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THE WORLD BANK

ASSISTANCE TO THE GOVERNMENT OF INDONESIA'S DEMAND-SIDE MANAGEMENT PROGRAM

FINAL REPORT
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ECONOLER
INTERNATIONAL

ABBREVIATIONS AND ACRONYMS

A/C	Air Conditioning
ASEAN	Association of South East Asian Nations
BNS	Bureau of National Standards
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CFL	Compact Fluorescent Lamps
DSM	Demand-Side Management
DGEEU	Directorate General of Electricity and Energy Utilization
EE	Energy Efficiency
ESCO	Energy Services Company
FPR	Financial Progress Report
GDP	Gross Domestic Product
GEF	Global Environment Fund
GoI	Government of Indonesia
HVAC	Heating, ventilation and air conditioning
IRP	Integrated Resource Planning
KONEBA	PT Konservasi Energi Abadi (Persero), Energy and environmental services company
LFA	Logical Framework Analysis
MEMR	Ministry of Energy and Mineral Resources
NEM	National Energy Management (Blueprint)
NPR	Narrative Progress Report
PIP	Project Implementation Plan
PLN	PT PLN (PERSERO) (Indonesian Electricity Provider)
PNM	PT Permodalan Nasional Madani (Persero)
SBM	Acronym in Bahasa standing for Oil Barrel Equivalent
SNI	Standard National Indonesia
Toe	Tons of Oil Equivalent
TDS	Total Dissolved Solids
UNFCCC	United Nations Framework Convention on Climate Change

EXECUTIVE SUMMARY

Background

The energy situation in Indonesia is changing rapidly. High and fast international oil energy price increases had to be dealt with to ease the pressure on the national economy. In the meantime, electricity tariffs subsidy had to decrease significantly to prepare the ground for electricity sector restructuring.

In addition, Indonesia shows the highest energy intensity level in the sub-region, indicating that potential significant energy savings may exist in several economical sectors.. One option to deal with this new energy situation was clearly to promote actively DSM initiatives and programs so to limit at customer's level the potential negative impact of energy price hike.

In this context, Econoler International was contracted by the World Bank to develop a strategy assisting the government of Indonesia to enhance its Demand-Side Management Program. DGEEU and PLN were identified as key stakeholders in that policy planning and implementation. DSM Program Review and additional suggested initiatives implementation include organizational aspects that refer to both entities.

Mandate's Objectives

The objectives of our assignment were to assist the Ministry of Energy and Mineral Resources and PLN together with other pertinent governmental agencies, to implement the proposed DSM Program through the following actions:

- Assess DGEEU and PLN's ongoing DSM Program.
- Strengthen PLN and Ministries' capacity for implementing DSM programs in the industrial and commercial sectors.
- Develop a preliminary but more comprehensive DSM program for potential industrial and commercial customers.

Energy Current Situation

Over the past decade, power demand grew rapidly in Indonesia. PT PLN (Persero), the Indonesian utility, quadrupled in size; sales grew from 27.7 TWh in 1990/91 to 98.3 TWh in 2004/05 and installed capacity increased from 9.3 GW to 21.8 GW in the same period. The number of customers grew from 11 millions to 33.5 millions.

Total consumption and peak demand are expected to continue this relentless growth through the next five years. High growth rates are forecasted for all sectors: between 2005 and 2015, the energy consumption is expected to grow at 6.6% while the demand is expected to grow at 3.6%. Moreover the Master Plan of National Energy Conservation issued by the National Energy Coordinating Boar is planning to increase the electrification rate from 60% in 2004/05 to 95% in 2025, adding more

pressure on electricity demand. This growth may be constrained by the effective ability to keep up with demand. Electricity shortage is common outside Java-Bali and in 2005 it has reached Java. Increasing power supply so rapidly created new financial, economic, and environmental pressures on the national economy. This situation is amplified as the electricity tariff rates were not increased in 2004 by 6% as decided for and do not reflect yet the current oil prices increase.

