: General technologies)
c. Stipulation of ESCO model and Qualification

(2) Required Capacity Building for Energy Auditor

(3) Creation of specified foundation for Saving Energy

Required function: Indonesian “NEDO” + “ECCJ” + ”Revolving Fund”
a. Assistance for Investment and Development regarding Saving Energy
b. Capacity building for Energy Auditor and Energy Manager
c. Public Awareness (Education and Seminar)
d. Arrangement and Development of Financial Scheme

8.3.2 Next Stage

For the purpose of building a more general and comprehensive energy audit system, the following study

and plan will be further required:

a. Further study on ESCO model

b. Detailed design for capacity building energy auditors

c. Further study and planning for the establishment of a new specified saving-energy foundation

Although the model projects are limited to the three above-mentioned sectors in this study, it also seems to be an important future task to carry out model projects in other sectors.

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16. JBIC:
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Feasibility Study for Model Project for Self-power Produced by Waste Heat Recovery
in the Cement Industry in Indonesia
Survey for Energy Audit in Steel Industry in Indonesia
Feasibility Study for Model Project for High-performance Industrial Furnace in Indonesia
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22. IEEJ:
2010 HANDBOOK of ENERGY & ECONOMICS STATISTICS in JAPAN
Asia/World Energy Outlook 2009
Study on Energy Conservation in Indonesia

Data Collection List

NO.	TITLE	FORM	Original or Copy	Issuing Institution	Year of Publication
1	ROAD MAP MITIGATION APPROCH OF CLIMATE CHANGE IN INDUSTRY	BOOK	Copy	Agency of Research and Development of Industry, Ministry of Industry	2008
2	LAW OF THE REPUBLIC OF INDONESIA NUMBER 30 YEAR 2007 ON ENERGY	BOOK	Original	Directorate General of Electricity and Energy Utilization, Ministry of Energy and Mineral Resources	2008
3	INDONESIA ENERGY OUTLOOK 2008	BOOK	Original	Center for Data and Information on Energy and Mineral Resources, Ministry of Energy and Mineral Resources	2008
4	2009 HANDBOOK of ENERGY & ECONOMIC STATISTICS of INDONESIA	BOOK	Original	Center for Data and Information on Energy and Mineral Resources, Ministry of Energy and Mineral Resources	2009
5	2008 KEY INDICATOR of INDONESIA ENERGY and MINERAL RESOURCES	BOOK	Original	Center for Data and Information on Energy and Mineral Resources, Ministry of Energy and Mineral Resources	2008
6	INDONESIA ENERGY STATISTICS 2009	BOOK	Original	Center for Data and Information on Energy and Mineral Resources, Ministry of Energy and Mineral Resources	2009
7	PLN STATISTICS 2008	BOOK	Original	PT PLN (Persero)	2009
8	THE INDONESIAN IRON AND STEEL INDUSTRY ASSOCIATION DIRECTORY 2009 First Edition	BOOK	Original	IISIA (The Indonesian Iron and Steel Industry Association)	2008
9	PT SEMEN PADANG 2008 ANNUAL REPORT	BOOK	Original	PT SEMEN PADANG	2009
10	ROAD MAP PENANGANAN PERUBAHAN IKLIM SEKTOR INDUSTRI	BOOK	Copy	gtz (Deutsche Gesellschaft fur Technische Zusammenarbeit)	2009
11	PROJECT DESIGN DOCUMENT FORM (CDM PDD) Version 02	BOOK	Copy	UNFCCC (United Nations Framework Convention on Climate Change)	2004
12	Introduction to a green house gas emission reduction scheme in the cement sector in Indonesia Confidential	BOOK	Copy	Ecofys International BV (by order of AFD)	2009
13	Project for the Sectoral Approach Promotion Study to Update CO2 Roadmap of Indonesia - Interim Report	BOOK	Copy	MRI (Mitsubishi Research Institute, Inc)	2010
14	Economic and fiscal policy strategies for climate change mitigation in Indonesia	BOOK	Copy	Ministry of Finance, Republic of Indonesia	2009
15	The Advisory and Monitoring Activity for the Climate Change Program Loan to the Republic of Indonesia - Final Report	BOOK	Copy	Japan International Cooperation Agency Prepared by the Institute for Global Environmental Strategies	2009
16	Thailand’s Energy Efficiency Revolving Fund: A Case Study	BOOK	Copy	DMG Thailand (Danish Management Group Thailand)	2005

Attachment 1

Record of Plant Visits

1. Kashima Forging Co., Ltd.

(Metal Working)

(February 10, 2010)

2. PT GUNUNG GARUDA

(Iron and Steel)

(March 12, 2010)

3. PT SEMEN PADANG

(Cement)

(March 15, 2010)

4. PT BANGUN SARANA BAJA

(Iron and Steel)

(March 17, 2010)

1. Kashima Forging Co., Ltd. (Metal Working)

(1) Overview of the plant

Establishment: 1948
Address: 3-9-7, Tagawa-kita, Yodogawa Ward, Osaka City, Osaka Prefecture
Product: precision die forged steel in general
Production capacity: 300 tons/month

(2) Schedule

Date: February 10, 2010
13:30 - 13:40: Greetings, explanation of the purport, self introduction
13:40 - 14:00: Plant tour (forging heating furnace [regenerative burner])
14:00 - 14:30: Overview of the company (Kashima Forging Co., Ltd.), achievements of introducing the regenerative burner, and Q&As

(3) Interviewee

Takehiko Okubo (Representative Director)
Kashima Forging Co., Ltd.

JICA STUDY TEAM
Mr. Hirai (Team Leader), Mr. Hachiuma

(4) Details

1) Greetings, explanation of the purport, self introduction

2) Plant tour
- Forging heating furnace (regenerative burner)
- Air stamp hammer

3) Overview of the company (Kashima Forging Co., Ltd.), achievements of introducing the regenerative burner, and Q&A
- Company profile (Kashima Forging Co., Ltd.)
- Achievements of introducing the regenerative burner (including advantages of gasification)
  a. CO_2 emissions were reduced by 35%.
  b. Energy consumptions were reduced by 35%.
  c. Quality became stable through good temperature control.
  d. The plant became cleaner inside.
  e . Noise (combustion noise) was reduced.

f. Exempted from the Fire Service Act.

- Q&As

a. The company has signed a maintenance contract with Osaka Gas, and Osaka Gas performs the maintenance. Under the contract, Osaka Gas periodically cleans heat storage bowls and replaces changeover valves and burner nozzles.

b. It was confirmed with actual production data that the specific consumption was drastically reduced through the introduction of the regenerative burner.

(5) Photos

1) Appearance of the company

2) Forging heating furnace

3) Product

2. PT GUNUNG GARUDA (Iron and Steel)

(1) Overview of the plant

Establishment: 1986
Address:JI. Imam Bonjol 4, Warung Bongkok, Suka Danau,Cikarang Barat, Bekasi 17520, West Java, Indonesia

(2) Schedule

Date: March 12, 2010
10:00 - 10:40: Greetings, explanation of the purport, self introduction
10:40 - 11:40: Plant tour (electric furnace, rolling heating furnace [regenerative burner], rolling mill)
11:40 - 13:10: Lunch, etc.
13:10 - 14:40: Overview of the company (PT GUNUNG GARUDA), achievements of introducing the regenerative burner, and Q&As

(3) Interviewee

PT GUNUNG GARUDA
Mr. Andrew Tanoto(Business Development Manager)
Mr. Abdullah Taniwan(Management Accounting)

Ministry of Industry
Center for Research and Development for Resource, Environment and Energy
Agency of Research and Development of Industry
Ms. Andalia Gustari
Directorate General of Metal Machinery Textile and Multivarious Industry
Directorate of Metal Industry
Ms. Flori Daryanti
Mr. Yudhi Syaputra

JICA STUDY TEAM
Mr. Hirai (Team Leader), Mr. Hachiuma, Mr. Asep(Interpreter)
Ms. Diah Febriani, ST(EMI), Mr. Arief Rachman(EMI)

(4) Details

1) Greetings, explanation of the purport, self introduction

2) Plant tour

- Electric furnace
    a. Currently, the company is building new facilities (electric furnace preheater + dust collector), and expects 40% energy saving
- Rolling heating furnace (regenerative burner), rolling mill
    a. The alumina bowl for storing heat of the regenerative burner is cleaned/ replaced twice a year.
    b. Changeover valves and burner nozzles are also replaced periodically.

3) Overview of the company (PT GUNUNG GARUDA), achievements of introducing the regenerative burner, and Q&As
- Overview of PT Gunung Garuda (using an introductory video)
    a. The plant produces various products such as through steelmaking, rolling, forging and plating in groups.
    b. The plant also places focus on product quality control and environmental measures.
- Achievements of introducing the regenerative burner
    a. Combustion air temperature: 300°C ⇒ 1,040°C (energy saving by 34.9%)
    b. Normally natural gas is used for the fuel. Heavy oil is occasionally used when natural gas is in short supply. However, there is no notable difference in the combustion condition.
    c. Specific consumption: approx. 120 Nm3/ton ⇒ approx. 80 Nm3/ton
    d. Roller volume: 300,000 ton/year
    e. Advantages of the introduction
        Energy saving (by 34.9%)
        Scale loss reduction (by 0.9%)
        Increased production capacity (by 15%)
        Improved quality
        --> CO2 emissions were reduced by 12,800 ton-CO2
    f. Cost effectiveness
        Cost: introduction cost: USD 4 million
            + lost earnings due to 2-month production suspension: USD 2.5 million
        Effect: fuel reduction USD 1.3 million
            + reduced scale loss USD 2.2 million
            + production increase by USD 2.4 million
        Single recovery period: 13 months
- Q&As
    a. The maintenance cost for the regenerative burner is unknown because only overall maintenance of all furnaces is performed.
    b. Concerning the evaluation of this project, it seems to be successful since it enjoys a large advantage.
    c. There are the following problems in introducing the regenerative burner to the Indonesian steel industry. First, the price of the regenerative burner is high. Second, the production cannot be stopped for the replacement work (if the production were stopped,

the share would be taken by other plants or China during the production suspension).

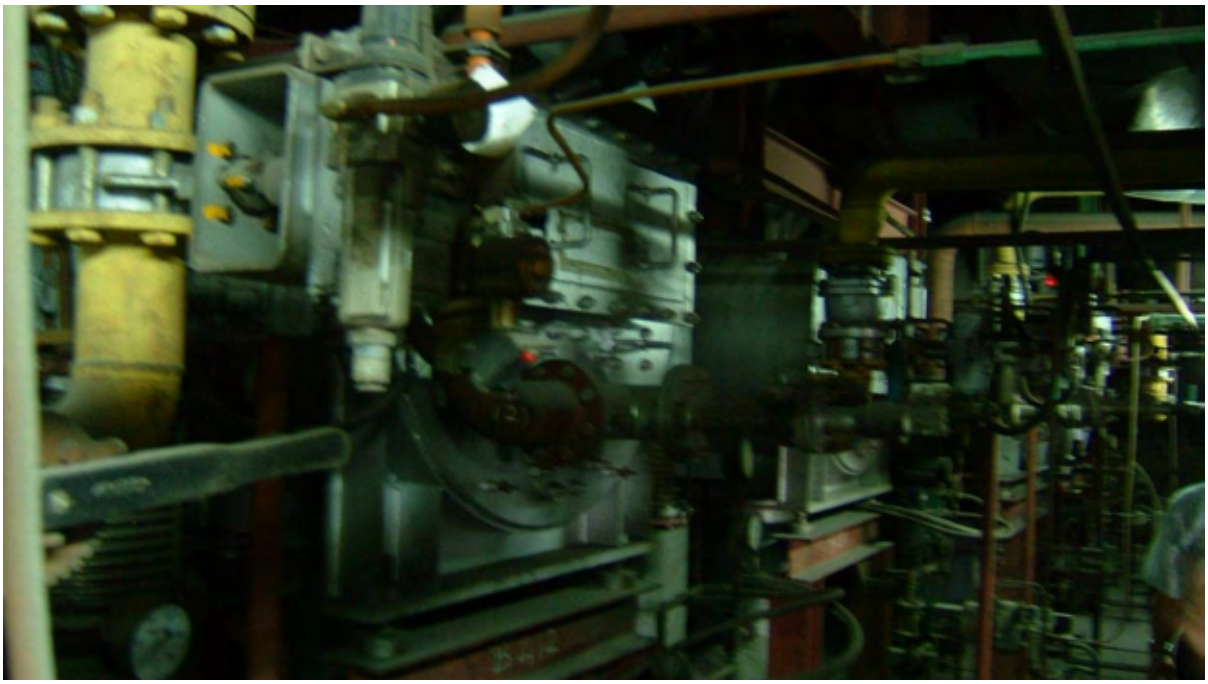
d. The steel price makers are scrap prices, China and PT Krakatau Steel.

(5) Photos of the plant

1) Entrance of the company

2) Electric arc furnace (left); electric furnace preheater/dust collector (right)

3) Burner of the rolling heating furnace (regenerative burner)



4) Control screen of the regenerative burner

5) Rolling mill

6) Products of PT GUNUNG GARUDA

3. PT SEMEN PADANG (Cement)

(1) Overview of the plant

Establishment: 1910
Address: JI. Raya Indarung 25237 Sumatera Barat
Production volume: Cement 5.365 million ton/year; Clinker 4.89 million ton/year (2009)

(2) Schedule

Date: March 15, 2010
10:00 - 10:30: Greetings, explanation of the purport, self introduction
10:30 - 12:50: Overview of the company (PT SEMEN PADANG)
12:50 - 13:50: Lunch, etc.
13:50 - 14:30: Plant tour (whole plant)
14:30 - 15:00: Q&As

(3) Interviewee

PT Semen Padang
Mr. Minto Saksono (Production Manager)
Mr. Ujang Friatna (Production Staff)
Mr. Mardian (Production Staff)
Mr. Benny Wendry, MM (Secretary)

Ministry of Industry
Center for Research and Development for Resource, Environment and Energy
Agency of Research and Development of Industry
Ms. Eva Dasmita
General Directorate for Agriculture and Chemistry Based Industries
Directorate for Down Chemical Industries
Ms. Putu Nadi Astuti

JICA STUDY TEAM
Mr. Hirai (Team Leader), Mr. Hachiuma, Mr. Asep(Interpreter)
Ms. Diah Febriani, ST(EMI), Mr. Safri Saipulloh, ST(EMI)

(4) Details

1) Greetings, explanation of the purport, self introduction

2) Overview of the company (PT SEMEN PADANG)

- Currently, plants II to V (Indarung) are operating.
- Production capacity: clinker 5.49 million ton/year; cement 6.5 million ton/year
- Production items are OPC1, OPC2, OPC3, OPC4, OWC, SMC, PPC and PCC.
- Company ownership ratio: Semen Gresik 99.99%; Padang workers 0.01%
  --> In 1995, the company consolidated three companies (Gresik, Padang and Tonasa) in order to counter Indocement.
- The materials of clinker consist of lime ±80%, soil ±16%, silica ±3% and slag ±1%. The materials of cement (OPC1) consist of clinker ±96% and gypsum ±4%.
- Production process: raw material mill --> ESP --> rotary kiln --> clinker storage --> cement mill --> cement storage
- Energy used
  a. Electricity: 95 - 115 kWh/ton-cement
  b. Thermal: 760 - 830 kcal/kg-clinker
  c. Coal: 0.14 - 0.17 kg-coal/kg-clinker
  d. Oil (diesel oil): used only to start up the rotary kiln
- Energy-saving measures to be implemented
  a. An exhaust-heat power generation facility is being installed in plant V, and will be put into operation in 2011.
     Power generation capacity: 8.5 MW
     CO2 reduction: 47,000 ton-CO2/year
     Cost: 200 billion Rp
     (JFE: 130 billion Rp; PT Semen Padang: 70 billion Rp)
     Advantage: 33 billion Rp/year
  b. Blended cement
     (Other materials [pozzolana, fly ash, etc.] are used as an alternative to clinker)
     Cost: 65 billion Rp
  c. Replacement of inefficient separators
     Cost: 18 billion Rp
     Specific consumption: 42 kWh/ton-cement → 38 kWh/ton-cement
- Specific consumptions and fuel princes in 2009:
  a. Coal: specific consumption 0.16 ton-coal/ton-cement; price 668,000 Rp/ton-coal
  b. Electricity: specific consumption 110 kWh/ton-cement; price 534 Rp/kWh
- Cement plants in Indonesia:
  a. There are 10 plants owned by 9 companies (only Indocement has two plants).
  b. Indocement has the largest production capacity, which is 15.65 million ton/year.
  c. All plants provide the same quality.

3) Plant tour
- Raw material mill
- ESP
- Rotary kiln
- Clinker storage

- Cement mill
- Cement storage
- Site for Waste Heat Recovery boiler installation
- Site for AQC installation
- Site for generator installation

4) Q&As

- Of all the electricity generated in West Sumatra, 50% is represented by hydraulic power generation represents and the rest by thermal power generation. In the dry season, water shortage causes shortage of power generation capacity.
- Purchasers of coal are Jambi and Bengkulu, and its use is rotary kilns.
- Coal rank in caloric value is 5,000 - 6,000 kcal/ton.
- For private power generation, private companies can build power generation facilities. However, PT Semen Padang cannot because it is a state-run enterprise. In fact, we proposed a thermal power generation facility (35 MVA x 3) in 2007, but the proposal was rejected in 2009.
- There are three electricity contracts with PLN: 90 MVA/TT 150 kV for plants, 4 MVA/TM 20 kV for a pier and 0.26 MVA/TM 20 kV for the pack plant. Electricity is received at 30 MVA x 3.

(5) Photos

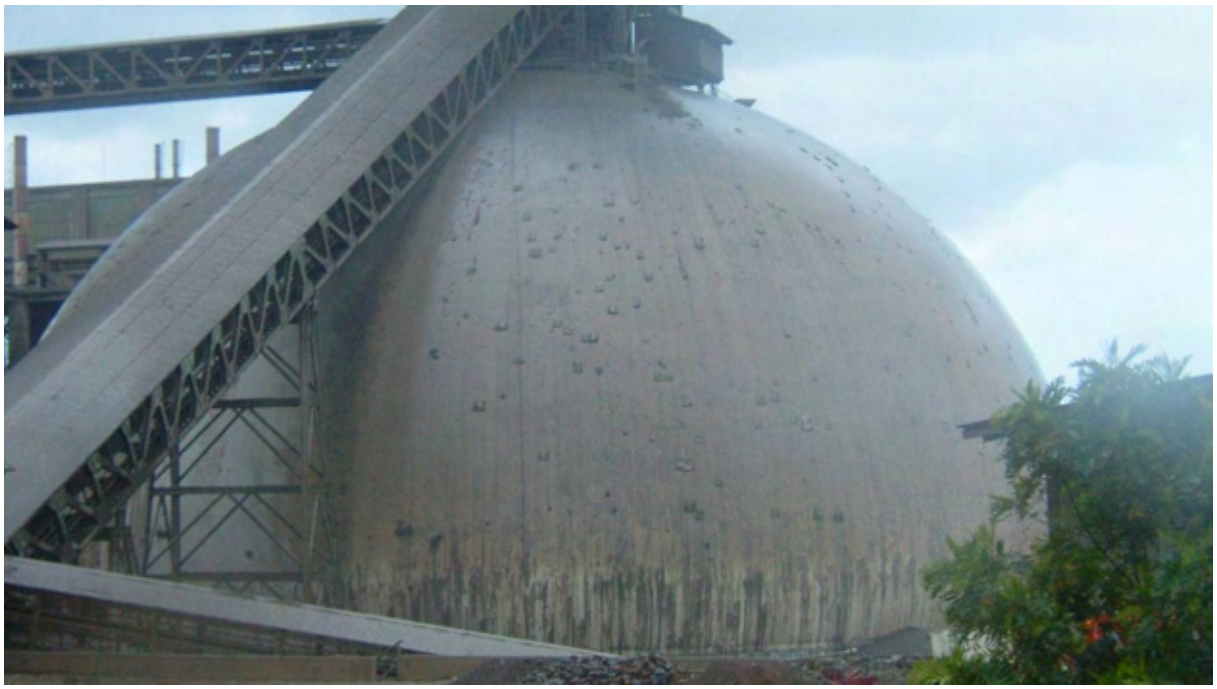
1) Company symbol

2) Lime stone mine

3) Plant layout

4) ESP, Rotary Kiln

5) Clinker Storage



6) Site for Waste Heat Recovery boiler installation

7) Site for generator installation

4. PT BANGUN SARANA BAJA (Iron and Steel)

(1) Overview of the plant

Establishment: 2008
Address:JL. Raya Serang KM. 25 Balaraja-Tangerang 15610, Indonesia

(2) Schedule

Date: March 17, 2010
9:00 - 9:30: Greetings, explanation of the purport, self introduction
9:30 - 10:00: Overview of the company
10:00 - 10:30: Plant tour
10:30 - 10:40: Q&As

(3) Interviewee

PT BANGUN SARANA BAJA
Mr. Gim/Teguh Raharjo (Production Manager)

Ministry of Industry
Center for Research and Development for Resource, Environment and Energy
Agency of Research and Development of Industry
Mr. Juwarso
Directorate General of Metal Machinery Textile and Multivarious Industry
Directorate of Metal Industry
Ms. Flori Daryanri

JICA STUDY TEAM
Mr. Hirai (Team Leader), Mr. Hachiuma, Mr. Asep(Interpreter)
Ms. Diah Febriani, ST(EMI), Mr. Muhammad Haikal Nur, ST(EMI)

(4) Details

1) Greetings, explanation of the purport, self introduction

2) Explanation of the overview of the plant
- The company was established in 1996 (head office is in Gresik), and this plant started production in February 2009.
- The plant has 10 batch induction furnaces (made in China and Taiwan), each with a capacity of 2.5 ton/h.
- Currently, 4 of these furnaces are operating to produce 6 to 7 batch/day --> production volume:

60 to 70 ton/day

- The continuous reheating furnace (made in Taiwan) for rolling is a gas (LPG) furnace and has a capacity of 35 ton/h.
- The induction furnaces operate from 22:00 to 7:00, and the reheating furnace from 7:00 to 17:00 (from 18:00 to 22:00, which are the peak hours, they are inoperative because the electricity charge is high).
- The contract electricity is 8 MW, and the price is 850 Rp/kWh (400 Rp/kWh for households).
- Specific consumption (kWh/ton): unknown
- The LPG price is 8,700 Rp/kg (that of state-run gas company BGN is 3,000 to 4,000 Rp/m3).
- Scraps are procured domestically (import requires approval of MOI).