The Electricity Law in Indonesia

The electricity law issued on September 2002 was finally abolished on November 2004. The decision of the Constitutional Court was based on the interpretation that the state should regulate, facilitate and operate electricity provision as a means to exercise ''control'' over the sector. Furthermore, it was deemed that electricity production facilities should be integrated, nullifying the provision for unbundling PLN. The reform process was then put on ice and the Demand-Side-Management and Energy Efficiency concerns were also on stand-by.

In year 2005, Decree No. 31/2005 ''Implementation Guidelines for Energy Savings'' was issued by the Ministry of Energy and Mineral Resources. It includes various energy efficiency measures to be implemented in all economic sectors including transport. PLN programs, such as CFL promotion, labeling household appliances, energy audits, are to keep going. In the long-term, DSM policy objectives are to reduce by 1% yearly the energy intensity. In the medium-term PLN has set up to 14.3 TWh the cumulated electricity savings target for the period 2005-2010.

Short-term actions following the Presidential instruction No 10 on July 2005 were immediately taken by government officers and PLN claiming a 600-900 MW reduction on its peak demand of 16,600 MW. This readjusted somewhat the energy situation in the country. However, this national immediate reaction shows also the big potential on energy savings by demand-side effective management.

Demand-Side Management Benefits to Indonesia

DSM is the planning, implementation, and monitoring of utility activities designed to encourage customers to modify their electricity consumption patterns, both with respect to the timing and level of electricity demand. Although DSM is not a panacea for problems of the Indonesian power sector, experience in United States, Canada, and elsewhere suggests that it deserves a role in Indonesia's power sector strategy for the next decade. As capacity deferral and energy reduction benefits are potentially so significant in Indonesia, peak clipping and strategic energy conservation should be vigorously pursued through DSM wherever it is cost effective for the customer and for the power industry.

The DSM programs developed in this report refer to the request of DGEEU/PLN for the following activities:

- Efficient lighting program for all the sectors including social category for residential sector.
- Street lighting program.

- Audit program for the Industrial and building sectors.
- Labelling for residential appliances.
- Awareness and dissemination program.

Additional activities are identified in the report considering that they present large potential for sustainability and reliability and thus help reinforcing the ongoing DSM programs:

- Developing an ESCO market in Indonesia.
- Benchmarking program for industries and commercial and offices buildings.
- Build up an energy efficiency revolving fund.
- DSM program for the governmental buildings.
- Load shifting for centralized Air conditioning systems.
- Cogeneration as an interesting DSM Channel.
- Indonesian Building code as an initiative for saving by design.

Efficient Lighting Program for All the Sectors

The efficient lighting program driven by PLN started on 2002. With a rapid growth of CFL usage in all the economical sectors of Indonesia, its importation was then increased by more than five times since program start-up. The CFL market is estimated to be more than 147 million units. Ongoing efforts to promote CFLs are bringing a penetration rate of nearly 32.5%. Efforts to promote CFLs should be sustained to ease its access to all customers' categories. PLN is developing with the manufacturers a new way to introduce new efficient technologies in Indonesia.

To take advantage of the momentum created by CFL program, it is suggested also to include FTL in the program. The potential FTL market is estimated to be 29 million units.

If the efficient lighting program is totally achieved it will generate 730 MW load savings and 1.9 TWh annual energy savings.

Street Lighting Program

Street lighting program is still at its early development stage. The program is a response by the Municipal Corporations to the street lighting tariff large increase introduced by PLN in 2002.

PLN is installing the meters for the participant cities. The replacement of existing lamps with more efficient models is the only technology introduced.

DGEEU/PLN can develop more aggressive strategy towards the implementation of EE in the public street lighting. Other technologies such as load management systems can be introduced. Improvement of maintenance along with a financing scheme involving ESCO concept would be very appropriate.

The whole street lighting connected load approximates 400 MW. With a potential savings of 80-160 MW and almost a full coincidence with PLN peak load, public street lighting should be included as part of the near future DSM programs in Indonesia.

Partnership Program on energy conservation for the Industrial and Building Sectors

Almost 17 free of charge audits were achieved as part of the partnership on energy conservation program since its start-up in 2003. Our opinion, based on international experience, is that the free-of-charge aspect is prejudicial to the program as it reduces customer obligation towards the implementation stage and decreases his interest toward the proposed energy efficient measures.

A second aspect to be dealt with in the existing program is that, auditors are putting emphasis on analyzing the current energy situation of the facilities. Little interest is addressed to identify and promote energy efficiency measures. Adequate training and accreditation of auditors should improve audits results and enlarge the number of auditors in Indonesia.

Recommendations are made, such as: adopt mandatory audits for intensive energy customers (with more than 12,000 Toe/year), implement an important awareness program to promote auditing practices among the targeted sector members.

Technologies with high replication potential like HE motors, VSD, efficient pumps and fans, efficient A/C, ice storage, etc. should be promoted in the market in close collaboration with existing suppliers.

A minimum of 800 audits achievement is suggested to be a realistic target for the period 2006-2010. Well conducted audits and actual implementation of identified energy efficiency measures would result in 160 MW load savings of and around 760 MW for year 2015. . The cost of this program has been estimated to US$15 million approximately.

Labeling for Residential Appliances

The evening peak demand is mostly created by the residential sector electricity demand In Indonesia. Despite the fact that only 53% of the 56 million households are presently electrified, the labelling activities are considered by the Government of Indonesia among the main DSM programs. The labelling program is at an early stage in Indonesia.

A preliminary energy saving evaluation has been conducted. A total load saving potential has been estimated up to 910 MW.

Energy efficiency tests and certification are to be conducted on so called energy efficient appliances to be sold in the Indonesian market before they get any official label. The PLN existing laboratory is the appropriate place to conduct these energy efficiency tests. A priority should be given to the new CFL introduced heavily since 2003 in the Indonesian market. Refrigerators and freezers, and individual air conditioners should be the next candidates for labeling. Testing these appliances will require some additional equipment as mentioned in this report.

The procedure for the whole design of standards and labeling requires experimented support. The report describes the standard of art steps including the involvement of local manufacturers of the targeted products. Disseminating and evaluating labeling program impact are among the most important activities.

Awareness and Dissemination Program

According to our assessment, there is a need to develop material for awareness purposes for the industrial and building sectors on the short term and for households on the long term.

Awareness initiatives and strategies can be developed by DGEEU/PLN through video films, printed material, travelling booth with leaflets, energy hot-line, visits and monthly newspaper articles and information sheets, energy contests, etc.

As a priority we recommend to develop a guide for energy efficiency targeting specific applications for Indonesia.

Next Step

A next step for GoI DSM strategy would entail the elaboration of a DSM Master Plan. This plan would be based on comprehensive market research and fix the technical and economical energy efficiency potential. Detailed end-use energy consumption pattern would be developed for typical peak day and the rest of the year. Such research should be looked at as long-term GoI activities as DSM should be part of energy planning and policies in the future.

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1 BACKGROUND

1.1 ENERGY SECTOR

The energy sector of Indonesia is currently facing an important period of evolution, which is partly due to the strong increases in fuel costs. The past evolution of the generation-transmission and distribution system may bring explanations to the current energy challenges. DSM as a potential solution to this situation will then build on this background to size the level of efforts required to correct the current energy gaps. In the following paragraphs energy sector key elements will be described such as: electricity sector situation, energy intensity evolution and electricity peak load.

Electricity Sector

The existing electricity generation and transmission system in Indonesia is presented on the map below. The total installed production capacity is 24,000 MW, of which 18,500 MW are located in the Java-Bali region.