3) Facility tour

- Induction Furnace
- Reheating Furnace
- Rolling Machine

4) Comments on energy saving

- The induction furnace is an old, inefficient technology.
- We should start with data (production volume, fuel consumptions, etc.) collection in order to be conscious of the specific consumption.
- The next step is to work on the improvement while referring to the data.
- To improve the specific consumption, it is also important to increase the utilization rate.
- We should also be conscious of how much scrap is used per ton of the product (yield of raw material) by collecting data.
- The result of checking the data on the plant indicates that the production volume was 49.0425 ton/day and the electricity consumption was 38,675 kWh. The calculated specific consumption was 788.6 kWh/ton.

(5) Photos

1) Scrap

2) Billet

3) Induction Furnace

4) Reheating Furnace

Attachment 2

Review of Energy Audit by PT EMI

Building: 30 units

Industry: 20 units

Building 1

Review of energy audit of building

1. General

Name of Building	1	Location	Jakarta
Category of Building	Commercial Building	Total floor area (P)	81,153 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption		Energy cost (Rp/year)
1	Electricity consumption	15,026,880	kWh/year	8,264,784,000
2	Heat Consumption		kWh/year	
3	Auto power producing		kWh/year	
4	Total energy consumption	15,026,880	kWh/year	8,264,784,000

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
Energy management program in house keeping		Replacement of 4 units of chiller	

5 Improvement Cost : Rp. 6,000,000,000

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	5,440,066	kWh/year	550	2,720,023,300		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Building 2

Review of energy audit of building

1. General

Name of Building	2	Location	Jakarta
Category of Building	Commercial Building	Total floor area (P)	20,330 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption		Energy cost (Rp/year)
1	Electricity consumption	5,516,207	kWh/year	3,033,913,850
2	Heat Consumption		kWh/year	
3	Auto power producing		kWh/year	
4	Total energy consumption	5,516,207	kWh/year	3,033,913,850

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
Chiller operation re-schedulling	AC performance improvement		
AC set point arrangement			
Demand side management			

5 Improvement Cost : Rp. 100,000,000

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	731,107	kWh/year	550	365,554,296		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Building 3

Review of energy audit of building

1. General

Name of Building	3	Location	Jakarta
Category of Building	Commercial Building	Total floor area (P)	25,386 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption		Energy cost (Rp/year)
1	Electricity consumption	8,087,437.5	kWh/year	4,448,090,625
2	Heat Consumption		kWh/year	
3	Auto power producing		kWh/year	
4	Total energy consumption	8,087,437.5	kWh/year	4,448,090,625

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
Night load decreasing	Energy management system implementation		
Rising AHU temperature setting			

5 Improvement Cost : Rp. 100,000,000

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	1,307,252	kWh/year	550	590,877,760		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing all the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

Building 4

Review of energy audit of building

1. General

Name of Building	4	Location	Jakarta
Category of Building	Commercial Building	Total floor area (P)	26,257 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption		Energy cost (Rp/year)
1	Electricity consumption	3,582,144	kWh/year	1,970,179,200
2	Heat Consumption		kWh/year	
3	Auto power producing		kWh/year	
4	Total energy consumption	3,582,144	kWh/year	1,970,179,200

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
Night electricity load decreasing	Installation of window film		
Pipe leakage fixing	Refigerant change		
Routine AC maintenance			
House Keeping			

5 Improvement Cost : Rp. 288,000,000

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	2,120,258	kWh/year	550	893,212,752		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Building 5

Review of energy audit of building

1. General

Name of Building	5	Location	Jakarta
Category of Building	Hotel Building	Total floor area (P)	48,384 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption		Energy cost (Rp/year)
1	Electricity consumption	12,546,442	kWh/year	6,900,543,100
2	Heat Consumption		kWh/year	
3	Auto power producing		kWh/year	
4	Total energy consumption	12,546,442	kWh/year	6,900,543,100

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
Cooling load optimization	Attaching compressor to boiler		
House Keeping	Replacement of refrigerant		
Replacing of incandecent light-bulb to PLC light bulb	Installation of VSD		
	Implementing of cogeneration		

5 Improvement Cost: 15,080,000,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	1,553,337	kWh/year	550	854,335,350		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented. But further, they will implement cogeneration by funding from a leasing or ESCO company

Building 6

Review of energy audit of building

1. General

Name of Building	6	Location	Jakarta
Category of Building	Hospital	Total floor area (P)	50,246 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	7,495,200 kWh/year	4,122,360,000
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	7,495,200 kWh/year	4,122,360,000

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 Energy Management System implementation	Replacement of refrigerant		
2	Economizer installation in boiler		

5 Improvement Cost: 59,040,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	1,016,075	kWh/year	550	558,841,250		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Building 7

Review of energy audit of building

1. General

Name of Building	7	Location	Jakarta
Category of Building	Hospital	Total floor area (P)	43,350 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	11,794,880 kWh/year	6,487,184,000
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	11,794,880 kWh/year	6,487,184,000

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 Increasing temperature setting in AC		Replacement of chiller	
2 House keeping		Installation of capacitor bank	

5 Improvement Cost: 855,000,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	1,624,125	kWh/year	550	893,268,750		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Building 8

Review of energy audit of building

1. General

Name of Building	8	Location	Yogyakarta
Category of Building	Other (Social building)	Total floor area (P)	30,520 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	1,695,204 kWh/year	932,362,200
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	1,695,204 kWh/year	932,362,200

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 Reducing electricity load at night	Installation of window-film		
2 Reducing numbers of transformator	Replacement of refrigerant		
3 Routine maintenance of AC			

5 Improvement Cost: 167,000,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	725,690	kWh/year	550	399,129,500		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Building 9

Review of energy audit of building

1. General

Name of Building	9	Location	Yogyakarta
Category of Building	Government building	Total floor area (P)	4,059 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	203,380 kWh/year	111,859,000
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	203,380 kWh/year	111,859,000

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 Reducing of installed power capacity	Modification of vertical blind	Replacement of Ballast	
2 House keeping	Replacement of refrigerant	Replacing of incandecent light-bulb with PLC light bulb	

5 Improvement Cost: 21,960,930 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	56,164 kWh/year	550	30,890,338		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Government
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Building 10

Review of energy audit of building

1. General

Name of Building	10	Location	Yogyakarta
Category of Building	Hospital	Total floor area (P)	40,000 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	9,284,571 kWh/year	5,106,514,050
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	9,284,571 kWh/year	5,106,514,050

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 Reducing of installed power capacity	Boiler's excess air adjustment and dumper activation	Installation of motorized dumper	
2 House keeping	Humidifier modification		

5 Improvement Cost: 303,200,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	1,174,736	kWh/year	550	646,104,800		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited and lack of knowledge of energy efficiency

Building 11

Review of energy audit of building

1. General

Name of Building	11	Location	Surabaya
Category of Building	Other (Social building)	Total floor area (P)	44,912 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	1,766,400 kWh/year	971,520,000
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	1,766,400 kWh/year	971,520,000

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 Reducing power intensity in some places	Installation of film-window in 2 (two) places	Installation of electronic ballast in 2 (two) places	
2	Replacement of refrigerant		

5 Improvement Cost: 544,222,187 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	520,939	kWh/year	550	286,516,450		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing all the recommendation, except replacement of refigerant (not yet implemented)
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

Building 12

Review of energy audit of building

1. General

Name of Building	12	Location	Surabaya
Category of Building	Government building	Total floor area (P)	4,950 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	820,800 kWh/year	451,440,000
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	820,800 kWh/year	451,440,000

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1	House keeping	Insallation of door closers	Installation of electronic ballast	
2	Reducing of installled power capacity	Replacement of refrigerant	Replacement of AC 15 PK to 3x2 PK	
3	Optimizing overall AC performance			

5 Improvement Cost: 106,040,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	117,197	kWh/year	550	64,458,350		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Building 13

Review of energy audit of building

1. General

Name of Building	13	Location	East Java
Category of Building	Hospital	Total floor area (P)	12,642 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	381,480 kWh/year	209,814,000
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	381,480 kWh/year	209,814,000

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 House keeping	Replacement of refrigerant	Replacement of incandecent light-bulb with PLC light bulb	

5 Improvement Cost: 43,670,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	90,587	kWh/year	550	49,822,630		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Building 14

Review of energy audit of building

1. General

Name of Building	14	Location	East Java
Category of Building	Hospital	Total floor area (P)	7,008 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	184,987 kWh/year	101,742,850
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	184,987 kWh/year	101,742,850

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 Routine maintenance of AC	Replacement of refrigerant	Replacement of TL 40 W light bulbs with 18 W	
2 Reducing electricity load at night			

5 Improvement Cost: 7,169,520 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	41,574	kWh/year	550	22,865,601		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost
	When	After implementation of audit energy
	How	By implementing therecommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

Building 15

Review of energy audit of building

1. General

Name of Building	15	Location	Surabaya
Category of Building	Hospital	Total floor area (P)	2,184 person

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	682,954 kWh/year	375,624,700
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	682,954 kWh/year	375,624,700

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 House keeping	Insallation of door closers		
2 Routine maintenance of AC	Installation of window-films		
	Replacement of refrigerant		

5 Improvement Cost: 115,014,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	115,039	kWh/year	550	63,271,450		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Building 16

Review of energy audit of building

1. General

Name of Building	16	Location	Surabaya
Category of Building	Hospital	Total floor area (P)	29,953 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	7,468,671 kWh/year	4,107,769,050
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	7,468,671 kWh/year	4,107,769,050

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 House keeping	Reducing excess air in 2 boiler	Replacement of refrigerant	
2 Improving routine maintenance of split AC	Installation of window-films		
3 Reducing power intensity of light	Installation of EMCS		

5 Improvement Cost: 760,067,863 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	1,003,634	kWh/year	550	551,998,700		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Building 17

Review of energy audit of building

1. General

Name of Building	17	Location	Medan
Category of Building	Commersial building	Total floor area (P)	143,136 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	23,298,840 kWh/year	12,814,362,000
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	23,298,840 kWh/year	12,814,362,000

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 Deactivating 4 units of elevator	Improving chiller performance		
2	VSD installation		
3	chiller control installation		

5 Improvement Cost: 910,000,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	1,555,397	kWh/year	550	855,468,350		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing some of recommendations
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

Building 18

Review of energy audit of building

1. General

Name of Building	18	Location	Medan
Category of Building	Hotel building	Total floor area (P)	8,150 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	2,251,200 kWh/year	1,238,160,000
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	2,251,200 kWh/year	1,238,160,000

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 House keeping	Replacement of refrigerant	Replacement of chiller	

5 Improvement Cost: 294,500,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	466,368	kWh/year	550	256,502,400		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

Building 19

Review of energy audit of building

1. General

Name of Building	19	Location	Palembang, South Sumatera
Category of Building	Government building	Number of Employee	750 person
Total floor area (P)	14,475 m2		

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	543,360 kWh/year	298,848,000
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	543,360 kWh/year	298,848,000

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 House keeping	Replacement of refrigerant	Replacement of incandecent light bulb 40 W with LHE 18 W	
2 Reducing operating hours of laser light of 5000 W		Replacement of TL light bulb 40 W with TL 18 W	
3 Reducing load electricity of night time			

5 Improvement Cost: 21,425,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	305,904	kWh/year	550	168,247,151		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Building 20

Review of energy audit of building

1. General

Name of Building	20	Location	Palembang, West Sumatera
Category of Building	Hospital	Number of Employee	1731 person
Total floor area (P)	39,605 m2		

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	3,604,911 kWh/year	1,982,701,050
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	3,604,911 kWh/year	1,982,701,050

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 House keeping	Replacement of refrigerant	Replacement of TL 40 W with TL 36 W	
2 Reducing installed power capacity	Fuel switching from diesel to gas		

5 Improvement Cost: 302,015,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	490,011	kWh/year	550	269,506,050		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited.

Building 21

Review of energy audit of building

1. General

Name of Building	21	Location	Palembang, South Sumatera
Category of Building	Hospital	Number of Employee	975 person
Total floor area (P)	16,079 m2		

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	2,935,000 kWh/year	1,614,250,000
2	Heat Consumption	- kWh/year	
3	Auto power producing	- kWh/year	
4	Total energy consumption	2,935,000 kWh/year	1,614,250,000

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 House keeping	Replacement of refrigerant	Reducing numbers of pump through installation of water tower	
2 Reducing installed power capacity			
3 Chiller operating hour adjustment			

5 Improvement Cost: 111,500,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	436,822	kWh/year	550	240,252,100		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

Building 22

Review of energy audit of building

1. General

Name of Building	22	Location	Lampung
Category of Building	Government building	Number of Employee	400 person
Total floor area (P)	5,233 m2		

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	1,044,007 kWh/year	574,203,850
2	Heat Consumption	- kWh/year	
3	Auto power producing	- kWh/year	
4	Total energy consumption	1,044,007 kWh/year	574,203,850

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1	House keeping	Modification of capasitor bank		
2	Reducing installed power capacity	Installation of shading or double window		
3	Removing a unit of TL 36 W per armatur			

5 Improvement Cost: 289,000,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	339,514	kWh/year	550	186,732,700		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Building 23

Review of energy audit of building

1. General

Name of Building	23	Location	Bali
Category of Building	Government building	Total floor area (P)	15,609 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	612,660 kWh/year	336,963,000
2	Heat Consumption	- kWh/year	
3	Auto power producing	- kWh/year	
4	Total energy consumption	612,660 kWh/year	336,963,000

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 House keeping	Replacement of refrigerant	Replacement of incandescent light bulb (14 W) with PLC (11 W)	
2	Replacement of armatur and istallation of electronic ballast		

5 Improvement Cost: 254,750,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	113,344	kWh/year	550	62,339,200		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Government
In the case of non- implementation	Reason & hurdles	Cost budgeting is limited. Only low cost recommendation will be implemented.

Building 24

Review of energy audit of building

1. General

Name of Building	24	Location	Mataram, West Nusa Tenggara
Category of Building	Government building	Total floor area (P)	10,800 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	371,300 kWh/year	204,215,000
2	Heat Consumption	- kWh/year	
3	Auto power producing	- kWh/year	
4	Total energy consumption	371,300 kWh/year	204,215,000

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 Routine maintenance of AC	Installation of water tank		
2 House keeping	Replacement of refrigerant		
3 Reducing installed power capacity	Installation of electronic ballast in TL 36 W		

5 Improvement Cost: 188,522,600 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	111,789	kWh/year	550	61,483,950		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Government
In the case of non- implementation	Reason & hurdles	Cost budgeting is limited. Only low cost recommendation will be implemented.

Building 25

Review of energy audit of building

1. General

Name of Building	25	Location	Mataram, West Nusa Tenggara
Category of Building	Commercial building	Total floor area (P)	14,195 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	4,526,578 kWh/year	2,489,617,900
2	Heat Consumption	- kWh/year	
3	Auto power producing	- kWh/year	
4	Total energy consumption	4,526,578 kWh/year	2,489,617,900

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 House keeping	Replacement of refrigerant		
2 Routine maintenance of AC	Installation of galss film		
3 Reducing electricity load at night-time			

5 Improvement Cost: 145,000,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	1,034,172	kWh/year	550	568,794,600		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

Building 26

Review of energy audit of building

1. General

Name of Building	26	Location	Lombok, Mataram
Category of Building	Hotel Building	Total floor area (P)	8,000 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	1,144,320 kWh/year	629,376,000
2	Heat Consumption	- kWh/year	
3	Auto power producing	- kWh/year	
4	Total energy consumption	1,144,320 kWh/year	629,376,000

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 House keeping	Installation of water tank		
2 Remove a unit of AC 5 PK	Replacement of refrigerant		

5 Improvement Cost: 42,600,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	139,646	kWh/year	550	76,805,300		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

Building 27

Review of energy audit of building

1. General

Name of Building	27	Location	Mataram
Category of Building	Other (Social Building)	Total floor area (P)	3,122 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	116,230 kWh/year	63,926,500
2	Heat Consumption	- kWh/year	
3	Auto power producing	- kWh/year	
4	Total energy consumption	116,230 kWh/year	63,926,500

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 Routine maintenance of AC	Installation of window film	Replacement of incandescent light bulb with PLC	
2 House keeping	Modification of loading in transformator		

5 Improvement Cost: 186,500,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	352,760	kWh/year	550	194,018,000		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Building 28

Review of energy audit of building

1. General

Name of Building	28	Location	Makassar, South Sulawesi
Category of Building	Hospital	Total floor area (P)	4,035 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	878,799 kWh/year	483,339,450
2	Heat Consumption	- kWh/year	-
3	Auto power producing	- kWh/year	-
4	Total energy consumption	878,799 kWh/year	483,339,450

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1 House keeping	Installation of window film in *Poliklinik* building		
2 Reducing excess air of boiler stack	Installation of door closer in *Poliklinik* building		
3 Improvement of maintenance of AC	Replacement of refrigerant		
4 Improvement of chiller maintenance			
5 Remove AHU supply to IRD building and install air cooled package chiller for IRD building 2nd floor			

5 Improvement Cost: 475,169,656 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	395,824	kWh/year	550	217,703,200		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented. And it is difficult to get refrigerant in this area

Building 29

Review of energy audit of building

1. General

Name of Building	29	Location	Jakarta
Category of Building	Government Building	Total floor area (P)	7,426 m2

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2009	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	622,968 kWh/year	495.5 million
2	Heat Consumption	kWh/year	
3	Auto power producing	kWh/year	
4	Total energy consumption	622,968 kWh/year	495.5 million

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1	Starting operational electricity earlier	Optimizing lighting at night	Replacing magnetic ballast with electronic ballast	
2	Reducing night load	Replacing CFC refrigerant (R-22 freon) to hydrocarbon HC 22	Replacing dimmed lamps with brighter lamps	
3		Installation of Air Conditioner automatic regulator hardware in meeting rooms	Replacing Central Air Cinditioner with Several unit of Split Air Conditioner	
4				
5				

5 Improvement Cost: 116.98 Rp.million

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	317,785 kWh/year	550	158.894 million/year		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	
	When	
	How	
	Financial Resources	
In the case of non- implementation	Reason & hurdles	Implementation of energy audit was just completed, so the recommendations not yet implemented because it is still in planning and waiting for the budget expense

Building 30

Review of energy audit of building

1. General

Name of Building	30	Location	Jogjakarta
Category of Building	Commercial Building	Total floor area (P)	30,000 m2

2 Implementation of Audit Energi

The reason for implementation	Recipient Request	
Date of implementation	2007	
Duration of implementation	3 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Technician
	Man days	105 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp/year)
1	Electricity consumption	5,408,736 kWh/year	2.974 billion
2	Heat Consumption	kWh/year	
3	Auto power producing	kWh/year	
4	Total energy consumption	5,408,736 kWh/year	2.974 billion

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
Regular maintenance of condenser units	Reduction of transformator units of 4 (four) to 1 (one) can improve the efficiency of electrical energy consumption by 20.68%	Replacing CT in trafo panel 2 and 4 because of metering inaccuracy	Decrease power from 5450 kVA to 2500 kVA

5 Improvement Cost: : 200,000 Rp.thousand

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	163,757.30 kWh/year	550	90.06 million/year		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

Industry 1

Review of energy audit of industry

1. General

Name of Building	31	Location	Bandung
Category of Building	Textile	Number of Employee	530 person
Products	Weaving	Amount of product	934,050 yard/month
	Dying		

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption		Energy cost (Rp/year)
1	Electricity consumption	5,921,148	kWh/year	3.256 billion
2	Heat Consumption	32,113,683	kWh/year	6.053 billion
3	Auto power producing		kWh/year	
4	Total energy consumption	38,034,831	kWh/year	9.309 billion

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1	Voltage Correction of Transformator 1 and 2		
2	Installation of fin in AC Evaporator to perform better coolling		
3	Reset Air Inlet in boiler to perform better coal combustion		

5 Improvement Cost: 95 Rp.million

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	1,640,311	kWh/year	550	902.171 million/year		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