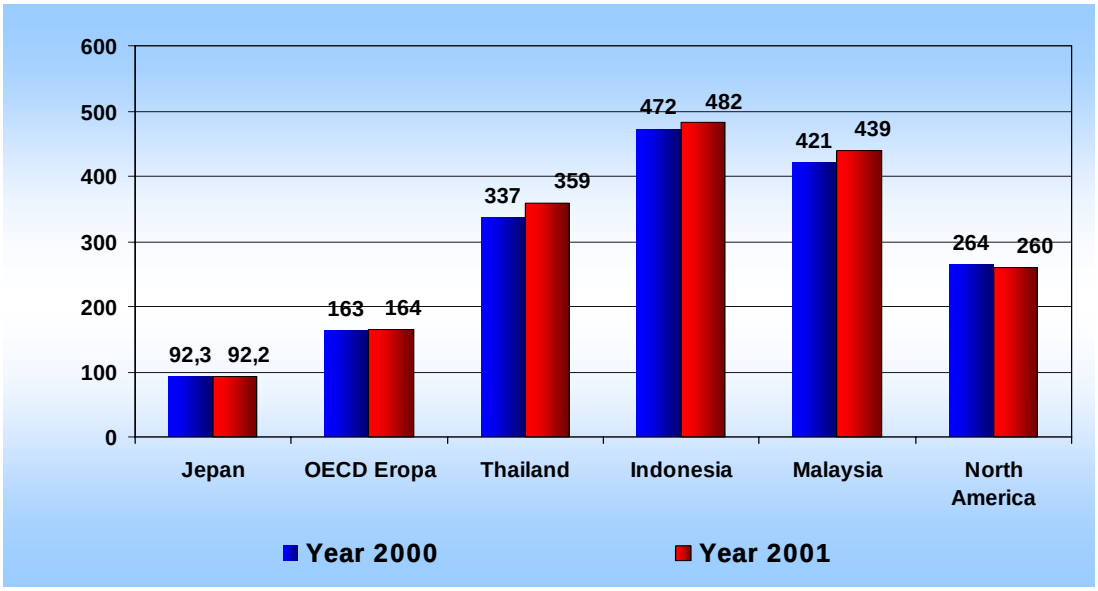
Source: Blueprint of National Energy Coordinating Board 2005 – 2025, June 2005

Figure 1: Indonesian Electricity Generation-Transmission Capacity

Energy Intensity

Indonesia is the largest energy consumer in Southeast Asia. Even though energy consumption per capita remains limited, energy intensity is among the highest in the region (482 Toe/US$1,000 in 2001 compared to 359 Toe/US$1,000 in Thailand and 92.2 Toe/US$1,000 in Japan). This is particularly perceivable in the industrial sector, where 176 Toe/US$1,000 were witnessed in 2001 and 188 Toe/US$1,000 in 2003.

The following graph illustrates the situation in various South East Asian countries for the years 2000 and 2001.



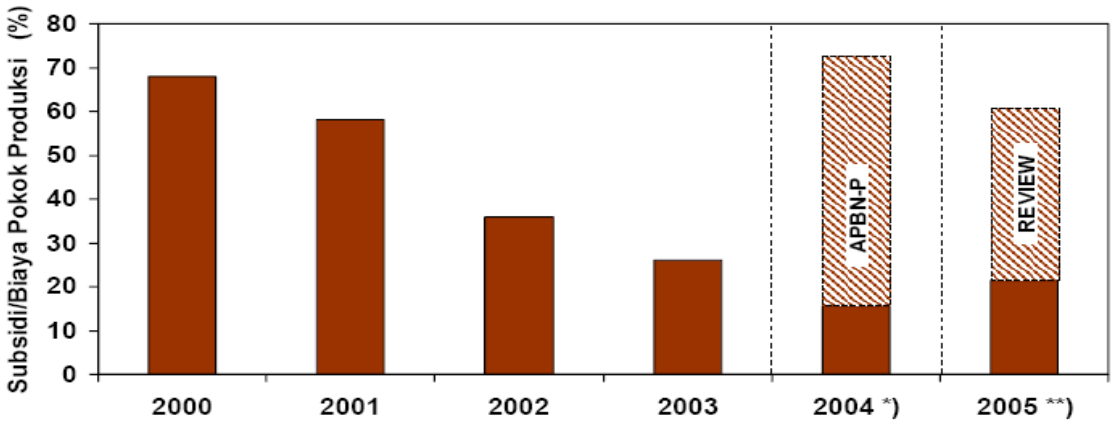
Source: Blueprint of National Energy Coordinating Board 2005 – 2025, June 2005

Figure 2: Energy Intensity Comparison

The figure shows that to produce US$1,000 of GDP, in year 2001 Indonesia used an average energy consumption of 482 Toe, more than 1.3 times in Thailand for example, and that the industries are responsible for more than 36% of that energy demand. Therefore, Indonesia could take advantage of large-scale energy efficiency projects in order to reduce energy intensity, especially in the industrial and building sectors.

Energy Prices

As fossil fuels are still heavily subsidized in Indonesia, the Government of Indonesia (GoI) has been trying to reduce them over the last two years. The following graph describes the amount of subsidy for the fuel in terms of ratio between subsidy and production cost under the state budget.



*) Target; For APBN, assumption: volume of Oil Fuel 59.63 million KL, crude oil price US$ 36/bbl, Rate Rp.8,900/US$

**) APBN 2005 with assumption volume of Oil Fuel 59.63 million KL, crude oil price US$24/bbl, Rate: Rp.8,600/US$

Review: assumption of ICP = US$35/bbl, Rate Rp.8,900/US$

Source: Blueprint of National Energy Coordinating Board 2005 – 2025, June 2005

Figure 3: Reduction of Fuel Oil Subsidies

As a result and effective July 1, 2005, Pertamina raised the Industrial Diesel Oil (IDO) price by 113% for the mining, oil and gas, and export-oriented industries. The new price is based on the price set by Mid Oil Platts Singapore (MOPS) plus 15 percent, which raised the price from Rp 2,200 to Rp 4,740 per litre. Following the example of the mining industry, many Indonesian industries are preparing for significantly decreasing profits since all sale prices cannot be adjusted to reflect the higher price for fuel.

PLN, the state-owned national power company which generates more than 33% of its electricity production from fuel oil, highly depends on fuel oil subsidies to balance its financial situation. New fuel prices will significantly increase losses for PLN. In the past, PLN witnessed a loss of 8,162 billion Rp in 2002 for other reasons but showed that they are able to quickly adjust their financial balance as seen in 2003 with a loss of 1,446 billion Rp only.

In the past electricity tariffs have been increasing at a rate of 6%/year. In 2004, tariffs remained stable due to political reasons. In 2005, PLN is asking for a 12% increase on its average tariff. Included in that request is an increase of the ''K'' ratio used for peak and off peak electricity prices (presently K = 1,4 in Java-Bali but can go up to 2.0 in some regions depending upon the load profiles and the electrical system characteristics of the region). A ''K'' factor increase occurred in the industrial sector in September 2005.

The National Energy Management (NEM) Blueprint establishes the tariff adjustment policy for the period 2005-2025, as represented in the following graph. The strategy is targeting to reduce the

government subsidies and maintain them for poor communities only who are unable to pay the economic cost of electricity, which is equivalent to 5.5-6 US Cents/KWh.

According to PLN, electricity prices are supporting a very high level of distortion that needs fixing. These distortions are self-evident when comparing the selling price of Rp 402/KWh for residential R-1 customers (connected power less than 450 VA) with the Rp 934/KWh charged to R-3 customers (connected power higher than 6,600 VA) while the cost of electricity provided to low customers are usually much higher than the cost of electricity provided to intensive customers. Similar situation occurs for industrial customers I-3 (connected load higher than 200 KVA) paying Rp 784/KWh, which is more than household users R-1. This is another example of the distortion. Such distortion is usually the result of political considerations.