9 Description of process and energy utility

a. Process flow production

Industry 2

Review of energy audit of industry

1. General

Name of Building	32	Location	Bandung
Category of Building	Textile	Number of Employee	739 person
Products	Spinning	Amount of product	416,405 kg/bln
	TFO		45,051 kg/bln
	Bleaching		207,010 kg/bln
	Dyeing		

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption		Energy cost (Rp/year)
1	Electricity consumption	19,758,393	kWh/year	10.543 billion
2	Heat Consumption	25,675,614	kWh/year	6.054 billion
3	Auto power producing		kWh/year	
4	Total energy consumption	45,434,007	kWh/year	16.597 billion

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Others
1	Voltage Correction of Transformator 1 and 2		
2	Adding Cable to SDP 1 ,6,12Unit		

5 Improvement Cost: 120 Rp.million

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	91,488	kWh/year	550	9.96 million/year		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

9 Description of process and energy utility

a. Process flow energy utilities

Industry 3

Review of energy audit of industry

1. General

Name of Industry	33	Location	Tanggerang
Category of Industry	Textile	Number of Employee	N/A person
Products	Spinning	Amount of product	10030 Bale/month
	Weaving		3800000 Yard/month
	Yarn Dyeing		200925 Ton/month
	Dyeing Finishing		4000000 Yard/month

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp)
1	Electricity consumption	59,215,500 kWh/year	32,568,525,000
2	Heat Consumption	95,653,012 kWh/year	52,609,156,600
3	Auto power producing	kWh/year	
4	Total energy consumption	154,868,512 kWh/year	85,177,681,600

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1	Increasing output voltage on weaving area from 365 V become 400 V	Replacing water washer pump motor aproacing to actual power	
2	increasing carding speed machine from 5 step become 20 step		
3	installing transparent roof at finishing area		

5 Improvement Cost : 103.000.000 Rp

6 Effect of saving energy and saving cost

No.	Saving Energy	Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
1	364,687 kWh/year	550	200,577,600		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing some of recommendations
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

9 Description of process and energy utility

a. Process FlowProduction

Industry 4

Review of energy audit of industry

1. General

Name of Industry	34	Location	Langensari Unggaran
Category of Industry	Textile	Number of Employee	2472 person
Products	Yarn	Amount of product	710,000 Bale/year
	Grey Fabric		109,000,000 Yard/year
	Finnish		119,000,000 Yard/year

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp)
1	Electricity consumption	77,447,104 kWh/year	42,595,907,200
2	Heat Consumption	12,357,466 kWh/year	788,070,000
3	Auto power producing	648,000 kWh/year	136,048,896
4	Total energy consumption	90,452,570 kWh/year	43,520,026,096

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1		Install inverter (VSD) at ID fan boiler motor		
2	Turn off unnacesary trafo (2 trafo at Spinning 1 & 3 area)			
3	Turn off unnacesary compressor (1 compressor at Spinning 3 area)			

5 Improvement Cost 80,000,000 Rp

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
1	469,580 kWh/year	550	258,269,000		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing lthe recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

9 Description of process and energy utility

a. Process flow energy utilities

Industry 5

Review of energy audit of industry

1. General

Name of Industry	35	Location	Cirebon
Category of Industry	Textile	Number of Employee	417 person
Products	Grey	Amount of product	1,500,000 Yard/month

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp)
1	Electricity consumption	19,929,360 kWh/year	10,961,148,000
2	Heat Consumption	kWh/year	
3	Auto power producing	kWh/year	
4	Total energy consumption	19,929,360 kWh/year	10,961,148,000

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1	Lowering PLN power contracts connected to 3000 kVA			
2	Conversion from diesel to fuel for diesel generators MFO			
3	Conversion from diesel fuel to MFO for steam boilers			
4		Addition kWh meters for each unit of production machines		

5 Improvement Cost 44,000,000 Rp

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
1	4,277,124 kWh/year	550	1,924,712,832		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

9 Description of process and energy utility

a. Process flow energy utilities

Industry 6

Review of energy audit of industry

1. General

Name of Industry	36	Location	Bandung
Category of Industry	Textile	Number of Employee	N/A person
Products	Yarn	Amount of product	77,658 Bale
	Fabric		22,529,640 yards
	dyed fabric		24,103,194 kg
	Finishing Product		19,910,736 yards

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp)
1	Electricity consumption	23,190,228 kWh/year	12,754,625,400
2	Heat Consumption	105,101,190 kWh/year	6,701,102,500
3	Auto power producing	kWh/year	
4	Total energy consumption	128,291,418 kWh/year	19,455,727,900

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1	Install Inverter (VSD) at boiler ID fan motor			
2	Increasing of boiler eficience 70% to 85%			
3	Closing the hole-burning engine nozzles fur fabric (15 cm)			
4		Turn off chillers at night		

5 Improvement Cost 80,000,000 Rp

6 Effect of saving energy and saving cost

No.	Saving Energy		Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
1	4,445,216	kWh/year	550	9,265,642,000		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing lthe recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

9 Description of process and energy utility

a. Process flow energy utilities

Industry 7

Review of energy audit of industry

1. General

Name of Industry	37	Location	Sidoarjo,Jawa Timur
Category of Industry	Steel	Number of Employee	1000 person
Products	Billet	Amount of product	150,000 Ton
	Concrete iron		145,000 Ton

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp)
1	Electricity consumption	111,570,000 kWh/year	48,421,380,000
2	Heat Consumption	52,418,883,333 kWh/year	3,188,240,711,000
3	Auto power producing	kWh/year	
4	Total energy consumption	52,530,453,333 kWh/year	3,236,662,091,000

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1	Decrease compressors suction air temperature	Using VSD on motor fan dust collector		
2	Decrease compressors discharge air pressure	Optimized Compressors Load		
3		Optimized mill 3 compressors load		
4		Optimized electric motor efficiency		

5 Improvement Cost 500,000,000 Rp

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
1	2,958,575 kWh/year	545.50	1,613,891,084		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited.

9 Description of process and energy utility

a. Process flow energy utilities

Industry 8

Review of energy audit of industry

1. General

Name of Industry	38	Location	Jakarta
Category of Industry	Steel/Metal	Number of Employee	442 person
Products	Deep Groove Bearing	Amount of product	38,000,000 Piece

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp)
1	Electricity consumption	14,566,966 kWh/year	8,011,831,244
2	Heat Consumption	1,280,000 kWh/year	518,400,000
3	Auto power producing	kWh/year	
4	Total energy consumption	15,846,966 kWh/year	8,530,231,244

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1	Turn off AHU in new production area which is not yet use			
2	Decrease Compressors suction air temperature from 34 deg C to 27 deg C			
3		tower efficiency		
4			Replace colling water pump of HE cooling towerfrom 5.5 kW to 1.5 kW	
5		1.02 kW/TR to 0.65 kW/TR by increasing fresh air supply to		
6	Reduce number of lamp in new production corridor area			

5 Improvement Cost 15,000,000 Rp

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
1	166,908 kWh/year	550	91,799,400		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing lthe recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

9 Description of process and energy utility

a. Process flow energy utilities

Industry 9

Review of energy audit of industry

1. General

Name of Industry	39	Location	Jalan Raya cirebon - Bandung Km. 12 Plumbon, Cirebon
Category of Industry	Textile	Number of Employee	429 person
Products	combed/carded string for knitting	Amount of product	22,000 bale/year
	combed/carded string for weaving		

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption		Energy cost (Rp)	
1	Electricity consumption	2,470,104	kWh/year	10.587	billion
2	Heat Consumption		kWh/year		
3	Auto power producing		kWh/year		
	Power Production		kWh/year		
	Fuel Consumption		kWh/year		
4	Total energy consumption	2,470,104	kWh/year	10.587	billion

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1	Installation of kWh-meter (4 unit)	Replacing water pump motor	
2	Adding more cable in electricity system	Replacing 250 TR Chiller with 400 TR Chiller	
3	Adding partition in water container to prevent return water mixed with chilled water		

5 Improvement Cost : 591 Rp.million

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)		Saving Cost		Unit Price (non subsidized)		Saving Cost
	839,960 kWh/year	550	Rp/kWh	65.846	Rp.million			

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non-implementation	Reason & hurdles	Cost budgeting by self funding is limited.

9 Description of process and energy utility

a. Process flow Production

Industry 10

Review of energy audit of industry

1. General

Name of Industry	40	Location	Bandung
Category of Industry	Textile	Number of Employee	2500 person
Products	woven fabrics wrap knitted fabrics	Amount of product	50 juta meter 10 juta meter

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp)
1	Electricity consumption	76,232,940 kWh/year	41,928,117,000
2	Heat Consumption	kWh/year	
3	Auto power producing	855,759 kWh/year	470,667,450
4	Total energy consumption	77,088,699 kWh/year	42,398,784,450

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1 Reducing power production 5% to efficient coal using			
2	Reducing water cooler temperature until 5 degree celcius		
3	Change preparation romm roof with transparent roof		

5 Improvement Cost 89,000,000.00 Rp

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
1	307,668.00 kWh/year	499.30	153,619,200.00		
2	152,441.00 kWh/year	535.29	81,600,000.00		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited.

9 Description of process and energy utility

a. Process flow energy utilities

Industry 11

Review of energy audit of industry

1. General

Name of Industry	41	Location	Sidoarjo
Category of Industry	Manufacturing	Number of Employee	180 person
Products	Twist Insulated Cable	Amount of product	250 Ton/month

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2008	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp)
1	Electricity consumption	968,688 kWh/year	581,212,800
2	Heat Consumption	3,427,656 kwh/year	233,080,608
3	Auto power producing		
4	Total energy consumption	4,396,344 kwh/year	814,293,408

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1 Implementation of Management Energy System			
2 Turn off the cooling tower fan when production machine stop			
3	Installation of temperature sensor in alumunium furnace		
4		Replacing of fan cooling tower blade	
5		Replacing of extruder motor from DC to AC	
6	Installation of inverter in drawing machine motor		

5 Improvement Cost: 295,000,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	1,279,382.72 kWh/year	600	469,596,240		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited.

9 Description of process and energy utility

a. Process flow and energy utilities

Industry 12

Review of energy audit of industry

1. General

Name of Industry	42	Location	Sragen Central Java
Category of Industry	Textile	Number of Employee	4500 person
Products	Spinning Weafing Finishing	Amount of product	1.393.632 kg/month 3.939.075 yard/month 1.591.835 yard/month

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2008	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp)
1	Electricity consumption	65,452,800 kWh/year	39,271,680,000
2	Heat Consumption	56,826,420 kwh/year	8,552,376,000
3	Auto power producing		
4	Total energy consumption	122,279,220 kwh/year	47,824,056,000

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1	Implementation of Management Energy System			
2		Installation of exhaust gas sensor on boiler		
3		Installation of inverter on fan boiler motor ID and FD		
4		Installation of bypass pipe between in and out evaporator		
5		Repairing steam pipe isolation on finishing machine		

5 Improvement Cost: 222,000,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	2,487,568.32 kWh/year	550	983,324,976		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

9 Description of process and energy utility

a. Process flow and energy utilities

Industry 13

Review of energy audit of industry

1. General

Name of Industry	43	Location	Surabaya
Category of Industry	Steel	Number of Employee	495 person
Products	*hot rolled carbon steel plates*	Amount of product	350,000 Ton/Tahun

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2008	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp)
1	Electricity consumption	19,344,240 kWh/year	13,919,421,540
2	Heat Consumption	170,569,702 kwh/year	51,606,864,000
3	Auto power producing	kwh/year	
4	Total energy consumption	189,913,942 kwh/year	65,526,285,540

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1 Closing the door after entering furnace slab	Repairing slab exit door		
2 Implementing Energy Management System	Install VSD on the furnace fan motor FD		
3	Install converter on motor roller		

5 Improvement Cost: 5,282,000,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
	5,811,471 kWh/year	550	2,899,170,096		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing some of recommendations
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

9 Description of process and energy utility

a. Process flow and energy utilities

Industry 14

Review of energy audit of industry

1. General

Name of Industry	44	Location	Bandung
Category of Industry	Textile	Number of Employee	320 person
Products	Leather	Amount of product	460,000 kg/bulan

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2008	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp)
1	Electricity consumption	19,232,976 kWh/year	11,539,785,600
2	Heat Consumption	68,208,000 kwh/year	8,232,000,000
3	Auto power producing	kwh/year	
4	Total energy consumption	87,440,976 kwh/year	19,771,785,600

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1	Implementation of Management Energy System			
2	Replacement work of cooling tower 1 to cooling tower 2			
3		Replacement of heat isolation on therm oil pipe		
4		Installation of VSD on compressor 450 hp		

5 Improvement Cost: 885,000,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
1	3,762,876 kWh/year		156,786,548		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited.

9 Description of process and energy utility

a. Process flow and energy utilities

Industry 15

Review of energy audit of industry

1. General

Name of Industry	45	Location	Tegal, Central Java
Category of Industry	Textile	Number of Employee	500 person
Products	Yarn Grey	Amount of product	N/A N/A

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2008	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption	Energy cost (Rp)
1	Electricity consumption	6,847,385 kWh/year	3,378,000,000
2	Heat Consumption	7,930,497 kwh/year	2,166,000,000
3	Auto power producing	kwh/year	
4	Total energy consumption	14,777,882 kwh/year	5,544,000,000

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1	Merger transformator load spinning area of 4 to 2 transformer.	Installation of Inverter on ID fan boiler		
2	Implementing energy management system	Installation of Inverter on TFO machine		
3		installation o electric heater on boiler		
4				

5 Improvement Cost: 262,000,000 Rp.

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)	Saving Cost	Unit Price (non subsidized)	Saving Cost
1	2,560,113 kWh/year		388,946,260		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

9 Description of process and energy utility

a. Process flow and energy utilities

Industry 16

Review of energy audit of industry

1. General

Name of Industry	46	Location	Surabaya
Category of Industry	Steel/Metal	Number of Employee	74 person
Products	Concrete Iron	Amount of product	3,129 ton/month

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2008	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption		Energy cost (Rp)
1	Electricity consumption	987,488	kWh/year	493,744,000
2	Heat Consumption	935,889	kWh/year	716,640,000
3	Auto power producing		kWh/year	
4	Total energy consumption	1,923,377	kWh/year	1,210,384,000

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1	Discipline closing door check on reheating furnace	Installation of thermometer on reheating furnace		
2	Adjustment rolling process based on the thickness of raw materials plate	Preventing PLN fines by installing timer on motor rolling		
3	Applying Energy Management System			
4	Controlling energy sources utilization by using logbook			

5 Improvement Cost : 32 Rp.million

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)		Saving Cost		Unit Price (non subsidized)		Saving Cost
	480,222 kWh/year	500	Rp/kWh	199,185,506.40	Rp			

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

9 Description of process and energy utility

a. Process flow production

Industry 17

Review of energy audit of industry

1. General

Name of Industry	47	Location	Semarang	
Category of Industry	Steel/Metal	Number of Employee	300	person
Products	Concrete Iron	Amount of product	11,140	ton/year

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2008	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption		Energy cost (Rp)	
1	Electricity consumption	11,293,716	kWh/year	5,646,858,000	
2	Heat Consumption	1,174,690	kWh/year	1,415,240,400	
3	Auto power producing		kWh/year		
4	Total energy consumption	12,468,406	kWh/year	7,062,098,400	

4 Content of improvement (EE&C measures proposed at the energy audit)

Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
	nozzle burner repairment		
	Monitoring of melting process by installing electricity meter		
	Relocating cooling tower		
	Repairment on chimney		
	Repairment on inner part of reheating furnace		

5 Improvement Cost : 292 Rp.million

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)		Saving Cost		Unit Price (non subsidized)		Saving Cost
	1,485,261 kWh/year	550	Rp/kWh	313,776,000.00	Rp			

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

9 Description of process and energy utility

a. Process flow production

Industry 18

Review of energy audit of industry

1. General

Name of Industry	48	Location	Central Java
Category of Industry	Steel/Metal	Number of Employee	1623 person
Products	Concrete Iron	Amount of product	11,140 ton/year

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2008	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption		Energy cost (Rp)
1	Electricity consumption	70,960,000	kWh/year	53,559,500,645
2	Heat Consumption	140,586,526	kWh/year	17,727,420,923
3	Auto power producing		kWh/year	
4	Total energy consumption	211,546,526	kWh/year	71,286,921,568

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1	Turn of Chiller at night	Installation of inverter in motor feed water pump boiler	Replacing blade fan cooling tower	
2	Reduce compressor inlet air temperature	Repairment of broken steam trap		

5 Improvement Cost : 126 Rp.million

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)		Saving Cost		Unit Price (non subsidized)		Saving Cost
	6,221,742 kWh/year	500	Rp/kWh	682,404,000	Rp			

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

9 Description of process and energy utility

a. Process flow energy utilities

Industry 19

Review of energy audit of industry

1. General

Name of Industry	49	Location	West Java
Category of Industry	Textile	Number of Employee	160 person
Products	Spinning	Amount of product	750 bale/month

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption		Energy cost (Rp)	
1	Electricity consumption	3,177,840	kWh/year	1.707	billion
2	Heat Consumption		kWh/year		
3	Auto power producing				
	Power Production		kWh/year		
	Fuel Consumption		kWh/year		
4	Total energy consumption	3,177,840	kWh/year	1.707	billion

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1	Nozzle Air Pressure Cleaning	Setting compressor pressure to suitable working pressure		
2		Replacing ducting with metal material		

5 Improvement Cost : 20 Rp.million

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)	Saving Cost		Unit Price (non subsidized)	Saving Cost
	19,920 kWh/year	550 Rp/kWh	9.96	Rp.million		

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing low cost recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	Cost budgeting by self funding is limited. Only low cost recommendation will be implemented.

9 Description of process and energy utility

a. Process flow production

Industry 20

Review of energy audit of industry

1. General

Name of Industry	50	Location	Jalan Raya Serang Km. 12 Desa Sukadamai, Cikupa	
Category of Industry	Textile	Number of Employee	709	person
Products	Spinning	Amount of product	3,203	bale/month
	Weaving		1,700,000	kg/month

2 Implementation of Audit Energi

The reason for implementation	Government Suggestion	
Date of implementation	2007	
Duration of implementation	4 weeks	
Requirement for manpower	Number	5 person
	Professional carrier	Project Coordinator, Mechanical Engineer, Electrical Engineer, Process Engineer
	Man days	150 days

3 Energy consuming and Energy Cost (before improvement for saving energy)

No.	Energy	Annual consumption		Energy cost (Rp)	
1	Electricity consumption	43,700,996	kWh/year	21.85	billion
2	Heat Consumption	8,039	kWh/year	12.96	billion
3	Auto power producing				
	Power Production		kWh/year		
	Fuel Consumption		kWh/year		
4	Total energy consumption	43,709,035	kWh/year	34.81	billion

4 Content of improvement (EE&C measures proposed at the energy audit)

	Arrangement and/or improvement of operational procedures, scheduling and maintenance	Modification and improvement of energy equipment	Replacement of energy equipment	Replacement of process
1		Installation of kWh meter	Replacement of steam trap	
2		Repairing Hot Pipa Insulation		
3		Cable Addition from Transformator tu SDP AC Weaving		

5 Improvement Cost : 140 Rp.million

6 Effect of saving energy and saving cost

No.	Saving Energy	Unit Price (subsidized)		Saving Cost		Unit Price (non subsidized)		Saving Cost
	1,115,934 kWh/year	500	Rp/kWh	387.43	Rp.million			

7 Reporting and Recommendation

Results of energy audit reported to (excluding the recipient)	Government
Government reaction againts the results	The company must reduce their energy consumption by doing the energy conservation and efficiency program

8 Confirmation of implementation for saving energy

In the case of implementation	Why	Need to reduce energy cost and support for energy conservation and efficiency program
	When	After implementation of audit energy
	How	By implementing the recommendation
	Financial Resources	Self funding (corporate cost)
In the case of non- implementation	Reason & hurdles	

9 Description of process and energy utility

a. Process production energy utilities

Attachment 3

EMI REPORT

RECOMMENDATION FOR
BUILDING ENERGY AUDIT BUSINESS MODEL

3. RECOMMENDATION FOR BUILDING ENERGY AUDIT BUSINESS MODEL

The assessment for setting a recommendation for building energy audit's business model in Indonesia was conducted by reviewing audit energy reports done by PT. EMI (Persero) in 2007-2009 period according to the aspects of economics (including energy price subsidies), legal framework, financial supports and incentives, and ESCO business model. Finally, the output of this assessment is a way to build and finance projects aimed at energy efficiency and reduce operating costs and system maintenance / production process.

3.1 ECONOMIC ASPECTS FOR BUILDING ENERGY AUDIT'S BUSINESS MODEL

Fast growing national economic development and high level of population need energy support. Energy is needed for industrial growth, services, transport and even households. The role of energy will be more developed, especially to support industrial activities and other related activities, as well as to enhance the economic competitiveness of Indonesia in order to deal with the implementation of ACFTA in 2010, when all of domestic products compete both in the domestic market and internationally.

One of the major problems that can hold up the implementation of energy support is the problem of funding, considering that the energy development is a capital-intensive activity. As we know, the funding availability of both government and private funds are very limited. In order to keep the activity run well, there should be subsidies to the price of energy. Subsidy is an instrument of fiscal aiming to ensure the state's role in economic activities in order to improve the society's welfare. This scheme is more important when the state (government) has significantly reduced its role in economic activity, so that the government plays as a regulator of subsidies.

There are two well-known types of energy that are subsided by the government: electricity and fuel. Based on Law of The Republic of Indonesia Number 47 Year 2009 Article 8 paragraph (1), subsidies budget for electricity by 2010 is set at Rp 37.8 trillion and based on Law of The Republic of Indonesia Number 47 Year 2009 Article 7 paragraph (1), subsidies budget for fuel is set to Rp. 68,726 trillion.

In terms of electricity subsidies in 2010, State Electricity Company (PLN) has increased the basic electricity tariff for upper-class customers (6,600 kV and above) that is set out in Law of The Republic of Indonesia Number 47 Year 2009, exactly in Article 8 paragraph (2) b, which states that the budget control of subsidy in electricity for fiscal year of 2010 is made through the application of the basic electricity tariff, based on economic price for average energy consumption above 50 percent in 2009 for household customers, business, and Public with the power value start from 6,600 VA.

In terms of fuel subsidies in 2010, based on Law of The Republic of Indonesia Number 47 Year 2009, exactly in Article 7 paragraph (2) and (3), the government will conduct efficiency on distribution cost and margin. The government will also control the subsidized fuel user for household sector, small and medium enterprises (SMEs), fisheries, transportation, and public services.

3.2 LEGAL FRAMEWORKS FOR SUPPORTING ENERGY AUDIT'S BUSINESS MODEL

Energy plays a very important in all business sectors, industrial sector, transportation, mining, and other businesses. Thus, saving energy is necessary to keep the production cost down. Proper management and effective use of energy are expected to raise productivity. In this condition, government play role as regulator for energy business. They issued some of legal frameworks concerning with energy business to regulate the whole energy businesses, such as Law of the Republic of Indonesia Number 30 Year 2007 about energy, Regulation of the Government of the Republic of Indonesia Number 70 Year 2009 about energy conservation, and Regulation of Minister of Finance Number 24 Year 2010 about provision of taxation for activities of utilization of renewable energy resources.

Law of the Republic of Indonesia Number 30 Year 2007 stated that energy shall be managed under the principles of beneficial use, rationality, fair efficiency, value added enhancement, sustainability, people's welfare, environmental functions preservation, national resilience, and integration by prioritizing the nation's capability. To support national sustainable development and improve national energy resilience, the management of energy shall be aimed to achieve independence in the management of energy, guarantee the availability of domestic energy, both from domestic and overseas sources. Management of energy also shall guarantee that energy resources are managed in an optimal, integrated, efficient way in all sectors. Detailed explanation about Law of the Republic of Indonesia Number 30 Year 2007 can be seen in **Attachment 4**

Regulation of the Government of Indonesia Number 70 Year 2009 stated that there is a responsibility of energy conservation reports to the government, employers, and society. In the practice, the government both central and local levels are responsible for the supervision, guidance, and implementation of licensing and utilization of energy conservation activities. The employers and community must be oriented to the utilization of technology, equipments, materials, process, and system that are energy efficient. In addition, employers with energy use are above or equal to 6000 TOE shall provide a report of energy conservation activities through energy management to the government. Detailed explanation about Regulation of the Government of Indonesia Number 70 Year 2009 can be seen in **Attachment 4**

Regulation of Minister of Finance Number 24 Year 2010 stated about provision of taxation for activities of utilization of renewable energy resources. Type of provision of taxation issued by the government are income tax, value added tax, import duties, and taxes borne by the government. These

facilities are issued by the government in order to stimulate employers to deal with activities of utilization of renewable energy resources, considering that type of energy is much prospected to earn profit not just to the employers, but also to the government and society. That type of energy is also one possible way to conduct energy conservation. Detailed explanation about Regulation of Minister of Finance Number 24 Year 2010 can be seen in **Attachment 4**

3.3 FINANCIAL SUPPORTS AND INCENTIVES FOR BUILDING ENERGY AUDIT'S BUSINESS MODEL

To facilitate existing employers in utilizing energy efficiently and stimulate new employers in dealing with utilization renewable energy resources, the government as regulator gives financial supports and incentives to them in accordance with the legal frameworks. Such legal frameworks dealing with financial supports and incentives are stated in Regulation of the Government of the Republic of Indonesia Number 70 Year 2009 about energy conservation and Regulation of Minister of Finance Number 24 Year 2010 about provision of taxation for activities of utilization of renewable energy resources.

In Regulation of the Government of the Republic of Indonesia Number 70 Year 2009 there are incentives given by the government to both secondary sector or energy users and producers of energy-saving equipment or the upstream sector which can conduct energy conservation in specific period. Incentives given to energy users (secondary sector), which use energy more than or equal 6000 TOE per year and have conducted energy conservation reports, are the followings:

1. Giving taxation facilities for energy-saving equipments.
2. Granting reduction, relief, and local tax exemptions for energy-saving equipments.
3. Granting import duty facilities for energy-saving equipments.
4. Granting low interest funds for energy conservation investments in accordance with the provisions of legislation and/or energy audits in government-funded partnership.

Then for producers of energy-saving equipment or the upstream sector, the incentives are given like the followings:

1. Giving taxation facilities for components/spare parts and raw materials used to produce energy-saving equipments.
2. Granting reduction, relief, and local tax exemption for components/spare parts and raw materials used to produce energy-saving equipments.
3. Giving import tax facilities for components/spare parts and raw materials that will be used to produce energy-saving equipments.

4. Low interest funds for investment in order to produce energy-saving equipment in accordance with the provisions of legislation.

In Regulation of Minister of Finance Number 24 Year 2010 there are some financial supports from the government to employers that run business in utilizing renewable energy resources in order to attract investor and increase the competitiveness in utilization of renewable energy resources. Those financial supports are given in form of taxation facilities, such as:

1. *Giving income tax facilities*, that is giving depreciation of nett income tax about 30% of capital investment number. The depreciation is charged for 6 (six) years for 5% per year. Besides, the Government also gives income tax on dividends that is paid to the subjects of foreign tax by 10% or at lower rate, according to the Agreement of Double Taxation Avoidance. There is also compensation for the losses that are longer than five years but not more than 10 years according to the applicable provisions. Companies that report the losses in their profit-loss report certainly don't have to pay income tax. There is also exception to pay income tax article 22 imports for goods importing in form of machinery and equipments, whether installed or independent, not including spare parts, which is required by employers in the area of utilization of renewable energy resources.
2. *Giving exceptions in value added tax facilities*, such as exception from the value added tax on the import of strategic taxable goods in form of machinery and equipments, whether installed or independent, not including spare parts, which is required by employers in the area of utilization of renewable energy resources to produce taxable goods.
3. *Giving exceptions of import duties*, such as exception of import duties to imported machines and goods and materials for industrial development for the sake of capital investment. And also giving exception of import duties to imported goods in the development of power plant industries.
4. *Giving government-borne tax facilities* that are regulated by the Law of Budget of the State.

3.4 INTRODUCTION TO ESCO BUSINESS

Increase of energy needs and depletion of energy resources, especially fossil energy, have affected to the increase of energy price in international and domestic market. This condition gives an implication that energy saving and optimization of energy supply in the future will be more important. Besides, another implication is the problem of funding, considering that the energy development is a capital-intensive activity, while the funding availability of both government and private funds are very limited.

The existing main obstacle is that often the implementation of energy saving, especially about financing of utility replacement is relatively expensive. Internationally right now there are financing

scheme for the implementation of energy saving that is performance contracting through a program known as the concept of ESCO. ESCO's methodology or concept not only describe about methods of energy conservation but also discussed about several funding sources that can be used to fund the energy efficiency programs. Even today there are some producers of equipments that apply the concept of ESCO to market their products, where the payment for investment of equipment/utility can be paid through the cost savings each month. The purpose of ESCO is to build and fund projects aimed for energy efficiency and to reduce operating costs and system maintenance/production process. In general, the compensation for investment's value required is paid based on the existing savings.

Generally, the concept of ESCO is valued based on the energy savings achieved before and after the implementation of conservation. This concept can be applied in the case of energy conservation activities in the country. National financial institutions, both banking and non banking, are expected to provide financial help to the energy conservation activities. This funding is generally needed to replace the old equipment/utility with the one that is more efficient in energy consumption, based on the results of energy audits and recommendations given by ESCO. Monitoring activity to the implementation of energy conservation should be done strictly. It is important to be able to monitor the progress on the energy savings that can be achieved for each period.

3.4.1 Basic Concept of ESCO

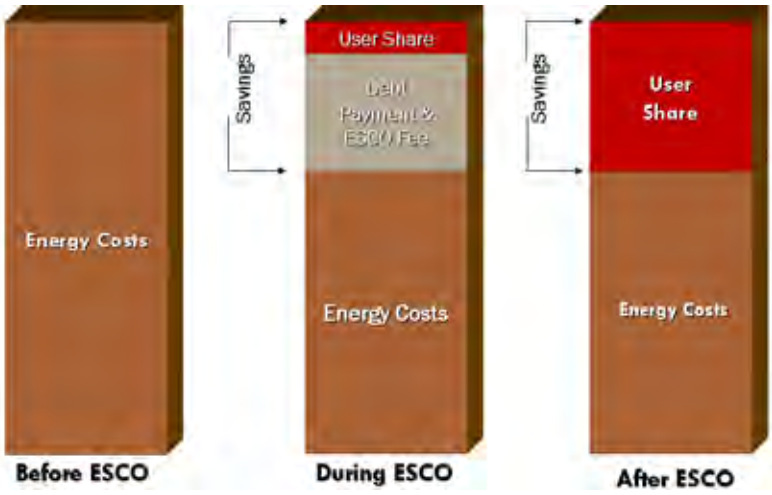


Figure.1 Concept Diagram of ESCO

Figure 3.1 above describing concept diagram of ESCO. In ESCO:

- Reduction of energy cost for infrastructure improvements is used.
- ESCO guarantee that the amount of savings achieved can be used for return on investment.
- After ESCO period, all of the savings are belong to the client (user).

3.4.2 ESCO Business Models

ESCO can be defined as a form of "creative funding" to increase the capital through the increase of energy efficiency by cost reduction. ESCO provide performance guarantee in the form of energy savings or cost savings. The cost savings are then divided between the ESCO party and client (user) that can be used for capital increase.

In order to understand more about the existing business and proposed ESCO business model simulation, possible funding models are presented as follows:

3.4.2.1 Guaranteed Saving (North America's Model)

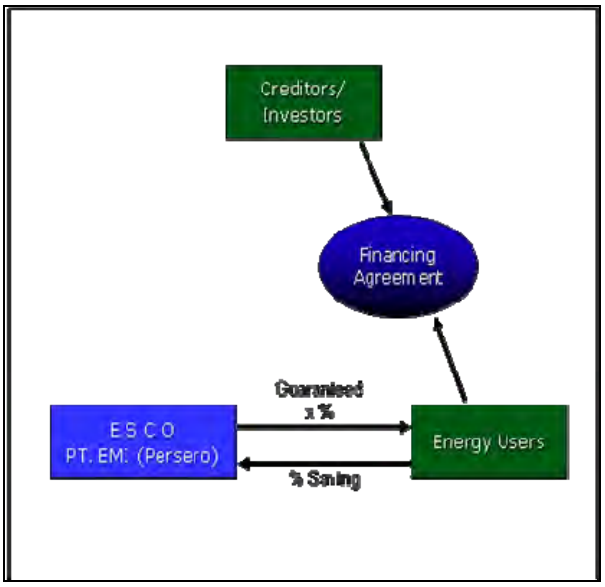


Figure.2 Flow Diagram of Guaranteed Saving Model

Funding in this pattern is done by the owner of the company, while ESCO only provide technical assurance of energy cost savings. Credit risk is guaranteed by the owner of the company if the source of funding use a third-party's funding.

ESCO is based on energy consumption baseline before and after implementation of conservation and energy diversification. ESCO is then used by the owner of the company as the basis of funding from the internal/creditors.

3.4.2.2 Shared Saving (France's Model)

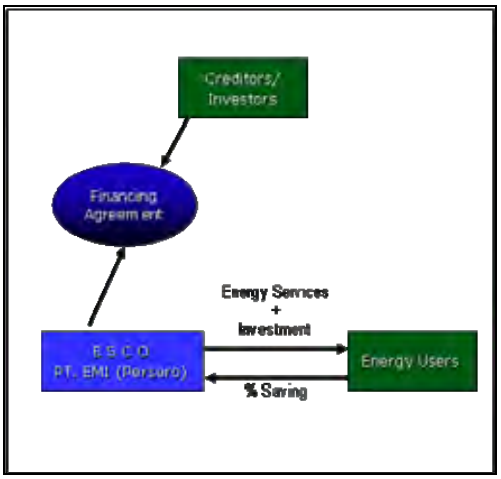


Figure.3 Flow Diagram of Shared Saving Model

In this model, funding is done by ESCO. It means that the risk is borne by ESCO. If the investment funding process of conservation and diversification is done for risk sharing between the ESCO and creditor or ESCO and the owner of the company, the sharing will be the basis in determining the "ownership" of new cash flow (new cash streams) produced during contract period.

3.4.2.3 ESCO Saving Model

A. Business Scheme

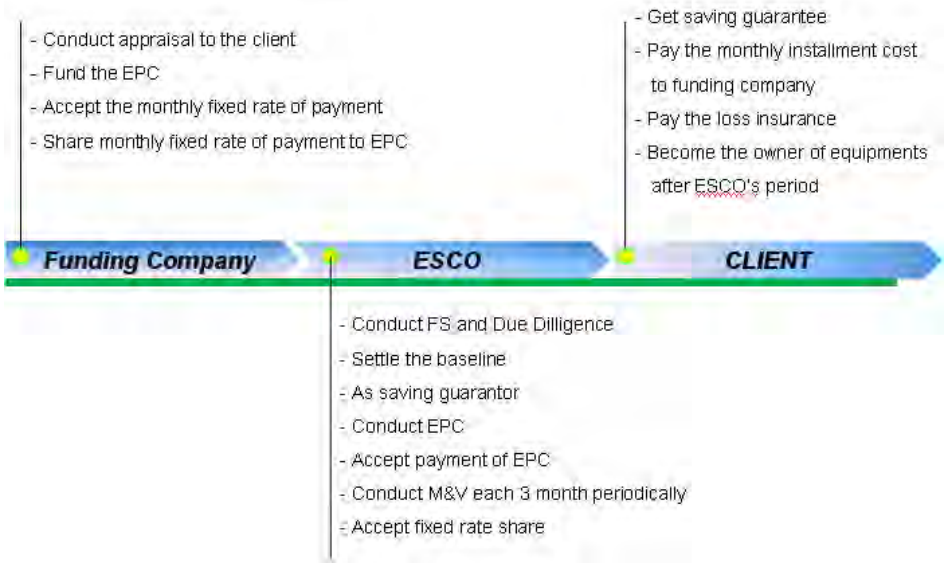


Figure.4 Business Scheme of ESCO Model

ESCO business model consists of three parties, that are funding company, ESCO, and client company. Each party has specific function. As its name, funding company provides funding activity to

ESCO to conduct EPC. ESCO conduct feasibility study and due diligence to the client, and after that conduct EPC and supply equipments after there is agreement between funding company and client. Credit risk is borne by the client while the performance risk is borne by ESCO. After ESCO's period, client will be the owner of the equipments that are supplied by ESCO.

B. Flow Process of ESCO Business Model

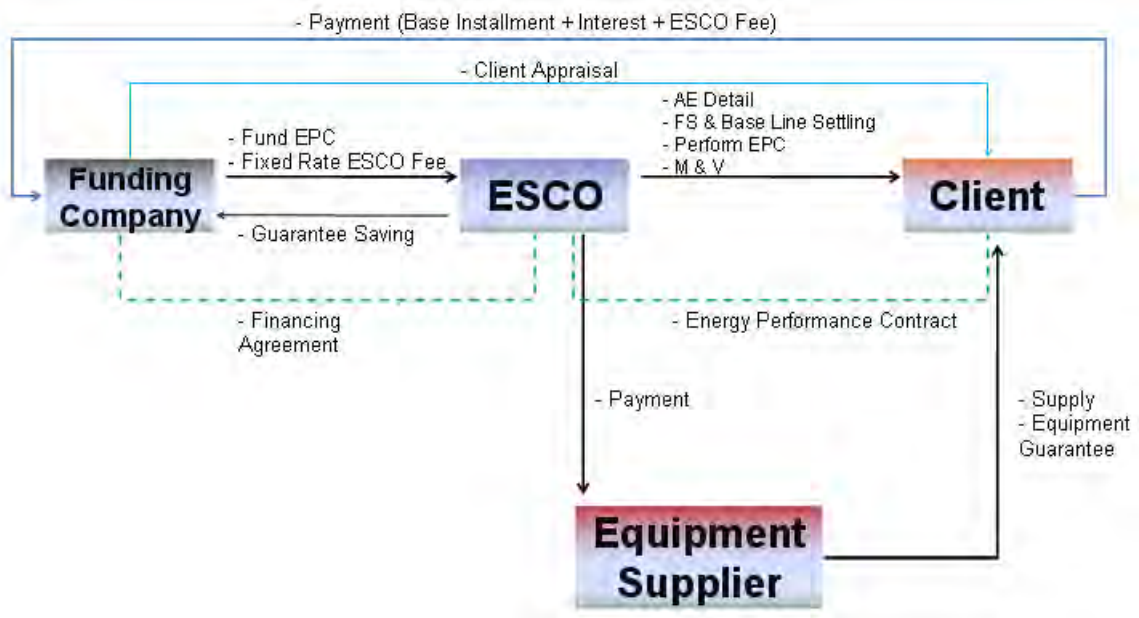


Figure.5 Flow Diagram of ESCO Model

The flow diagram above described the relationship among three parties (funding company, ESCO, and client), and also with fourth party, that is equipment supplier. In this model, investment financing is obtained from the funding company which has a cooperation with ESCO and client. The investment then will be used for conducting ESCO business model to the client. ESCO also conduct payment to equipment supplier so client will get equipments and guarantee needed. The sharing of fees saving and success fee of ESCO will be paid by funding company. In the picture above, there are four parties involved in ESCO business, i.e. Funding Company, ESCO Company, Equipment Supplier and Client.

- Funding Company is company or institution that makes financial support for all equipments required to be improved and or replaced by the Client in order to get the energy cost reduction (energy saving). Funding Company would be conventional bank, leasing company and financial institution. Financial institution in this case refers to *PT Sarana Multi Infrastruktur (Persero)*, an institution established by Ministry of Finance,

Government of Indonesia in order to *catalyze* high risk infrastructure construction investment.

- ESCO Company responsible to Client's energy auditing, feasibility study of energy saving opportunities, EPC (Engineering, Procurement and Construction) of replaced or improved equipment and M&V (Measurement and verification) of energy saving activities.
- Equipment supplier responsible to supply equipment needed to improve energy saving
- Client responsible to perform energy saving activities as contract.

This kind of ESCO model actually does not exist yet in Indonesia as well as other models. However, it is promising in near future that this model will be implementable. In this model, firstly, funding company, ESCO Company and Equipment Supplier make a contract among the three of them. By that contract the three will act as a Join Body. The Join Body will then make an ESCO contract with The Client. Financial flows, obligation and right of all parties involved in ESCO business well described in aforementioned picture.

3.4.3 Benefit of ESCO

1. Better facilities

   ESCO conduct renovation or replacement of old/expired equipments with newer one which technologically more efficient, so the client will use less energy, has better system quality, and get reduced damage and maintenance.

2. Wise investment

   ESCO provide an opportunity to the clients to transfer funds that will be used to pay energy cost to become an investment in the client's facility. For the government, it means that a limited budget can be used longer, or in other words they can use state funds on a better post. For building owners, energy system that is more efficient and modern will raise the property and selling value.

3. Repair / renewal without sacrifice

   ESCO provide an opportunity to the clients to deal with energy efficiency projects immediately although there is no fund available. It means that the client will still be able to make improvements despite facing budget cuts. And with ESCO client can take a comprehensive approach that can also optimize client's profits.

4. Cost savings

   New system and equipment can reduce energy cost. Many building owners can save around 15% -35% and also reduce the long-term maintenance cost. Clients can enjoy the savings that

occur after the new equipments are paid off, plus additional savings that occur during the contract period.

5. Trusted technology and expertise

   Since the late 1970s, ESCO have become an acceptable and reliable way to improve the energy system. Currently, ESCO use industry practice standard and energy saving technology that are proven and have very customer-satisfied record. ESCO have financial incentives to ensure that expected savings can be achieved.

6. One-stop shopping

   ESCO offer approaches from upstream to downstream for facility repair, because with only use a contract, the client can handle more than one energy efficiency project, rather than do it one by one. ESCO can provide various types of services and sustainable cooperation with clients, although the project has been completed so that the client can still obtain the optimal energy savings.

3.4.4 Problem and Countermeasures

The calculation of ESCO business model can be done systematically by describing the cash flow for both ESCO company and client. The parameters used to determine the feasibility of ESCO implementation to the project are based on value of Net Present Value (NPV) and Internal Rate of Return (IRR). NPV is the difference between the present values of the investment with the present value of net cash revenue in the future. The present value can be calculated by determining the relevant interest rate. A project is feasible if the value of NPV is positive. IRR is used to find the interest rate that equates the present value of expected cash flows in the future, or cash revenue, by issuing the initial investment. A project is feasible if the value of IRR is more than the value of interest rate used.