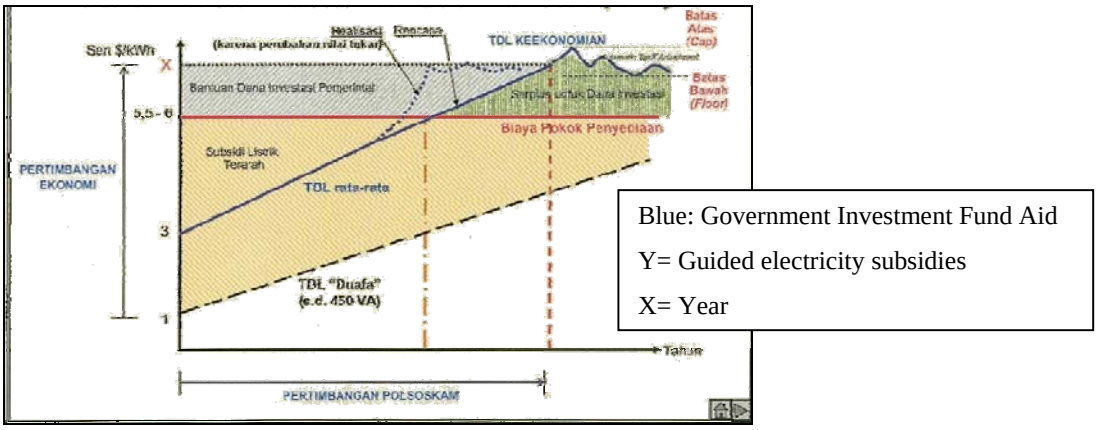


Figure 4: Electric Power Basic Tariff (TDL) Adjustment Policy

Electricity Peak Load

The NEM Blueprint has set the targets as follows: "Realization of consumption of energy per capita at a minimum of 10 SBM (RIKEN) and electrification ratio of 95% (RUKN) in the year 2025''. The actual low level of electrification in Indonesia will create pressure on the electricity supply when the rural electrification program is completed. As the electrification program will move forward, the need for DSM as a potential solution to reach equilibrium will be higher and more stressing. The electrification rate is presently 60.70%.

The existing generation capacity is mainly based on Coal PP and this strategy will continue for additional capacity as shown in the following table.

Table 1: Actual and Future Capacity of Generation of Indonesia

TYPE OF PLANT	INSTALLED 2005	ADDITIONAL
	(MW)	(MW)
HYDRO	2,567	1,000
COAL POWER PLANT	6,650	3,600
COMBINED CYCLE	5,706	3,825
COMBUSTION TURBINE	1,932	3,320
DIESEL POWER PLANT	76	-
GEOTHERMAL	784	70

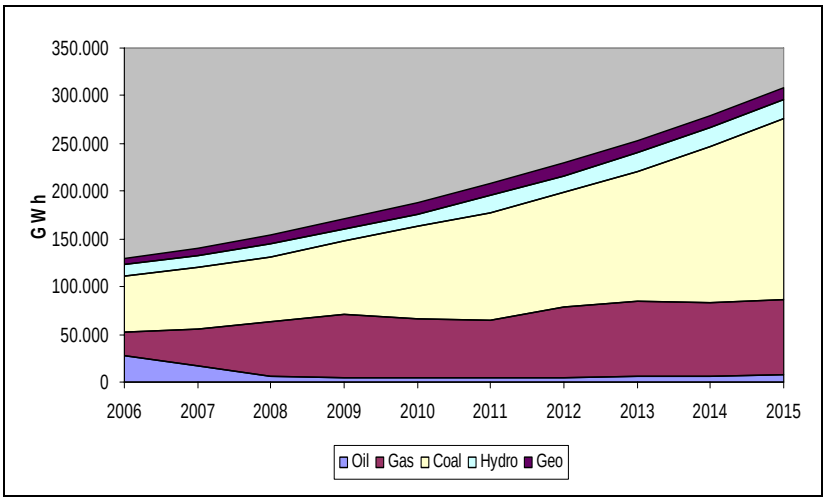


Figure 5: Additional Capacity of PLN Java-Bali 2006 – 2015 (RUPTL PLN)

It is estimated that PLN would require at the horizon of 2025 a total investment of close to 6 billion US$ to increase its generation transmission-distribution network to answer to the demand growth of electricity.

In what relates to the load curve, the peak period span is between 5:00 p.m. and 10:00 p.m. and reaches up to 14,500 MW in the Java-Bali region, with almost no capacity margin within the installed capacity. This peak increases by 2,500 MW around 6:00 p.m. However, the annual energy consumption is growing at a ratio of 9.9% while the annual peak load is increasing at a rate of 7%. This situation could improve the load factor but the effect does not seem to be significant without the reinforcement of a DSM strategy.

Indonesia's energy consumption forecast is increasing at a spectacular rate. In 2010, the country's consumption will reach 167.4 TWh with 130.4 TWh in the Java-Bali region alone, and in 2015 this consumption will reach 277 TWh for Indonesia and 211.9 TWH for Java-Bali by the year 2015.

1.2 THE ELECTRICITY LAW

Electricity Law No. 20/2002 stipulated that power generation will be open to competition on the islands of Madura, Java, and Bali by 2007. In 2008, retail competition in the electricity market would begin under the terms of the nation's new electricity law, approved in September 2002. The law laid down that PLN's monopoly on electricity distribution comes to an end within five years; private companies (both foreign and domestic) would then be permitted to sell electricity directly to consumers. However, all companies would need to use PLN's existing transmission network.

In November 2004, the Constitutional Court abolished Electricity Law No. 20/2002, ruling that it was against the nation's Constitution in regards to opening the door to full competition in the electricity sector. This was the first law to be abolished by this powerful court since its establishment in 2003. The Court expressed that, since electricity was an important commodity and pivotal to the lives of many people, it should remain under the government's control. The Court also said that this was in accordance with Article 33 of the 1945 Constitution, which reads: "Economic sectors which are important to the state and crucial for the welfare of the people are controlled by the state and must be developed to give the maximum benefit to the people." The Court reinstated the then defunct Electricity Law No. 15/1985 trying to maintain a level of legal certainty following the abolition of the 2002 law. However, it maintained that any contracts made by the government under Law No. 20/2002 prior to its abolition in November 2004 would remain in effect. The Court stated that the Nation's Constitution did not prohibit the private sector from doing business in the power sector, but the government must keep control on the sector.

The Court also stated that private companies, national or foreign, may cooperate with the state-owned enterprise to supply and generate power for the public, by providing loans or setting up joint ventures. In the case of joint ventures, the state-owned enterprise must own majority shares of more than 50 percent or relative majority shares of less than 50 percent.

Under the 2002 law, the government would have gradually liberalized the power sector, starting in Java, Madura and Bali in 2007. By then, private companies would have been allowed to produce and sell power to the public in those areas alone. The decision of the Constitutional Court was based on the interpretation that the state should regulate, facilitate and operate electricity provision as a means to exercise ‘’control’’ over the sector. Furthermore, it was deemed that electricity production facilities should be integrated, nullifying the provision for unbundling PLN.

1.3 ENERGY EFFICIENCY ACTIVITIES

DSM is being justified in Indonesia since its energy intensity is the highest in comparison to many other countries, even though the consumption per capita is low. According to the NEM Blueprint, the main policy components related to energy use are the following:

''Utilization Side:

- Efficiency of energy utilization
- Diversification of resources usage''

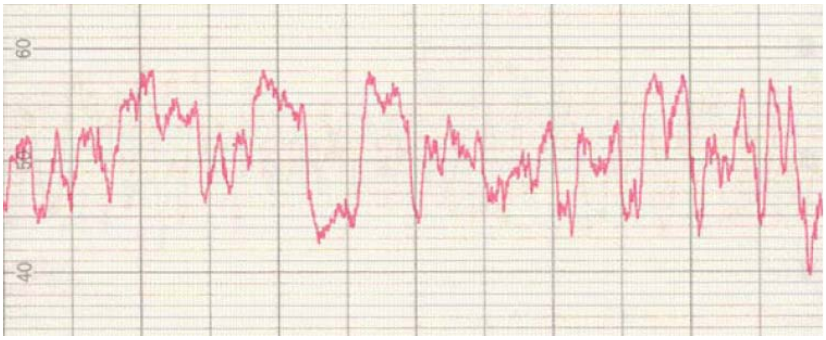
NEM Blueprint describes all the following main strategies for DSM:

i) Industries, either primary or secondary: applying energy saving technologies and energy management
ii) Household and Commercial: applying energy saving equipment
iii) Transportation: application of fuel efficiency standards
iv) Power Plants: application of energy saving technologies and energy management.''

In response to these GoI's energy conservation policies, PLN has been implementing an Integrated Resource Planning (IRP) Program. The major objectives of the IRP program are to: 1) encourage additional sales of electricity from industrial captive power plants to the grid; and 2) reduce peak demand growth from targeted customers by one-third over a five-year period. Practically in what relates to the 1st objective, PLN has been purchasing during peak hours up to 165 MW captive power in Java, Kalimantan, and Sumatera region during the period 2002-2004. In what relates to GoI's second objective, PLN evaluates that ongoing DSM activities are to achieve 893 MW power savings for Java-Bali region, including a 796 MW from I/C tariff; the resulting peak load with DSM is estimated to reach 14,621 MW[1].