The problem case is about a client that wants to get energy saving from their building. After conducting measurement, ESCO determined that the energy saving can be reached if the client equip chilled water system and capacitor bank. The detailed scheme of ESCO model calculation can be described as follows:

- ***Energy saving opportunity***
  - Chilled water system replacement in a 7 floor building
  - Capacitor Bank installation in 5 buildings
- ***Specification of new equipments to be installed***
  - Chilled Water System

- Chilling Unit

  - Type : Water Cooler Screw Chillers
  - Capacity : 150 TR
  - Efficiency : 0.588 kW/TR
  - Input Power : 110 kW
  - Number : 2 units

- Pump for Chiller Water

  - Capacity : 2,000 liter/minute
  - Number : 2 units
  - Motor : 22 kW

- Pump for Cooling Tower

  - Capacity : 2,800 liter/minute
  - Number : 2 units
  - Motor : 15 kW

- Installation Cost : Rp. 1,350,000,000 (include all of supporting equipments)

o Capacitor Bank

- Total Capacity : 1,000 kVAR
- Unit Capacity (Panel 1) : 8 steps @ 60 kVAR and 4 steps @ 30 KVAR = 600 kVAR
- Unit Capacity (Panel 2) : 8 steps @ 40 kVAR and 4 steps @ 20 KVAR = 400 kVAR
- Total step for Panel 1 : 12
- Total step for Panel 2 : 12
- Installation Cost : Rp. 500,000,000

- ***Statement of cash flow***

  Conditions:

  - ESCO Service period : 10 years
  - Reduction of electricity consumption : Rp. 893,912,000 / year
  - Total investment : Rp. 1,850,000,000
  - Term of loan from Funding Company : 5 years
  - Interest rate : 14%

- ***Scenario #1 (80:20)***

Saving of electricity consumption obtained from improvement of equipment will be shared to both ESCO Company and Hospital. In the first 5 years, ESCO Company and Hospital will earn saving for 80% and 20% respectively. In the rest of the ESCO period, the shared saving will be 20% and 80% for ESCO Company and Hospital respectively. The cash flow explanation of both Hospital (client) and ESCO Company (ESCO) is stated as follows:

For all of scenarios, the source of incomes and expenses of client and ESCO are same. Income of client is from the reduction of electricity consumption from chiller and capacitor bank. Expense of client is from service charge of ESCO, which consist of installment and sharing. The total amount of money saved from the reduction of electricity consumption is Rp.8,866,380,000, while the total amount of expenses is Rp.7,149,385,000. From the ESCO implementation, finally the client's profit is Rp. 1,716,995,000 after the ESCO contract period is finished. Net Present Value for the client is Rp. 18,124,000, and IRR is 14.33%. As the value of NPV is positive and value of IRR is more than interest rate, the ESCO implementation is feasible for the client. But, the client will get little profit, because the value of IRR is nearly same with the value of rate of interest. The client also gets the advantages from the equipments. Lifetime of equipments (chiller and capacitor bank) is 15 years, while the ESCO contract period is only 10 years. So, after the ESCO contract period is finished, the client still gets the asset (equipments), and also saving/electricity budget, as the equipments still in their lifetime period.

The next step of ESCO calculation scheme is calculating the ESCO's cash flow. Based on the cash flow, ESCO earns money from the service charge of ESCO implementation to the client. Expenses of ESCO are from procurement, refund of initial fund, insurance, and operational cost. Procurement expense came from purchasing of equipments. This expense is initial investment for ESCO. Refund of initial fund came from the installment from the client that has to be paid to the equipment supplier. Insurance expense is a form of guarantee for the equipments that is borne by ESCO, which the value is constant during ESCO period. After ESCO period, the guarantee of equipment will be borne by client. The value of operational fees is settled to Rp.4,000,000 per month. From ESCO implementation, ESCO will get total income of Rp. 7,149,385,000, while the total expenses are Rp. 3,359,373,000. Finally, during ESCO implementation, ESCO will earn profit of Rp. 10,508,758.,000

The NPV of ESCO is Rp. 2,421,813,000, while the IRR is 24.78%. From NPV and IRR parameters, we can clearly see that the value of NPV of this project is positive, and the value of IRR is more than the value of interest rate. Because those two parameters are fulfilled, the ESCO implementation project is feasible, so ESCO can easily attract funding company to fund the project.

Calculation spreadsheet of ESCO scheme for this scenario can be seen in Table 3.1.

Table.1 Calculation Spreadsheet of ESCO Scheme with 80%: 20% Sharing

(in thousand rupiah)

Assumption	
Initial Investment	
- AC Chiller + other equipments	1,350,000
- Capacitor Bank	500,000
	1,850,000
Interest Rate	**14%**

ESCO SCHEME CALCULATION

CHILLER & CAPACITOR BANK REPLACEMENT

(in thousand rupiah)

Client Cash Flow												
Service Period	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**TOTAL**
INCOME												
Reduction of Elecricity Consumption		**893,912**	**893,912**	**893,912**	**893,912**	**893,912**	**879,364**	**879,364**	**879,364**	**879,364**	**879,364**	**8,866,380**
- Chiller		247,309	247,309	247,309	247,309	247,309	232,761	232,761	232,761	232,761	232,761	
- Bank Capacitor		646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	
EXPENSE												
ESCO service charge		**(1,254,004)**	**(1,254,004)**	**(1,254,004)**	**(1,254,004)**	**(1,254,004)**	**(175,873)**	**(175,873)**	**(175,873)**	**(175,873)**	**(175,873)**	**(7,149,385)**
- Installment		(538,875)	(538,875)	(538,875)	(538,875)	(538,875)						
- Sharing	80%	(715,130)	(715,130)	(715,130)	(715,130)	(715,130)						
	20%						(175,873)	(175,873)	(175,873)	(175,873)	(175,873)	
PROFIT		**(360,092)**	**(360,092)**	**(360,092)**	**(360,092)**	**(360,092)**	**703,491**	**703,491**	**703,491**	**703,491**	**703,491**	**1,716,995**

NPV	**18,124**
IRR	**14.33%**

(in thousand rupiah)

ESCO Cash Flow												
Service Period	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**TOTAL**
INCOME												
ESCO service charge		1,254,004	1,254,004	1,254,004	1,254,004	1,254,004	175,873	175,873	175,873	175,873	175,873	**7,149,385**
EXPENSE		(605,375)	(605,375)	(605,375)	(605,375)	(605,375)	(66,500)	(66,500)	(66,500)	(66,500)	(66,500)	**(3,359,373)**
Procurement	(1,850,000)											
Refund of Initial Fund		(538,875)	(538,875)	(538,875)	(538,875)	(538,875)						
Insurance		(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	
Operational Fee		(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	
PROFIT	**(1,850,000)**	**648,630**	**648,630**	**648,630**	**648,630**	**648,630**	**109,373**	**109,373**	**109,373**	**109,373**	**109,373**	**10,508,758**

NPV	**2,421,813**
IRR	**24.78%**

o

- ***Scenario #2 (70:30)***

Saving of electricity consumption obtained from improvement of equipment will be shared to both ESCO Company and Hospital. In the first 5 years, ESCO Company and Hospital will earn saving for 70% and 30% respectively. In the rest of the ESCO period, the shared saving will be 30% and 70% for ESCO Company and Hospital respectively. The cash flow explanation of both Hospital (client) and ESCO Company (ESCO) for this scenario is stated as follows:

The total amount of money saved from the reduction of electricity consumption is same with previous scenario, which is Rp.8,866,380,000. Total amount of expenses is Rp. 7,142,111,000. From the ESCO implementation, finally the client's profit is Rp.1,724,269,000 after the ESCO contract period is finished. Net Present Value for the client is Rp. 168,217,000, and IRR is 17.86%. As the value of NPV is positive and value of IRR is more than interest rate, the ESCO implementation is feasible for the client. With this scenario, the value of NPV and IRR for client is larger than previous scenario.

From ESCO implementation, ESCO will get total income of Rp. 7,142,111,000, while the total expenses are Rp. 3,359,373,000. Finally, during ESCO implementation, ESCO will earn profit of Rp.10,501,484,000. The NPV of ESCO company is Rp. 2,271,720,000, while the IRR is 21.18%. From NPV and IRR parameters, we can clearly see that the value of NPV of this project is positive, and the value of IRR is more than the value of interest rate. NPV and IRR of ESCO in this scenario is lower than previous scenario, but those two parameters are still feasible. With this scenario, ESCO can still attract funding company to fund the project, but they will get lower profit.

Calculation spreadsheet of ESCO scheme for this scenario can be seen in Table 3.2.

Table.2 Calculation Spreadsheet of ESCO Scheme with 70%: 30% Sharing

(in thousand rupiah)

Assumption	
Initial Investment	
- AC Chiller + other equipments	1,350,000
- Capacitor Bank	500,000
	1,850,000
Interest Rate	**14%**

ESCO SCHEME CALCULATION

CHILLER & CAPACITOR BANK REPLACEMENT

(in thousand rupiah)

Client Cash Flow												
Service Period	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**TOTAL**
INCOME												
Reduction of Elecricity Consumption		**893,912**	**893,912**	**893,912**	**893,912**	**893,912**	**879,364**	**879,364**	**879,364**	**879,364**	**879,364**	**8,866,380**
- Chiller		247,309	247,309	247,309	247,309	247,309	232,761	232,761	232,761	232,761	232,761	
- Bank Capacitor		646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	
EXPENSE												
ESCO service charge		**(1,164,613)**	**(1,164,613)**	**(1,164,613)**	**(1,164,613)**	**(1,164,613)**	**(263,809)**	**(263,809)**	**(263,809)**	**(263,809)**	**(263,809)**	**(7,142,111)**
- Installment		(538,875)	(538,875)	(538,875)	(538,875)	(538,875)						
- Sharing	70%	(625,738)	(625,738)	(625,738)	(625,738)	(625,738)						
	30%						(263,809)	(263,809)	(263,809)	(263,809)	(263,809)	
PROFIT		**(270,701)**	**(270,701)**	**(270,701)**	**(270,701)**	**(270,701)**	**615,555**	**615,555**	**615,555**	**615,555**	**615,555**	**1,724,269**

NPV	**168,217**
IRR	**17.86%**

(in thousand rupiah)

ESCO Cash Flow												
Service Period	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**TOTAL**
INCOME												
ESCO service charge		1,164,613	1,164,613	1,164,613	1,164,613	1,164,613	263,809	263,809	263,809	263,809	263,809	**7,142,111**
EXPENSE		(605,375)	(605,375)	(605,375)	(605,375)	(605,375)	(66,500)	(66,500)	(66,500)	(66,500)	(66,500)	**(3,359,373)**
Procurement	(1,850,000)											
Refund of Initial Fund		(538,875)	(538,875)	(538,875)	(538,875)	(538,875)						
Insurance		(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	
Operational Fee		(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	
PROFIT	**(1,850,000)**	**559,238**	**559,238**	**559,238**	**559,238**	**559,238**	**197,309**	**197,309**	**197,309**	**197,309**	**197,309**	**10,501,484**

NPV	**2,271,720**
IRR	**21.18%**

o

- ***Scenario #3 (60:40)***

Saving of electricity consumption obtained from improvement of equipment will be shared to both ESCO Company and Hospital. In the first 5 years, ESCO Company and Hospital will earn saving for 60% and 40% respectively. In the rest of the ESCO period, the shared saving will be 40% and 60% for ESCO Company and Hospital respectively. The cash flow of both Hospital (client) and ESCO Company (ESCO) for this scenario is stated as follows:

Total amount of money saved from the reduction of electricity consumption is Rp.8,866,380,000, while the total amount of expenses is Rp. 7,134,837,000. From the ESCO implementation, finally the client's profit is Rp. 1,731,543,000 after the ESCO contract period is finished. Net Present Value for the client is Rp. 318,311,000, and IRR is 23.82%. As the value of NPV is positive and value of IRR is more than interest rate, the ESCO implementation is feasible for the client. The value of NPV and IRR of the client is larger than two previous scenarios, so the client will get more profit than two previous scenarios.

From ESCO implementation, ESCO will get total income of Rp. 7,134,837,000, while the total expenses are Rp. 3,359,373,000. Finally, during ESCO implementation, ESCO will earn profit of Rp. 10,494,210,000. The NPV of ESCO Company is Rp. 2,121,626,000, while the IRR is 18.16%. From NPV and IRR parameters, we can clearly see that the value of NPV of this project is still positive, but those values are lower than two previous scenarios. Although the project is still feasible, ESCO will be more difficult to attract funding company to fund the project, because the project won't give much profit.

Calculation spreadsheet of ESCO scheme for this scenario can be seen in Table 3.3.

Table.3 Calculation Spreadsheet of ESCO Scheme with 60%: 40% Sharing

(in thousand rupiah)

Assumption	
Initial Investment	
- AC Chiller + other equipments	1,350,000
- Capacitor Bank	500,000
	1,850,000
Interest Rate	**14%**

ESCO SCHEME CALCULATION

CHILLER & CAPACITOR BANK REPLACEMENT

(in thousand rupiah)

Client Cash Flow												
Service Period	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**TOTAL**
INCOME												
Reduction of Elecricity Consumption		**893,912**	**893,912**	**893,912**	**893,912**	**893,912**	**879,364**	**879,364**	**879,364**	**879,364**	**879,364**	**8,866,380**
- Chiller		247,309	247,309	247,309	247,309	247,309	232,761	232,761	232,761	232,761	232,761	
- Bank Capacitor		646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	
EXPENSE												
ESCO service charge		**(1,075,222)**	**(1,075,222)**	**(1,075,222)**	**(1,075,222)**	**(1,075,222)**	**(351,746)**	**(351,746)**	**(351,746)**	**(351,746)**	**(351,746)**	**(7,134,837)**
- Installment		(538,875)	(538,875)	(538,875)	(538,875)	(538,875)						
- Sharing	60%	(536,347)	(536,347)	(536,347)	(536,347)	(536,347)						
	40%						(351,746)	(351,746)	(351,746)	(351,746)	(351,746)	
PROFIT		**(181,310)**	**(181,310)**	**(181,310)**	**(181,310)**	**(181,310)**	**527,618**	**527,618**	**527,618**	**527,618**	**527,618**	**1,731,543**

NPV	**318,311**
IRR	**23.82%**

(in thousand rupiah)

ESCO Cash Flow												
Service Period	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**TOTAL**
INCOME												
ESCO service charge		1,075,222	1,075,222	1,075,222	1,075,222	1,075,222	351,746	351,746	351,746	351,746	351,746	**7,134,837**
EXPENSE		(605,375)	(605,375)	(605,375)	(605,375)	(605,375)	(66,500)	(66,500)	(66,500)	(66,500)	(66,500)	**(3,359,373)**
Procurement	(1,850,000)											
Refund of Initial Fund		(538,875)	(538,875)	(538,875)	(538,875)	(538,875)						
Insurance		(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	
Operational Fee		(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	
PROFIT	**(1,850,000)**	**469,847**	**469,847**	**469,847**	**469,847**	**469,847**	**285,246**	**285,246**	**285,246**	**285,246**	**285,246**	**10,494,210**

NPV	**2,121,626**
IRR	**18.16%**

o

- ***Scenario #4 (50:50)***

Saving of electricity consumption obtained from improvement of equipment will be shared to both ESCO Company and Hospital. In the first 5 years, ESCO Company and Hospital will earn saving for 50% and 50% respectively. In the rest of the ESCO period, the shared saving will be 50% and 50% for ESCO Company and Hospital respectively. The cash flow of both Hospital (client) and ESCO Company (ESCO) for this scenario is stated as follows:

The total amount of money saved from the reduction of electricity consumption is Rp.8,866,380,000 , while the total amount of expenses is Rp. 7,127,563,000. From the ESCO implementation, finally the client's profit is Rp. 1,738,817,000 after the ESCO contract period is finished. Net Present Value for the client is Rp. 468,404,000, and the value of IRR is 36.76%. It can be concluded that the project is feasible for the client and will get more profit than previous scenarios.

From ESCO implementation, ESCO will get total income of Rp. 7,127,563,000, while the total expenses are Rp. 3,359,373,000. Finally, during ESCO implementation, ESCO will earn profit of Rp.10,486,936,000. The NPV of an ESCO company is Rp. 1,971,533,000, while the IRR is 15.67%. From NPV and IRR parameters, we can clearly see that the value of NPV of this project is still positive, and the value of IRR is more than the value of interest rate. But those two values are not good. The value of NPV is low, and the value of IRR is near the value of interest rate. With this scenario, it's difficult for ESCO to attract funding company to fund the project.

Calculation spreadsheet of ESCO scheme for this scenario can be seen in Table 3.4.

Table.4 Calculation Spreadsheet of ESCO Scheme with 50%: 50% Sharing

(in thousand rupiah)

Assumption	
Initial Investment	
- AC Chiller + other equipments	1,350,000
- Capacitor Bank	500,000
	1,850,000
Interest Rate	**14%**

ESCO SCHEME CALCULATION

CHILLER & CAPACITOR BANK REPLACEMENT

(in thousand rupiah)

Client Cash Flow												
Service Period	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**TOTAL**
INCOME												
Reduction of Elecricity Consumption		**893,912**	**893,912**	**893,912**	**893,912**	**893,912**	**879,364**	**879,364**	**879,364**	**879,364**	**879,364**	**8,866,380**
- Chiller		247,309	247,309	247,309	247,309	247,309	232,761	232,761	232,761	232,761	232,761	
- Bank Capacitor		646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	
EXPENSE												
ESCO service charge		**(985,831)**	**(985,831)**	**(985,831)**	**(985,831)**	**(985,831)**	**(439,682)**	**(439,682)**	**(439,682)**	**(439,682)**	**(439,682)**	**(7,127,563)**
- Installment		(538,875)	(538,875)	(538,875)	(538,875)	(538,875)						
- Sharing	50%	(446,956)	(446,956)	(446,956)	(446,956)	(446,956)						
	50%						(439,682)	(439,682)	(439,682)	(439,682)	(439,682)	
PROFIT		**(91,919)**	**(91,919)**	**(91,919)**	**(91,919)**	**(91,919)**	**439,682**	**439,682**	**439,682**	**439,682**	**439,682**	**1,738,817**

NPV	**468,404**
IRR	**36.76%**

(in thousand rupiah)

ESCO Cash Flow												
Service Period	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**TOTAL**
INCOME												
ESCO service charge		985,831	985,831	985,831	985,831	985,831	439,682	439,682	439,682	439,682	439,682	**7,127,563**
EXPENSE		(605,375)	(605,375)	(605,375)	(605,375)	(605,375)	(66,500)	(66,500)	(66,500)	(66,500)	(66,500)	**(3,359,373)**
Procurement	(1,850,000)											
Refund of Initial Fund		(538,875)	(538,875)	(538,875)	(538,875)	(538,875)						
Insurance		(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	
Operational Fee		(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	
PROFIT	**(1,850,000)**	**380,456**	**380,456**	**380,456**	**380,456**	**380,456**	**373,182**	**373,182**	**373,182**	**373,182**	**373,182**	**10,486,936**

NPV	**1,971,533**
IRR	**15.67%**

o

- ***Scenario #5 (40:60)***

Saving of electricity consumption obtained from improvement of equipment will be shared to both ESCO Company and Hospital. In the first 5 years, ESCO Company and Hospital will earn saving for 40% and 60% respectively. In the rest of the ESCO period, the shared saving will be 60% and 40% for ESCO Company and Hospital respectively.

The cash flow of both Hospital (Client) and ESCO Company (ESCO) stated as follow:

Total amount of money saved from the reduction of electricity consumption is Rp. 8,866,380,000, while the total amount of expenses is Rp. 7,120,289,000. From the ESCO implementation, finally the client's profit is Rp. 1,746,091,000 after the ESCO contract period is finished. Net Present Value for the client is Rp. 618,498,000, and IRR is 168.36%. It can be concluded that the project is very feasible for the client, because the value of IRR is very high.

From ESCO implementation, ESCO will get total income of Rp.6,460,916,000, while the total expenses are Rp.2,700,000,000. Finally, during ESCO implementation, ESCO will earn profit of Rp. 3,359,373,000. The NPV of ESCO is Rp.1,821,439,000, in other words, ESCO will not get any profit from this project. The value of IRR is 13.65%, which is below the value of interest rate. From NPV and IRR parameters, we can clearly see that those two parameters are not fulfilled, so the ESCO implementation project is not feasible for ESCO, because they cannot attract funding company to fund the project, although this project is very feasible for the client.

Calculation spreadsheet of ESCO scheme for this scenario can be seen in Table 3.5.

Table.5 Calculation Spreadsheet of ESCO Scheme with 40%:60% Sharing

(in thousand rupiah)

Assumption	
Initial Investment	
- AC Chiller + other equipments	1,350,000
- Capacitor Bank	500,000
	1,850,000
Interest Rate	**14%**

ESCO SCHEME CALCULATION

CHILLER & CAPACITOR BANK REPLACEMENT

(in thousand rupiah)

Client Cash Flow												
Service Period	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**TOTAL**
INCOME												
Reduction of Elecricity Consumption		**893,912**	**893,912**	**893,912**	**893,912**	**893,912**	**879,364**	**879,364**	**879,364**	**879,364**	**879,364**	**8,866,380**
- Chiller		247,309	247,309	247,309	247,309	247,309	232,761	232,761	232,761	232,761	232,761	
- Bank Capacitor		646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	646,603	
EXPENSE												
ESCO service charge		**(896,439)**	**(896,439)**	**(896,439)**	**(896,439)**	**(896,439)**	**(527,618)**	**(527,618)**	**(527,618)**	**(527,618)**	**(527,618)**	**(7,120,289)**
- Installment		(538,875)	(538,875)	(538,875)	(538,875)	(538,875)						
- Sharing	40%	(357,565)	(357,565)	(357,565)	(357,565)	(357,565)						
	60%						(527,618)	(527,618)	(527,618)	(527,618)	(527,618)	
PROFIT		**(2,527)**	**(2,527)**	**(2,527)**	**(2,527)**	**(2,527)**	**351,746**	**351,746**	**351,746**	**351,746**	**351,746**	**1,746,091**

NPV	**618,498**
IRR	**168.36%**

(in thousand rupiah)

ESCO Cash Flow												
Service Period	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**TOTAL**
INCOME												
ESCO service charge		896,439	896,439	896,439	896,439	896,439	527,618	527,618	527,618	527,618	527,618	**7,120,289**
EXPENSE		(605,375)	(605,375)	(605,375)	(605,375)	(605,375)	(66,500)	(66,500)	(66,500)	(66,500)	(66,500)	**(3,359,373)**
Procurement	(1,850,000)											
Refund of Initial Fund		(538,875)	(538,875)	(538,875)	(538,875)	(538,875)						
Insurance		(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	
Operational Fee		(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	(48,000)	
PROFIT	**(1,850,000)**	**291,065**	**291,065**	**291,065**	**291,065**	**291,065**	**461,118**	**461,118**	**461,118**	**461,118**	**461,118**	**10,479,662**

NPV	**1,821,439**
IRR	**13.65%**

Based on the statement of cash flows described in the example above, however, the result is not always good. In one of the scenarios, the IRR of ESCO is below the interest rate, so they can't attract the funding company. To make the ESCO business more attractive for client, non financial benefits must be considered, as productivity increase, equipment reliability, revenue increase, and so on.

Although theoretically ESCO business is promising, actually it faces big challenges to make it works in real life. Hereafter are some of the obstacles or barriers in actualizing ESCO business in Indonesia.

- Energy prices both electricity and fuel (oil and gas) are subsidized by government. Therefore, cost saving obtained from energy saving is not worth enough compare to investment. Thus, industrialists (business owners) are not challenged enough to save energy. If energy prices are not subsidized, energy saving from reduction of energy consumption will produce higher saving in term of cost. However, energy prices subsidy is a tough issue because it is not only economic matter but also politic matter.
- There's no such ESCO model succeed to be implemented in Indonesia until 2009.
- There's no special license for ESCO business in Indonesia unlike other business, for example license for trading, construction, mining, etc. This lack of license makes ESCO business less interesting for both Funding Company and potential players of ESCO Company.
- Conventional Banks to whom the ESCO business will be proposed, don't want to take risk. So, The Banks will ask for collateral or guarantee for the loan, which is assets collateral. Unfortunately, the ESCO Company has no adequate assets to be guaranteed.
- Some of energy savings offered by ESCO Company to funding company (banks) are too low. Thus, it will take a long time for payback (more than 3 years). Generally, this funding company will be attracted if energy saving is high and payback is short. Alas, ESCO Company needs longer time to make money from the ESCO business, generally 5 even 10 years. The aforementioned cash flow demonstrates it.
- Energy efficiency and conservation program in Indonesia is different with Japan. In Indonesia, government gives energy audit for free to some selected buildings and industries. A year after the energy auditing, government will control the implementation of energy audit result through a monitoring program. These two programs (energy auditing and monitoring) are annual program of MEMR Gov. of Indonesia regarding energy efficiency and conservation. However, government seems more concerns to energy audit rather than implementation of audit results. While energy audit is given for free, financial matters in implementing audit energy result is still unsolved. Government of Indonesia actually has tried to solve the problem through steps as follow:

- Ministry of Industry has offered *a scheme of soft loan* to industries that committed to implement energy efficiency and conservation programs. However, the scheme offered is unattractive enough to industries.
- Ministry of Finance has launched a regulation that confirmed taxes cutting (*taxes and duties facilities*) for Renewable Energy (RE) equipment. The taxes and duties facilities consist of Income Tax facility, Value Added Tax facility, Import Duty facility and Government Tax Borne facility (please refer to Attachment 3). As the regulation aforementioned has just launched this January 2010, so far the effect is still insignificant.

Attachment 4

Law and Regulations of The Republic of Indonesia

LAW OF THE REPUBLIC OF INDONESIA
NUMBER 30 YEAR 2007
ON
ENERGY
BY THE BLESSING OF THE ONE AND ONLY GOD
PRESIDENT OF THE REPUBLIC OF INDONESIA

REGULATION OF THE GOVERNMENT OF THE REPUBLIC OF INDONESIA
NUMBER 70 YEAR 2009
ON
ENERGY CONSERVATION
BY THE BLESSING OF THE ONE AND ONLY GOD
PRESIDENT OF THE REPUBLIC OF INDONESIA

REGULATION OF THE MINISTER OF FINANCE
NUMBER 24/PMK.011/2010
ON
GRANTING OF TAXATION AND CUSTOMS FACILITIES FOR
RENEWABLE ENERGY RESOURCES UTILIZATION ACTIVITIES
BY THE BLESSING OF THE ONE AND ONLY GOD
MINISTER OF FINANCE

PRESIDENT OF THE REPUBLIC OF INDONESIA

LAW OF THE REPUBLIC OF INDONESIA
NUMBER 30 YEAR 2007
ON
ENERGY
BY THE BLESSING OF THE ONE AND ONLY GOD
PRESIDENT OF THE REPUBLIC OF INDONESIA

Considering:

a. that energy resources constituting natural riches as mandated in Article 33 of the 1945 Constitution of the Republic of Indonesia shall be controlled by the state and utilized for the greatest prosperity and welfare of the people;
b. that energy plays such a vital role in increasing national economy and resilience that the management of energy that covers its provision, utilization and enterprise shall be conducted in a fair, sustainable, rational, optimal, and integrated fashion;
c. that reserves of non-renewable energy resources are limited, therefore it is necessary to diversify energy resources to guarantee the availability of energy;
d. that on the basis of the considerations as intended by letters a, b, and c, it is necessary to stipulate a Law on Energy;

In view of: Article 5 paragraph (1), Article 20, Article 21, Article 33 of the 1945 Constitution of the Republic of Indonesia;

With Joint Approval of
House of People's Representatives of the Republic of Indonesia
and
President of the Republic of Indonesia

DECIDES:
To stipulate: LAW ON ENERGY

CHAPTER I
GENERAL PROVISIONS
Article 1

The following definitions shall apply in this Law:

1. Energy shall mean the capacity to perform work that may take the form of heat, light, mechanics, chemical, and electromagnetic.
2. Energy sources shall mean anything that can produce energy, both directly and indirectly, through conversion or transformation processes.
3. Energy resources shall mean the natural resources that can be utilized, both as energy source and energy.
4. New energy sources shall mean the energy sources that can be produced through
5. New technologies, coming from both renewable energy sources and non-renewable energy sources, such as nuclear, hydrogen, coal bed methane, liquefied coal, and gasified coal.
6. New energy shall mean the energy coming from new energy sources.
7. Renewable energy sources shall mean the energy sources produced from sustainable energy resources if well managed such as geothermal, wind, bioenergy, sunlight, water flow and waterfall, and the movement and difference of sea layer temperature.
8. Renewable energy shall mean the energy coming from renewable energy sources.
9. Non-renewable energy sources shall mean the energy sources produced from non replenishable energy resources if continuously exploited, such as oil, natural gas, coal, turf, and bituminous shale.
10. Non-renewable energy shall mean the energy coming from non-renewable energy sources.
11. Environment means a spatial unit with all objects, capacities, conditions, and living creatures, including human beings and their behaviors, which affect the life and well-being of human beings and other living creatures.
12. Preservation of environmental functions shall mean a series of efforts intended to maintain the supporting and carrying capacities of the environment.
13. Business entity shall mean a company in the form of a legal entity that runs a continuous and permanent business and is established in accordance with the laws and regulations and is operational and domiciled within the territory of the Unitary State of the Republic of Indonesia.
14. Permanent business establishment shall mean a business entity established and having a legal entity outside the Unitary State of the Republic of Indonesia engaged in aactivities and domiciled within the territory of the Unitary State of the Republic of Indonesia and obliged to comply with the laws and regulations of the Republic of Indonesia.
15. Energy buffer reserve shall mean the quantity of the energy sources and energy stored nationally required to meet the nation’s energy requirements in a given period of time.
16. Provision of energy shall mean any activity or process aimed to make available energy, both from Indonesia and overseas.
17. Utilization of energy shall mean any activity using energy, both directly and indirectly, from energy sources.

18. Management of energy shall mean an activity consisting of the provision, enterprise, and utilization of energy and the provision of strategic reserves and the conservation of energy resources.
19. Enterprise of energy shall mean an activity consisting of the provision and/or utilization of energy.
20. Enterprise of energy services shall mean a service business activity directly or indirectly associated with the provision and/or utilization of energy.
21. Energy reserves shall mean the energy resources whose location, quantity and quality have been known.
22. Energy diversification shall mean diversifying the utilization of energy sources.
23. Strategic reserves shall mean the energy reserves for the future.
24. Energy conservation means a systematic, planned and integrated effort intended to preserve domestic energy resources and to improve efficiency in their utilization.
25. Conservation of energy resources shall mean the management of energy resources that guarantees their utilization and supply by continuing to maintain and improve the quality of the value and diversity of the energy resources.
26. National energy policies shall mean the policies on the management of energy based on the principles of fairness, sustainability and environmental outlook aimed to create national energy independence and resilience.
27. National Energy Council shall mean a national, independent and permanent institution in charge of the execution of the national energy policy.
28. Master plan on energy shall mean an energy management plan intended to meet energy requirements in a region, some regions, and in the country.
29. Central Government, hereinafter referred to as Government is the President of the
30. Republic of Indonesia who holds the authority to govern the Republic of Indonesia as intended by the 1945 Constitution of the Republic of Indonesia.
31. Regional government shall mean the governor, regent, or mayor and regional instrumentalities as the elements of the regional government administration.
32. Minister means the minister who is in charge of energy affairs.

CHAPTER II
PRINCIPLES AND OBJECTIVES
Article 2

Energy shall be managed under the principles of beneficial use, rationality, fair efficiency, value added enhancement, sustainability, people’s welfare, environmental functions preservation, national resilience, and integratedness by prioritizing the nation’s capability.

Article 3

To support national sustainable development and improve national energy resilience, the management of energy shall be aimed to:

a. Achieve independence in the management of energy;
b. Guarantee the availability of domestic energy, both from domestic and oversea sources.
c. Guarantee the availability of energy from domestic and/or oversea sources as intended by letter b to:
    1. meet domestic energy requirements;
    2. meet raw material requirements for domestic industries; and
    3. increase state revenues;
d. Guarantee that energy resources are managed in an optimal, integrated, and sustainable fashion.
e. Guarantee that energy is used efficiently in all sectors.
f. Improve accessibility to energy for the people who are less wealthy and/or who live in remote areas to bring about just and equal welfare and prosperity for the people by:
    1. providing assistance to increase the availability of energy for less wealthy people;
    2. building energy infrastructures in under-developed regions in order to reduce disparities among regions.
g. Develop independent domestic energy and energy services industries and improve the professionalism of human resources.
h. Create work opportunities; and
i. Preserve the environment.

CHAPTER III
MANAGEMENT OF ENERGY
Part One
Energy Resources
Article 4

(1) Fossil, geothermal, large-scale hydro and nuclear energy sources shall be controlled by the state and utilized for the greatest welfare and prosperity of the people.
(2) New energy resources and renewable energy resources shall be managed by the state and utilized for the greatest welfare and prosperity of the people.
(3) The control and management of energy resources by the state, as intended by paragraphs (1) and (2), shall be conducted by the Government according to the laws and regulations.

Part Two

Energy Buffer Reserves

Article 5

(1) To guarantee national energy resilience, Government is obliged to provide energy buffer reserves.
(2) The provisions on the types, amount, time, and location of the energy buffer reserves as intended by paragraph (1) are regulated further by National Energy Council.

Part Three

Energy Crisis and Emergency

Article 6

(1) Energy crisis constitutes an energy shortage condition.
(2) Energy emergency constitutes a condition in which the supply of energy is disturbed due to disconnection of energy facilities and infrastructures.
(3) If the energy crisis and energy emergency as intended by paragraphs (1) and (2) result in the government functions, the community social life, and/or economic activities being disrupted, the Government is obliged to take any necessary corrective measure.

Part Four

Energy Prices

Article 7

(1) Energy prices shall be determined on the basis of a fair economic value.
(2) The Government and regional government shall provide subsidy funds for less wealthy community groups.
(3) Further provisions on energy prices and subsidy funds, as intended by paragraphs (1) and (2), shall be regulated by the laws and regulations.

Part Five

Environment and Safety

Article 8

(1) Any energy management activity shall prioritize the use of environmentally-friendly technologies that meet the requirements set by the laws and regulations on the environment.
(2) Any energy management activity shall meet the requirements set by the laws and regulations on safety which cover issues on standardization, security and safety of the installation, and occupational safety and health.

Part Six

Domestic Content Levels

Article 9

(1) Domestic content levels for both goods and services shall be maximized in the energy enterprise.
(2) Government is obliged to encourage the provision of domestic goods and services to support independent, efficient and competitive energy industries.

Part Seven

International Cooperation

Article 10

(1) International cooperation in the energy sector can only be conducted to:
    a. Guarantee the nation's energy resilience;
    b. Guarantee the availability of domestic energy; and
    c. Improve the nation's economy.
(2) The international cooperation as intended by paragraph (1) shall be implemented in accordance with the laws and regulations.
(3) Any international agreement in the field of energy that has wide-ranging and fundamental impacts on the people's life associated with the state financial burden and/or requiring the amendment to or the making of laws is subject to approval of the House of People's Representatives.

CHAPTER IV

ENERGY POLICIES AND NATIONAL ENERGY COUNCIL

Part One

National Energy Policies

Article 11

(1) National energy policies shall cover the following issues:
    a. availability of energy to meet the nation's requirements;
    b. energy development priorities
    c. utilization of national energy resources; and
(2) The national energy policies as intended by paragraph (1) shall be adopted by the Government with the approval of the House of People's Representative.

Part Two

National Energy Council

Article 12

(1) National Energy Council shall be established by President.
(2) National Energy Council has the following duties;
    a. designing and formulating national energy policies to be adopted by the Government with the approval of the House of People's Representatives as intended by Article 11 paragraph (2);
    b. determining a master plan on national energy;
    c. determining responses to energy crisis and emergency conditions; and
    d. monitoring the implementation of cross-sectoral policies on energy.
(3) National Energy Council is comprised of a board of management and members. The Board of Management of National Energy Council are comprised of :
    a. Chairperson: President
    b. Vice Chairperson: Vice President
    c. Daily Chairperson: Minister in charge of energy affairs.
(4) Members of National Energy Council are comprised of;
    a. seven persons, including both the Minister and other government officials directly responsible for the provision, transportation, distribution and utilization of energy; and
    b. eight persons representing stakeholders.

Article 13

(1) Members of National Energy Council, as intended by Article 12 paragraph (5) letter a, are appointed and terminated by the President.
(2) Members of National Energy Council, as intended by Article 12 paragraph (5) letter b, are selected by the House of People's Representatives.
(3) Members of National Energy council as intended by Article 12 paragraph (5) letter b are comprised of:
    a. 2 (two) persons from academic circles;
    b. 2 (two) persons from industrial circles;
    c. 2 (two) persons from technological circles;
    d. 1 (one) person from environmental circles; and
    e. 2 (two) persons from consumers.
(4) The Government shall nominate candidates of the National Energy Council members as intended by paragraph (2) to the House of People's Representatives twice the number of each circle/group of stakeholders, as intended by paragraph (3).
(5) The selection of candidates as intended by paragraph (4) shall be conducted through a transparent and accountable screening process.

(6) The members of National Energy Council as intended by Article 12 paragraph (5) letter b are appointed and terminated by the President.
(7) Further provisions on the procedures for the selection of National Energy Council members as intended by paragraph (2) shall be regulated by the Presidential Regulation.

Article 14

(1) The term of service of the National Energy Council members who concurrently serve as Minister and hold other governmental positions shall end when they no longer hold the positions as intended by Article 12 paragraph (5) point a.
(2) The term of service of the National Energy Council members as intended by Article 12 paragraph (5) letter b is five years.

Article 15

The expense budget of National Energy Council shall be burdened to the State Budget.

Article 16

(1) National Energy Council in performing their duties shall be assisted by a secretariat general headed by a secretary general.
(2) Secretary General is appointed and terminated by the President.
(3) The organizational structure and work procedures of the Secretariat General of National Energy Council shall be further regulated by Decree of the Chairperson of National Energy Council.

Part Three
Master Plan on National Energy
Article 17

(1) The Government shall develop a draft master plan on national energy on the basis of the national energy policies.
(2) In developing the master plan on national energy as intended by paragraph (1), the Government shall involve the regional government and take into consideration opinions and inputs of the public.
(3) Further provisions on the development of the master plan on national energy shall be regulated by the Presidential Regulation.

Part Four

Master Plan on Regional Energy

Article 18

(1) The regional government shall develop a master plan on regional energy by referring to the master plan on national energy as intended by Article 17 paragraph (1).
(2) The master plan on regional energy as intended by paragraph (1) shall be stipulated by the regional regulation.

Part Five

Rights and Roles of the Community

Article 19

(1) Anyone has the right to obtain energy.
(2) The community, both individually and collectively, can participate in:
    a. Developing a master plan on national energy and a master plan on regional energy; and
    b. Developing energy for public interests.

CHAPTER V

ENERGY MANAGEMENT

Part One

Provision and Utilization

Article 20

(1) Energy shall be made available through:
    a. Inventorying energy resources;
    b. Increasing energy reserves;
    c. Developing a balance of energy;
    d. Diversifying, conserving, and intensifying energy sources and energy ;and
    e. Guaranteeing that energy sources and energy are well distributed, transmitted, and stored.
(2) Priorities to provide energy by the Government and/or the regional government shall be given to underdeveloped regions, remote areas, and village regions by using local energy sources, particularly renewable energy sources.
(3) The regions that produce energy sources shall be prioritized to obtain the energy from local energy sources.
(4) The provision of new energy and renewable energy shall be enhanced by the Government and the regional government according to their respective authority.
(5) Any business entity, permanent business establishment and individual that provide energy from new energy sources and renewable energy sources may obtain facilities and/or incentives from the

Government and/or the regional government according to their respective authority for a certain period until the economic value is reached.

Article 21

(1) Energy shall be utilized under the principles as intended by Article 2 by:
    a. Optimizing all potential energy resources,
    b. Considering technological, social, economic, conservation, and environmental aspects, and
    c. Prioritizing the fulfillment of the community's requirements and the improvement of economic activities in the region producing energy sources.
(2) The utilization of new energy and renewable energy shall be enhanced by the Government and the regional government.
(3) Any business entity, permanent business establishment and individual that utilize energy from new energy sources and renewable energy sources may obtain facilities and/or incentives from the Government and/or the regional government according to their respective authority for a certain period until the economic value is reached.

Article 22

(1) Further provisions on the granting of facilities and/or incentives by the Government and/or the regional government according to their respective authority, as intended by Article 20 paragraph (5) and Article 21 paragraph (3) shall be regulated by the Government Regulation and/or the Regional Regulation.
(2) Further provisions on the provision and utilization of energy by the Government and/or the regional government according to their authority as intended by Article 20 and Article 21 are regulated by the Government Regulation and/or the Regional Regulation,

Part Two
Enterprise
Article 23

(1) The enterprise of energy covers the enterprise of energy resources, energy sources, and energy.
(2) The enterprise of energy can be conducted by a business entity, a permanent business establishment and an individual.
(3) The enterprise of energy services can only be conducted by a business entity and an individual.
(4) The enterprise of energy services as intended by paragraph (3) shall follow the provisions on energy services classification.

(5) Classifying energy services is intended to protect and give the first opportunity in the use of domestic energy services.
(6) Further provisions on the classification of energy services are regulated by the Government Regulation.
(7) The enterprise of energy and energy services as intended by paragraph (1), paragraph (2) and paragraph (3) shall be conducted in accordance with the laws and regulations.

Article 24

(1) The business entity that engages in energy business activities as intended by Article 23 is obliged to:
    a. Empower the local community;
    b. Preserve and protect the environmental;
    c. Facilitate research and development on energy; and
    d. Facilitate training and education in the energy sector.
(2) Further provisions on the obligations of the business entity as intended by paragraph (1) shall be regulated by the Government Regulation.

Part Three
Energy Conservation
Article 25

(1) National energy conservation shall be the responsibility of the Government, the regional government, business entities, and the community.
(2) The national energy conservation as intended by paragraph (1) shall cover all phases of energy management.
(3) Consumers of energy and producers of energy-saving equipment who conserve energy shall be given facilities and/or incentives by the Government and/or the regional government.
(4) Consumers of energy sources and energy who do not conserve energy shall be given disincentives by the Government and/or the regional government.
(5) Further provisions on the implementation of energy conservation and the provision of facilities, incentives and disincentives as intended by paragraph (1), paragraph (2), paragraph (3) and paragraph (4) shall be regulated by the Government Regulation and/ or the regional regulation.

CHAPTER VI
AUTHORITY OF GOVERNMENT
AND REGIONAL GOVERNMENT
Article 26

(1) The Government's authority in the energy sector shall include, among others:
    a. Making laws and regulations
    b. Determining national policies
    c. Setting and enforcing standards; and
    d. Determining procedures.
(2) The provincial government's authority in the energy sector shall include, among others:
    a. Making provincial regional regulations;
    b. Providing guidance and supervision on the cross-regent/city enterprise; and
    c. Determining cross-regent/city management policies.
(3) The regental/city government's authority in the energy sector shall include, among others:
    a. Making regency/city-level regional regulations;
    b. Providing guidance and supervision on the enterprise conducted in a regency/city; and
    c. Determining management policies in a regency/city.
(4) The authority of the provincial and regental/city governments as intended by paragraphs (2) and paragraph (3) shall be executed in compliance with the laws and regulations.

CHAPTER VII
GUIDANCE AND SUPERVISION
Part One
Guidance
Article 27

The Government and the regional government shall provide guidance on the management of energy resources, energy sources and energy.

Part Two
Supervision
Article 28

The management of energy resources, energy sources and energy shall be supervised by the Government, the regional government and the community.

CHAPTER VIII
RESEARCH AND DEVELOPMENT
Article 29

(1) Any research and development on science and technology regarding the provision and utilization of energy shall be facilitated by the Government and the regional government in accordance with to their respective authority.
(2) The research and development as intended by paragraph (1) shall be directed towards developing new energy and renewable energy to support the development of an independent national energy industry.

Article 30

(1) The research and development activities as intended by Article 29 shall be funded by the Government and the regional government in accordance with their authority.
(2) Funds for the research and development on energy science and technology as intended by paragraph (1) shall be provided from the State Budget (APBN), the Regional Budget (APBD) and private sponsors.
(3) The development and utilization of the research outcomes on new energy and renewable energy shall be funded by the state revenues generated from non renewable energy.
(4) Provisions on funding as intended by paragraph (3) shall be regulated further by the Government Regulation.

CHAPTER IX
TRANSITORY PROVISIONS
Article 31

(1) When this Law comes into effect, all laws and regulations on energy shall remain in effect as long as they are not in contradiction with or have not been replaced under this Law.
(2) National Energy Coordinating Agency shall continue performing their duties and functions until National Energy Council has been established.
(3) Before National Energy Council is established, any policy to be issued by National Energy Coordinating Agency shall be adjusted to this law.

CHAPTER X
CLOSING PROVISIONS
Article 32

National Energy Council shall be established at the latest of 6 (six) months after this Law is enacted.

Article 33

The implementing regulations of this Law shall have been stipulated at the latest of 1 (one) year after this law is enacted.

Article 34

This Law shall become effective as of the date of its enactment.

For public cognizance, it is instructed to promulgate this Law by inserting the same in the State Gazette of the Republic of Indonesia.

Approved in Jakarta
On August 10, 2007

PRESIDENT OF THE REPUBLIC OF INDONESIA,
singed
DR. H. SUSILO BAMBANG YUDHOYONO

Enacted in Jakarta
On August 10, 2007
MINISTER OF LAW AND HUMAN RIGHTS
OF THE REPUBLIC OF INDONESIA
signed
ANDI MATALATTA

STATE GAZETTE OF THE REPUBLIC OF INDONESIA OF 2007 NUMBER 96

Copied pursuant to the original
DEPUTY TO STATE SECRETARY FOR LEGISLATION
MUHAMMAD SAPTA MURTI

ELUCIDATION OF
LAW OF THE REPUBLIC OF INDONESIA
NUMBER 30 YEAR 2007
ON
ENERGY

I. GENERAL

Energy resources as natural riches constitute the gifts bestowed by God upon the people and nation of Indonesia. Energy resources are strategic natural resources important for the life of the people to improve economic activities, create job opportunities, and enhance national resilience. As such, energy resources must be controlled by the state and must be utilized for the greatest welfare and prosperity of the people as mandated by Article 33 of the 1945 Constitution of the Republic of Indonesia.

The management of energy which covers the provision, utilization, and enterprise of energy must be conducted in a fair, sustainable, rational, optimal and integrated fashion to give an added value to the economy of the nation and unitary state of the Republic of Indonesia.

The provision, utilization and enterprise of energy conducted continuously to improve the welfare of the people must be performed in harmony and in line with the environmental functions.

Given the importance of energy resources, it is necessary for the Government to develop an energy management plan to meet domestic energy requirements on the basis of a long-term energy management policy.

Based on the foregoing, it is necessary to stipulate a law on energy as the legal basis and guidance in regulating and managing energy affairs.

This law regulates the following issues:

a. Energy management which consists of the control and management of energy resources,
b. Energy buffer reserves in order to safeguard the national energy resilience,
c. Energy crisis and emergencies and energy prices,
d. The Government's and the regional government's authority in managing energy,
e. National energy policies, a master plan on national energy and the establishment of National Energy Council,
f. The rights and roles of the community in the management of energy,
g. Guidance and supervision of energy management activities,
h. Research and development.

II. ARTICLE BY ARTICLE

Article 1

Sufficiently clear.

Article 2

The principle of beneficial use means that energy must be managed to meet the people's requirements.

The principle of fair efficiency means that energy must be managed to make sure that the people have equal access to energy at an affordable and economic price.

The principle of value added enhancement means that energy must be managed to achieve an optimum economic value.

The principle of sustainability means that energy must be managed to guarantee that energy can be made available and utilized for the present and future generations.

The principle of people's welfare means that energy must be managed for the greatest welfare and prosperity of the people.

The principle of environmental functions preservation means that energy must be managed in such a way that the quality of the environmental functions will be better.

The principle of national resilience means that the nation must be able to manage energy on its own capability.

The principle of integratedness means that energy must be managed in an integrated manner among sectors.

Article 3

Letter a

Sufficiently clear

Letter b

Sufficiently clear

Letter c

Sufficiently clear

Letter d

Sufficiently clear

Letter e

The utilization of energy in all sectors must be according to the requirements based on energy utilization standards.

Letter f

Sufficiently clear

Letter g

Sufficiently clear

Letter h

Sufficiently clear

Letter i

Sufficiently clear

Article 4

Sufficiently clear.

Article 5

Sufficiently clear.

Article 6

Sufficiently clear.

Article 7

Paragraph (1)

Fair economic value is a value/cost that reflects the energy production costs, including the environmental and conservation costs, and the profits reviewed on the basis of people's affordability and stipulated by the Government.

Paragraph (2)

Sufficiently clear.

Paragraph (3)

Sufficiently clear.

Article 8

Sufficiently clear.

Article 9

Sufficiently clear

Article 10

Sufficiently clear

Article 11

Sufficiently clear

Article 12

Sufficiently clear

Article 13

Paragraph (1)

Sufficiently clear.

Paragraph (2)

Sufficiently clear.

Paragraph (3)

Letter a

Academic circles include experts in the field of energy from universities.

Letter b

Industrial circles include practitioners engaged in the energy industry.

Letter c

Technological circles include experts in the field of energy technological engineering.

Letter d

Environmental circles include environmental experts in the ield of energy.

Letter e

Consumers mean the communities using energy.

Paragraph (4)

Sufficiently clear.

Paragraph (5)

Sufficiently clear.

Paragraph (6)

Sufficiently clear.

Paragraph (7)

Sufficiently clear.

Article 14

Sufficiently clear.

Article 15

Sufficiently clear.

Article 16

Sufficiently clear.

Article 17

Sufficiently clear.

Article 18

Sufficiently clear.

Article 19

Paragraph (1)

Sufficiently clear.

Paragraph (2)

The community‘s role under this provision is to provide inputs in the form of ideas, data, and/or information in writing.

Article 20

Paragraph (1)

Letter a

Sufficiently clear.

Letter b

Sufficiently clear.

Letter c

Balance of energy means a description of a balance between the supply of various energy sources and the use of energy within a given period of time.

Letter d

Sufficiently clear.

Letter e

Sufficiently clear.

Paragraph (2)

Sufficiently clear.

Paragraph (3)

Sufficiently clear.

Paragraph (4)

Sufficiently clear.

Paragraph (5)

Economic value is the value formed from the equilibrium between supply and demand.
Incentives can take the form of capital assistance, taxes, and fiscal.
Facilities can take the form of simplified licensing procedures and
enterprise requirements.

Article 21

Sufficiently clear.

Article 22

Sufficiently clear.

Article 23

Paragraph (1)

Sufficiently clear.

Paragraph (2)

Business entity includes state-owned companies, region-owned companies, cooperatives, and private companies.

Paragraph (3)

Sufficiently clear.

Paragraph (4)

Sufficiently clear.

Paragraph (5)

Sufficiently clear.

Paragraph (6)

Sufficiently clear.

Paragraph (7)

Sufficiently clear.

Article 24

Paragraph (1)

Letter a

The form of local community empowerment/development shall be tailored to the needs of the people around the business premises aimed to improve the people's welfare.

Letter b

Sufficiently clear.

Letter c

Sufficiently clear.

Letter d

Sufficiently clear.

Pargraph (2)

Sufficiently clear.

Article 25

Paragraph (1)

Sufficiently clear.

Paragraph (2)

Sufficiently clear.

Paragraph (3)

Producers mean domestic producers.

Paragraph (4)

Sufficiently clear.

Paragraph (5)

Sufficiently clear.

Article 26

Paragraph (1)

Letter a

Sufficiently clear.

Letter b

Determining national policies includes determining energy prices.

Letter c

Sufficiently clear.

Letter d

Sufficiently clear.

Paragraph (2)

Sufficiently clear.

Paragraph (3)

Sufficiently clear.

Paragraph (4)

Sufficiently clear.

Article 27

Guidance is prioritized to develop human resources and technologies.

Article 28

Sufficiently clear.

Article 29

Sufficiently clear.

Article 30

Sufficiently clear.

Article 31

Sufficiently clear.

Article 32

Sufficiently clear.

Article 33

Sufficiently clear.

Article 34

Sufficiently clear.

SUPPLEMENT TO THE STATE GAZETTE OF
THE REPUBLIC OF INDONESIA NUMBER 4746

REGULATION OF THE GOVERNMENT OF THE REPUBLIC OF INDONESIA
NUMBER 70 YEAR 2009
ON
ENERGY CONSERVATION
BY THE BLESSING OF THE ONE AND ONLY GOD
PRESIDENT OF THE REPUBLIC OF INDONESIA,

Considering : that to implement the provisions of Article 25 paragraph (5) of Law of the Government Number 30 Year 2007 on Energy, shall establish a Regulation of the Government on Energy Conservation;

In view of : 1. Article 5 paragraph (2) of the 1945 Constitution of the Republic of Indonesia
2. Law of the Government Number 30 Year 2007 on Energy (State Gazette of the Republic of Indonesia Year 2007 Number 96, Supplement to the State Gazette of the Republic of Indonesia Number 4746);

DECIDES :
To Stipulate : REGULATION OF THE GOVERNMENT ON ENERGY CONSERVATION.

CHAPTER I
GENERAL PROVISIONS
Article 1

The following definition shall apply in this Regulation of the Government:

1. Energy conservation shall mean a systematic, planned, and integrated effort in order to conserve energy resources in the country and improve the efficiency of its utilization.
2. Energy shall mean the the capacity to perform work that may take the form of heat, light, mechanics, chemical, and electromagnetic.
3. Energy sources shall mean anything that can produce energy, both directly and indirectly, through conversion or transformation processes.
4. Energy resources shall mean the natural resources that can be utilized, both as energy source and energy.
5. Business entity shall mean a company in the form of a legal entity that runs a continuous and permanent business and is established in accordance with the laws and regulations and is operational and domiciled within the territory of the Unitary State of the Republic of Indonesia.
6. Permanent business establishment shall mean a business entity established and having a legal entity outside the Unitary State of the Republic of Indonesia engaged in activities and

domiciled within the territory of the Unitary State of the Republic of Indonesia and obliged to comply with the laws and regulations of the Republic of Indonesia.

7. Entrepreneur shall mean individual, enterprise, permanent establishment that conduct energy business, including producers of energy utilization equipment.
8. Utilization of energy shall mean any activity using energy, both directly and indirectly, from energy sources.
9. Producer of energy saving equipment shall mean individual or business entity that has business activities that produce and / or conduct energy saving equipment.
10. Energy user shall mean individual, enterprise, permanent establishment, government agency, and non-governmental institution, which use energy to produce products and / or services.
11. Energy source user shall mean individual, enterprise, permanent establishment, government agency, and non-governmental institution, which use energy sources.
12. Energy saving equipment shall mean device or equipment or facility that in its operation as efficient use of energy in accordance with the benchmark of energy saving settled.
13. Energy utilization equipment shall mean device or equipment or facility that in its operation use energy sources of energy.
14. Energy audit shall mean a process of evaluation of energy utilization and energy saving opportunities identification and recommendation on improving of efficiency on energy user and energy source user in order to conserve energy.
15. Central Government, hereinafter referred to as Government is the President of the Republic of Indonesia who holds the authority to govern the Republic of Indonesia as intended by the 1945 Constitution of the Republic of Indonesia.
16. Regional government shall mean the governor, regent, or mayor and regional instrumentalities as the elements of the regional government administration.
17. Minister means the minister who is in charge of energy affairs.

CHAPTER II
RESPONSIBILITY OF GOVERNMENT, REGIONAL GOVERNMENT, ENTREPRENEUR AND SOCIETY
Part One
Common
Article 2

(1) National energy conservation become the responsibility of the Government, provincial governments, district government, employer and society.

(2) Responsibility as referred n paragraph (1) is conducted by the master plan of national energy conservation.

Article 3

(1) Master plan of national energy conservation is developed and stipulated by the Minister.
(2) Master plan of national energy conservation at least contains of target, main points of policy, program, and steps for energy conservation.
(3) Preparation of master plan of national energy conservation is done by:
    a. refers to the general plan of national energy and
    b. consider input from relevant agency, local government, enterpreneur, and society.
(4) Master plan of national energy conservation is created for a period of 5 (five) years and may be reviewed each year as needed.

Part Two
Government Responsibilities
Article 4

The Government as referred to Article 2 is nationally responsible for:

a. formulate and stimulate policies, strategies, and energy conservation programs;
b. develop qualified human resources in the field of energy conservation;
c. conduct socialization thoroughly and comprehensively for the use of technologies that implement energy conservation;
d. study, arrange, and stipulate policy, and allocate funds in order to implement energy conservation program;
e. provide facilities and / or incentives in order to implement energy conservation programs;
f. conduct technical assistance on energy conservation to entrepreneur, energy user, and energy user;
g. implement program and energy conservation activities that have been established; and
h. to provide guidance and supervision on the implementation of energy conservation program.

Part Three
Local Government Responsibilities
Article 5

Provincial local government as referred in Article 2 is responsible in accordance with the authorities in the related provinces to:

a. formulate and stimulate policies, strategies, and energy conservation programs;
b. develop qualified human resources in the field of energy conservation;
c. conduct socialization thoroughly and comprehensively for the use of technologies that implement energy conservation;

d. allocate fund in order to implement energy conservation;
e. provide facilities and / or incentives in order to implement energy conservation programs;
f. conduct technical assistance on energy conservation to entrepreneur, energy user, and energy user;
g. implement program and energy conservation activities that have been established; and
h. to provide guidance and supervision on the implementation of energy conservation program.

Article 6

The local government district referred to in Article 2 in accordance with the responsible authorities at the district / city for:

a. formulate and stimulate policies, strategies, and energy conservation programs;
b. develop qualified human resources in the field of energy conservation;
c. conduct socialization thoroughly and comprehensively for the use of technologies that implement energy conservation;
d. allocate fund in order to implement energy conservation;
e. provide facilities and / or incentives in order to implement energy conservation programs;
f. conduct technical assistance on energy conservation to entrepreneur, energy user, and energy user;
g. implement program and energy conservation activities that have been established; and
h. to provide guidance and supervision on the implementation of energy conservation program.

Part Four
Employers Liability
Article 7

(1) Enterpreneur as referred in Article 2 is responsible to:
    a. implement energy conservation in every stage of the implementation effort; and
    b. use energy efficient technologies and / or
    c. produce product and / or service that is energy efficient.
(2) Further provisions on energy efficient technologies as referred in paragraph (1) letter b are regulated by Regulation of the Minister.

Part Five
Community Responsibility
Article 8

Society as referred in Article 2 responsible for supporting and implementing energy conservation programs.

CHAPTER III
IMPLEMENTATION OF ENERGY CONSERVATION
Part One
Common
Article 9

(1) Implementation of energy conservation includes all stages of energy management.
(2) Energy management as referred in paragraph (1) includes the following activities:
    a. energy supply;
    b. energy exploitation;
    c. energy utilization; and
    d. energy resources conservation.

Part Two
Conservation in Provision of Energy
Article 10

(1) Individual, business entity, and a permanent business establishment in the energy supply activities shall implement energy conservation.
(2) Implementation of energy conservation in energy supply activities include:
    a. planning that oriented to the use of energy efficient technologies;
    b. electoral infrastructure, facility, equipment, material, and process that directly or indirectly using efficient energy; and
    c. system operation of efficient energy.

Part Three
Conservation in Utilization of Energy
Article 11

(1) Individual, business entity, and the permanent establishment doing business in the energy required to conserve energy.
(2) Utilization of energy as referred in paragraph (1) includes exploitation of energy resources, energy resources, and energy.

(3) Implementation of energy conservation in the energy business as referred in paragraph (1) is conducted through the application of energy efficient technologies that meet the standards in accordance with the provisions of legislation.

Part Four
Utilization of Energy Conservation in

Article 12

(1) Utilization of energy by the user of energy sources and energy users must be done sparingly and efficiently.

(2) User of energy sources and energy users that use energy sources and / or energy greater than or equal to 6000 (six thousand) tones of oil equivalent per year are required to conduct energy conservation through energy management.

(3) Energy management as referred to in paragraph (2) conducted by:
   a. appoint manager of energy;
   b. develop energy conservation programs;
   c. conduct energy audits on a regular basis;
   d. implement the recommendations of energy audits; and
   e. report the implementation of energy conservation every year to the Minister, governors, or regents / mayor in accordance with their respective authorities.

Article 13

(1) Energy audit as referred in Article 12 paragraph (3) letter c is carried by the internal energy auditor and / or institutions that have been accredited.

(2) Energy manager as referred in Article 12 paragraph (3) letter a and energy auditor as referred in paragraph (1), must have a certificate of competency in accordance with the provisions of legislation.

(3) Energy conservation program as referred in Article 12 paragraph (3) letter b made by energy sources user and energy user, at least contains information about:
   a. plan that will be done;
   b. type and energy consumption;
   c. the use of energy efficient equipment;
   d. measures of energy conservation and
   e. the number of products produced or services rendered.

(4) Report on the implementation of energy conservation as referred in Article 12 paragraph (3) letter e is compiled based on energy conservation program as referred in paragraph (3).

(5) Further provisions regarding the procedures for the preparation of programs and reporting the results of the implementation of energy conservation as referred in paragraph (3) and paragraph (4) are regulated by Regulation of the Minister.

Part Five

Energy Resources Conservation

Article 14

(1) The Minister establishes a policy of conservation of energy resources.

(2) The conservation policy of energy resources as referred in paragraph (1) include but are not limited to:

a. energy resources are prioritized to be made and / or made available;
b. the amount of energy resources that can be produced; and
c. limitation of energy resources in a certain time limit cannot be cultivated.

CHAPTER IV

STANDARD AND LABEL

Article 15

(1) Implementation of energy efficient technologies made through the establishment and enforcement of energy performance standards on energy utilized equipment.

(2) Standard referred in paragraph (1) is determined in accordance with the provisions of legislation.

Article 16

(1) Implementation of energy performance standard on energy utilized equipment as referred in Article 15 paragraph (1) is conducted with the inclusion of energy efficiency labels.

(2) Inclusion of the level of energy efficiency labels is carried by the equipment manufacturer and importer of energy utilization on energy utilized equipment in stages according to labeling procedures.

(3) Further provisions regarding the phasing, the procedures for labeling, and other types of energy utilization equipment as referred in paragraph (2) are regulated by Regulation of the Minister.

CHAPTER V

FACILITIES, INCENTIVES AND DISINCENTIVES

Part One

Facilities and Incentives

Article 17

Government and / or regional government give facilities to the energy user and energy saving equipment manufacturers in the country that carry out energy conservation to obtain:

a. access to information about energy-saving technologies and specifications, and how / energy-saving measures; and
b. consultancy services on how to / energy saving steps.

Article 18

Government and / or regional governments provide incentives to:

a. energy users that use energy greater than or equal to 6000 (six thousand) tones of oil equivalent per year as referred to in Article 12 paragraph (2); and
b. energy saving equipment manufacturers in the country, that successfully implement energy conservation at a particular period.

Article 19

Criteria for successful implementation of energy conservation for energy users as referred in Article 18 letter a certain period when there is decline on:

a. specific energy consumption and / or
b. elasticity of energy consumption.

Criteria for successful implementation of energy conservation for energy saving equipment manufacturers referred in Article 18 letter b if in a given period:

a. produce energy-saving equipment that energy efficiency is higher than the specified benchmark and
b. state that the energy efficiency label in accordance with applicable standards.

Further provisions concerning the criteria for successful implementation of energy conservation as referred in paragraph (1) and paragraph (2) are regulated by Regulation of the Minister.

Article 20

(1) Incentives given to energy users as referred in Article 18 letter a can be:

a. tax facilities for energy-efficient equipment;
b. granting the reduction, relief, and local tax exemptions for energy-saving equipment;
c. import duty facilities for energy-saving equipment;
d. low interest funds for energy conservation investments in accordance with the provisions of legislation and / or
e. energy audit in partnership financed by the Government.

(2) Incentives given to producers of energy-saving equipment as referred in Article 18 letter b can be:
   a. tax facilities for components / spare parts and raw materials used to produce energy-efficient equipment;
   b. granting the reduction, relief, and local tax exemption for parts / spare parts and raw materials used to produce energy-efficient equipment;
   c. import duty facilities for components / spare parts and raw materials that will be used to produce energy-saving equipment and / or
   d. low interest funds for investment in order to produce energy-saving equipment in accordance with the provisions of legislation.

(3) Application of incentives may be submitted by a user of energy in terms of the evaluation report on the implementation of energy conservation as stipulated in Article 12 paragraph (3) letter e in accordance with the provisions as referred in Article 19 paragraph (1), indicates the successful implementation of energy conservation.

(4) Application of incentives may be submitted by the manufacturer of energy saving equipment in the country in terms of verification of the success criteria as referred in Article 19 paragraph (2) shows the successful implementation of energy conservation.

(5) Tax facility as referred in paragraph (1) letter a, and paragraph (2) letter a, is given in accordance with the provisions of legislation in the field of taxation.

(6) Provision on reduction, relief, and local tax exemption as referred in paragraph (1) letter b and paragraph (2) letter b is given in accordance with the provisions of legislation in the field of local taxes.

(7) Facility of import duties as referred in paragraph (1) c and (2) c, is given in accordance with the provisions of legislation in the field of customs.

Article 21

(1) Incentives in the form of energy audit in partnership as referred in Article 20 paragraph (1) letter e that are provided to energy user as referred in Article 18 letter a, may also be given to energy user who use less energy than 6000 (six thousand) tones of oil equivalent per year that successfully implement energy conservation.

(2) Further provisions concerning the requirements and criteria for energy users as referred in paragraph (1) are regulated by Regulation of the Minister.

Part Two

Disincentive

Article 22

(1) Energy sources user and energy user as referred in Article 12 paragraph (2) which does not carry out energy conservation through energy management disincentives imposed by the Minister, governors, or regents / mayor in accordance with their respective authorities.
(2) Disincentives as referred to in paragraph (1) may include:
    a. written warning;
    b. announcements in the media;
    c. fines; and / or
    d. reduction of energy supply.

Article 23

Written warning as referred in Article 22 paragraph (2) letter a is given at most 3 (three) times in the deadlines of each 1 (one) month.

Article 24

In terms of energy user and energy user that has been warned as many as 3 (three) times as referred in Article 23 does not carry out energy conservation, Minister, governor, or regent / mayor in accordance with the authority announce user name of concerned energy sources and energy users cin media.

Article 25

(1) In the case of 1 (one) month after the user name of energy source and energy user announced in the media as referred in Article 24 would not carry out energy conservation, the related parties are fined.
(2) The fine referred in paragraph (1) is subjected to as much as 2 (two) times of the value of energy waste generated.
(3) The result of the fine as referred in paragraph (2) is deposited to the state treasury / cash in accordance with the provisions of the legislation.

Article 26

(1) In the case of 1 (one) month after the imposition of fines to energy sources user and energy user do not paying fines, Minister, governor, or regent / mayor in accordance with the authority settle the reduction of energy supply to the concerned.
(2) Governor or regent / mayor in determining the reduction of energy supply as referred in paragraph (1) must obtain approval from the Minister.

(3) Reduction of energy supply as referred in paragraph (1) does not eliminate the obligation to pay fines by energy sources user and energy user.

Article 27

Further provisions concerning the procedure of imposition of disincentives as referred in Article 22 to Article 26 shall be regulated by Regulation of the Minister.

CHAPTER VI
GUIDANCE AND SUPERVISION
Article 28

(1) The Government and regional governments provide guidance and supervision to the implementation of energy conservation in accordance with the authority.
(2) Guidance as referred to in paragraph (1), is implemented through:
    a. education and training;
    b. technical guidance;
    c. extension;
    d. dissemination of information through print media, electronic media, forums, or exhibitions; and
    e. encouragement and / or facilitation of research activities and development of energy conservation technologies.
(3) Supervision as referred in paragraph (1), is carried out on:
    a. the appointment of energy manager;
    b. formulation of energy conservation program;
    c. implementation of energy audit on a regular basis; and
    d. implementation of energy audit recommendation.
(4) Funding needed for guidance and supervision carried out by the Government as referred in paragraph (1) is charged to the State Budget of Income and Expenditure.
(5) Funding needed for guidance and supervision carried out by regional government as referred in paragraph (1) is charged to the Regional Budget of Income and Expenditure.

CHAPTER VII
TRANSITIONAL PROVISIONS
Article 29

In terms of national energy general plan as referred in Article 3 paragraph (3) letter a has not been determined, the master plan of national energy conservation can be arranged with concerning input from relevant agency, local government, entrepreneur, and society.

CHAPTER VIII
FINAL PROVISIONS
Article 30

At the time of this Regulation of The Government shall become effective, Presidential Decree Number 43 Year 1991 on Conservation of Energy is revoked and declared invalid.

Article 31

This Regulation of the Government shall become effective as of the date of its enactment.
For public cognizance, it is instructed to promulgate this Law by inserting the same in the State Gazette of the Republic of Indonesia

Approved in Jakarta
on 16 November 2009

PRESIDENT OF THE REPUBLIC OF INDONESIA,
signed
DR. H. SUSILO BAMBANG YUDHOYONO

Enacted in Jakarta
on 16 November 2009
MINISTER OF LAW AND HUMAN RIGHTS
OF THE REPUBLIC OF INDONESIA,
signed
Patrialis Akbar

STATE GAZETTE OF THE REPUBLIC OF INDONESIA YEAR 2009 NUMBER 171

SECRETARY OF STATE RI
Head of Bureau of Laws and Regulations
Field of Economy and Industry
signed
Setio Sapto Nugroho

EDUCATION OF
REGULATION OF THE GOVERNMENT OF THE REPUBLIC OF INDONESIA
NUMBER 70 YEAR 2009
ON
ENERGY CONSERVATION

I. GENERAL

Energy has a very important role and become the basic needs of sustainable national economic development. Therefore, the energy should be used efficiently, rationally, and wisely in order to fulfill the needs of today's and future's energy. Concerning the importance of using energy efficiently, rationally, and wisely, the Government shall stipulate the Regulation of The Government in the framework of regulation of energy resource, energy source and energy, through the application of energy efficient technology, utilization of energy efficiently and rationally, and application of energy-saving culture in order to ensure the availability of national energy that is environmental-perspective.
This Regulation of the Government provides:

1. Responsibility of the Government, regional governments, entrepreneur, and society;
2. implementation of energy conservation which covers all stages of energy management which includes the energy provision, energy exploitation, energy utilization, and energy resources conservation;
3. standards and label;
4. facilities, incentives and disincentives; and
5. guidance and supervision.

II. ARTICLE BY ARTICLE

Article 1

Sufficiently clear.

Article 2

Sufficiently clear.

Article 3

Sufficiently clear.

Article 4

Sufficiently clear.

Article 5

Sufficiently clear.

Article 6

Sufficiently clear.

Article 7

Paragraph (1)

Sufficiently clear.

Paragraph (2)

Regulation of the Minister under this provision among others regulate the utilization of energy efficient technology, from upstream to downstream, that is from the start of the process of the supply, transmission, distribution to use.

Article 8

Responsibility of community in this provision is intended to create energy-saving culture.

Article 9

Sufficiently clear.

Article 10

Sufficiently clear.

Article 11

Sufficiently clear.

Article 12

Paragraph (1)

The definition of "sparing" in this provision is related to the behavior of energy usage effectively and efficiently.

The definition of "efficient" in this provision is the maximum value resulting from the comparison between the output and input of energy in the energy utilized equipment.

Paragraph (2)

Determination limit the number 6000 (six thousand) is based on the consideration that the energy user's consumption is greater than or equal to 6000 (six thousand) tones of oil equivalent per year is not too much, but the total energy consumption is around 60% (sixty percent) of national energy consumption.

In other words, if measures for energy conservation are done successfully on these groups, the impact of national savings will be significant.
Equals 1 (one) ton of oil is equal to:

- 41.9 giga joules (GJ);
- 1.15 kilo liters of petroleum (oil kl);
- 39.68 million British Thermal Units (MMBTU); or
- 11.63 mega watt hour (MWh).

Paragraph (3)

The definition of "energy management" is an integrated activity to control energy consumption in order to achieve effective utilization of energy and efficient way to produce the maximum output through technical measures in a structured and economically to minimize the utilization of energy, including energy for production process and to minimize the consumption of raw materials and supported ingredients.

Article 13

Paragraph (1)

The definition of "internal energy auditor" is an auditor who worked on the energy sources user and energy user.

Paragraph (2)

Sufficiently clear.

Paragraph (3

Sufficiently clear.

Paragraph (4)

Sufficiently clear.

Paragraph (5)

Sufficiently clear.

Article 14

Paragraph (1)

Sufficiently clear.

Paragraph (2)

Letter a

Sufficiently clear.

Letter b

Sufficiently clear.

Letter c

Limitation of energy resources in this provision is conducted towards the energy resources that are not renewable.

Article 15

Sufficiently clear.

Article 16

Paragraph (1)

Level of energy efficiency label contains information on the level of energy consumption at an energy utilized equipment.

With the label, people get information about the level of energy consumption from an energy utilized equipment.

Paragraph (2)

Energy utilized equipment that is primarily meant is the one which use electrical energy such as refrigerator, lamp, iron, air conditioner, rice cooker, electric motor etc.

Paragraph (3)

Sufficiently clear.

Article 17

Sufficiently clear.

Article 18

Sufficiently clear.

Article 19

Paragraph (1)

Letter a

The definition of "specific energy consumption" is the amount of energy used to produce 1 (one) unit of product or output. Decrease in specific energy consumption should be compared in the same output level, such as kWh / ton, kWh/m^2, liters / kWh.

Letter b

The definition of "the elasticity of energy consumption" is the ratio of energy consumption's growth on the product or output's growth (Δ of energy consumption to the Δ of product or output).

Paragraph (2)

Sufficiently clear.

Paragraph (3)

Setting the success of implementation of energy conservation covers such as:

a. success criteria (energy-saving benchmark, the percentage decrease in intensity, elasticity, period, and the decrease trend); and
b. procedure of success assessment.

Article 20

Sufficiently clear.

Article 21

Sufficiently clear.

Article 22

Sufficiently clear.

Article 23

Sufficiently clear.

Article 24

Announcement in the mass media in this provision is conducted at least in 1 (one) printed or electronic media.

Article 25

Sufficiently clear.

Article 26

Sufficiently clear.

Article 27

Sufficiently clear.

Article 28

Sufficiently clear.

Article 29

Sufficiently clear.

Article 30

Sufficiently clear.

Article 31

Sufficiently clear.

SUPPLEMENT TO THE STATE GAZETTE OF
THE REPUBLIC OF INDONESIA NUMBER 5083

MINISTER OF FINANCE
REPUBLIC OF INDONESIA
COPY

REGULATION OF THE MINISTER OF FINANCE
NUMBER 24/PMK.011/2010
ON
GRANTING OF TAXATION AND CUSTOMS FACILITIES FOR RENEWABLE ENERGY RESOURCES UTILIZATION ACTIVITIES

BY THE BLESSING OF THE ONE AND ONLY GOD
MINISTER OF FINANCE,

Considering:

a. that in order to reduce dependence on non-renewable energy use and to ensure a sustainable energy supply, shall support the utilization of renewable energy sources;
b. that in order to attract investment and improve competitiveness in the field of utilization of renewable energy sources shall provide taxation and customs facilities for employers in the utilization of renewable energy sources;
c. that based on the consideration of letters a and b, it is necessary to stipulate the Regulation of The Minister of Finance on Granting of Taxation and Customs Facilities for Renewable Energy Resources Utilization Activities;

In view of:

1. Law Number 6 Year 1983 on General Provisions and Tax Procedures State Gazette of the Republic of Indonesia Year 1983 Number 49, Supplement to the State Gazette of the Republic of Indonesia Number 3262 as already several times amended at the latest by Law Number 16 Year 2009 (State Gazette of the Republic of Indonesia Year 2009 Number 62, Supplement to the State Gazette of the Republic of Indonesia Number 4999);
2. Law Number 7 Year 1983 on Income Tax (State Gazette of the Republic of Indonesia Year 1983 Number 50, Supplement to the State Gazette of the Republic of Indonesia Number 3263) as already several times amended at the latest by Law Number 36 Year 2008 (State Gazette of the Republic of Indonesia Year 2008 Number 133, Supplement to the State Gazette of the Republic of Indonesia Number 4893);
3. Law Number 8 Year 1983 on Value Added Tax on Goods and Services and Sales Tax on Luxury Goods (State Gazette of the Republic of Indonesia Year 1983 Number 51, Supplement to the State Gazette of the Republic of Indonesia Number 3312) as already several times amended at the latest by Law Number 18 Year 2000 (State Gazette of the Republic of Indonesia Year 2000 Number 128, Supplement to the State Gazette of the Republic of Indonesia Number 3986);

4. Law Number 10 Year 1995 on Customs (State Gazette Republic of the Republic of Indonesia Year 1995 Number 75, Supplement to the State Gazette of the Republic of Indonesia Number 3612) as amended by Law Number 17 Year 2006 (State Gazette of the Republic of Indonesia Year 2006 Number 93, Supplement to the State Gazette Republic of Indonesia Number 4661);
5. Law Number 47 Year 2009 on State Budget on Revenue and Expenditure Year 2010 (State Gazette of the Republic of Indonesia Year 2009 Number 156, Supplement to the State Gazette of the Republic of Indonesia Number 5075);
6. Government Regulation Number 12 Year 2001 on Import and or Taxable Goods Delivery of Certain Strategic Freed from Value Added Tax (State Gazette of the Republic of Indonesia Year 2001 Number 24, Supplement to State Gazzete of the Republic of Indonesia Number 4083) as already several times amended at the latest by Regulation of the Government of Indonesia Number 31 Year 2007 (State Gazette of the Republic of Indonesia Year 2007 Number 69, Supplement to the State Gazette of the Republic of Indonesia Number 4726);
7. Regulation of the Government of Indonesia Number 1 Year 2007 on Income Tax Facilities for Investment in Areas of Certain Enterprises and / or in Certain Areas (State Gazette of the Republic of Indonesia Year 2007 Number 1, Supplement to the State Gazette of the Republic of Indonesia Number 4675) as amended by Regulation of the Government of Indonesia Number 62 Year 2008 (State Gazette of the Republic of Indonesia Year 2008 Number 132, Supplement to the State Gazette of Republic of Indonesia Number 4892);
8. Presidential Decree Number 84 / P Year 2009;

DECIDES:

REGULATION OF THE MINISTER OF FINANCE ON THE GRANTING OF TAXATION AND CUSTOMS FACILITIES FOR RENEWABLE ENERGY RESOURCES UTILIZATION ACTIVITIES.

CHAPTER I
GENERAL PROVISIONS
Article 1

Regulation of the Minister of Finance has the following meanings:

1. Income Tax which hereinafter abbreviated as PPh is Income Tax as referred in Law Number 7 Year 1983 on Income Tax as amended several times at the latest by Law Number 36 Year 2008.

2. Value Added Tax which hereinafter abbreviated as VAT is Value Added Tax as referred in Law Number 8 Year 1983 on Value Added Tax on Goods and Services and Sales Tax on Luxury Goods as amended several times at the latest by Law Number 42 Year 2009.
3. Import Duties are state charges based on Law Number 10 Year 1995 on Customs as amended by Law Number 17 Year 2006 that imposed on imported goods.
4. Renewable Energy Resources are energy resources produced from sustainable energy resources if managed properly, such as geothermal, wind, bioenergy, sunlight, flow and fall of water, and movement and temperature difference on sea layer.
5. Renewable energy is energy derived from Renewable Energy Resources.

CHAPTER II
TAXATION AND CUSTOMS FACILITIES
Article 2

For Renewable Energy Resources Utilization Activities can be granted taxation and customs facilities in the form of:

a. Income Tax facility;
b. VAT facility;
c. Import Duties facility;
d. The Government paid tax facility.

CHAPTER III
TAX FACILITIES
Article 3

(1) Tax Facilities as referred in Article 2 letter a is:
   a. reduction of net income by 30% (thirty percent) from the value of investment, that is charged for 6 (six) years each of 5% (five percent) per year;
   b. accelerated depreciation and amortization, as follows:

Tangible Fixed Assets Group	Benefit Period Become:	Depreciation and Amortization Rates Based on Methods of:	
		Straight Line	Declining Balance
I. Not Building :			
Group I	2 years	50%	100% (charged once)
Group II	4 years	25%	50%
Group III	8 years	2,5%	25%
Group IV	10 years	10%	20%

II. Building :			
Permanent	10 years	10%	-
Non Permanent	5 years	20%	-

c. Income Tax on dividends that is paid to Foreign Tax Subjects by 10% (ten percent), or a lower rate according to the applicable Avoidance of Double Taxation Agreement; and

d. Compensation of losses that is longer than 5 (five) years but not more than 10 (ten) years with the following conditions:

1) additional 1 year: if the new investment is done in the areas of particular businesses on industrial and bonded zone;

2) additional 1 year: when employing at least 500 (five hundred) of Indonesian workers for 5 (five) consecutive years;

3) additional 1 year: if the new investment requires capital/expenditure for social and economic infrastructure at the business location of at least Rp. 10.000.000.000,00 (ten billion rupiahs);

4) additional 1 year: if the cost of research and development in the country within the framework of product development or production efficiency of at least 5% (five percent) of the investment within 5 (five) years; and / or

5) additional 1 year: when using raw materials or domestically produced components of at least 70% (seventy percent) since the 4th year (four).

(2) The procedure for granting income tax facilities as referred in act (1) is conducted in accordance with the provisions stipulated in Regulation of the Government of Indonesia Number 1 Year 2007 on Income Tax Facilities for Investment in Areas of Certain Enterprises and/or in Certain Areas and regulations implemented, and its amendment.

Article 4

(1) For Import of goods in the form of machinery and equipment, whether installed or independent, not including spare parts, which is required by employers in the area of of Renewable Energy Resources are exempt from the collection of Income Tax Article 22 of imports.

(2) Exclusion from the collection of Income Tax Article 22 of imports as referred to in act (1) is done automatically without using the Free Certificate (SKB).

CHAPTER IV
VALUE ADDED TAX FACILITIES
Article 5

(1) VAT facilities as referred in Article 2 letter b is the exemption from the imposition of VAT on the import of Taxable Goods in the form of strategic machinery and equipment, whether installed or independent, not including spare parts, which is required by employers in the area of utilization of Renewable Energy Resources to produce Taxable Goods.
(2) The procedure for exemption from the imposition of VAT as referred to in paragraph (1) in accordance with stipulations set out in Government Regulation No. 12 Year 2001 regarding Import and / or delivery of taxable goods Certain Strategic Freed from Value Added Tax and implementing regulations, and its amendment.

CHAPTER V
IMPORT DUTY FACILITIES
Article 6

Import Duty facilities as referred in Article 2 letter c is the exemption of import duty facilities as stipulated in:

(1) Regulation of the Minister of Finance Number 176/PMK.011/2009 on Exemption of Import Duties on Imports of Goods and Machinery And Materials for Industrial Construction and Development for Investment, and its amendment;
(2) Regulation of the Minister of Finance Number 154/PMK.011/2008 on Exemption of Import Duties on Imports of Capital Goods for Construction and Development of Power Plant Industry for Public Interest, and its amendment.

CHAPTER VI
FACILITIES TAX GOVERNMENT RESTS
Article 7

Government borne tax facilities as referred in Article 2 letter d is a Government borne tax facilities that are regulated by Law of Income and Expenditure Budget of the State and its implementing regulations.

CHAPTER VII
CLOSING
Article 8

This Regulation shall become effective as of the date of its enactment.
For public cognizance, it is instructed to promulgate this Regulation by inserting the same in the State Gazette of the Republic of Indonesia.

Approved in Jakarta
on January 29, 2010

MINISTER OF FINANCE,
signed
Sri Mulyani Indrawati

Enacted in Jakarta
On January 29, 2010
MINISTER OF JUSTICE AND HUMAN RIGHTS,
Patrialis Akbar

STATE GAZETTE OF THE REPUBLIC OF INDONESIA YEAR 2010 NUMBER 50