On the other hand, PLN achieved significant progress in the activities of reduction of their technical losses. Since 1992, these losses were maintained around 12%. The target for 2005-2006 is to reduce them to a maximum of 8%. In many countries, the losses on transmission-distribution networks are included within demand-side management in the case of generation units. In all cases, efforts are being made by PLN and there is no need on the short term to put any priority on this. The poor electricity quality shown by the frequency variations for Java-Bali in the following graph reflects needs for further investigations:

[1] Presentation ''PLN'S EFFORTS AND IMPLEMENTATION REPORT'', PLN - 2004



Source: RPTL_JAMALI_2004_2013_FINAL.PDF

Figure 6: Variation of the Electricity Frequency for Java-Bali

However, the technical losses did significant reductions since early 1980 as shown in the following graph. This is confirming that the situation is under control and does not need additional attention.

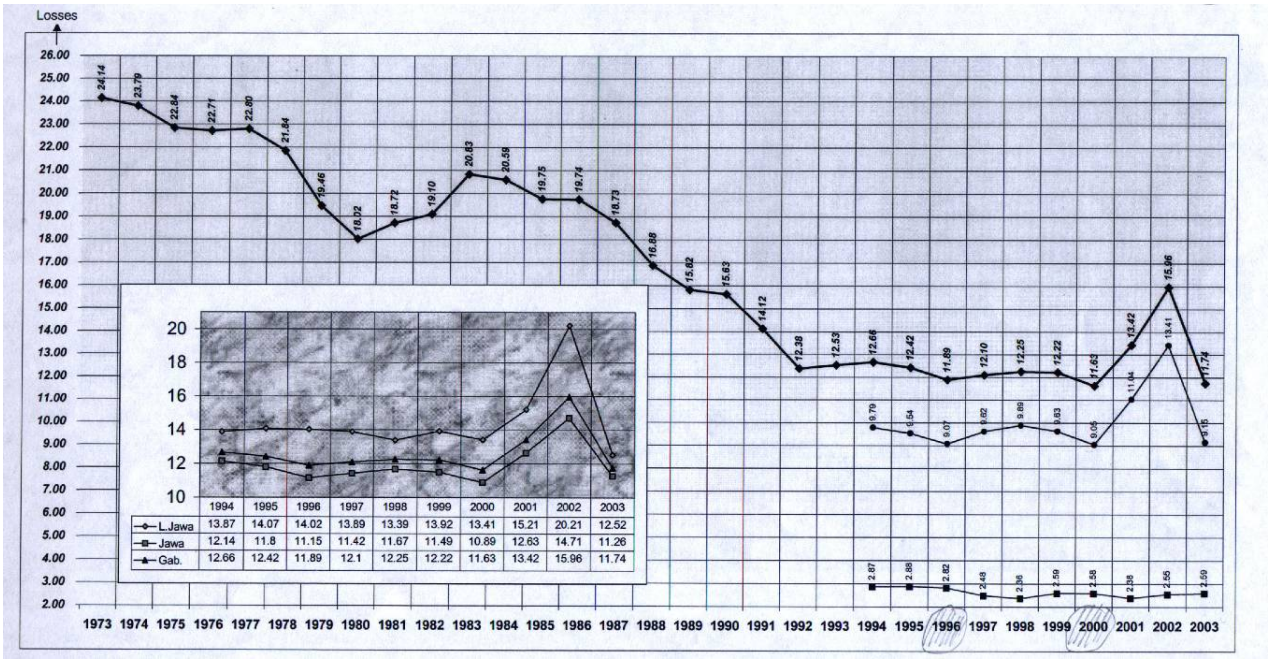


Figure 7: Evolution of the Technical Losses of PLN

Indonesia's economy and the growth of energy demand (around 7% per year) as well as oil price increases are among the main factors motivating the Directorate General of Electricity and Energy Utilization (DGEEU) of the GoI to introduce a new and more aggressive DSM strategy.

Energy Efficiency Players

Energy efficiency activities are under the responsibility of a number of Indonesian players in the field of EE. These players have been involved in the existing project; therefore they are identified below in order to have a general picture of all the staff involved in EE and DSM activities:

- Directorate General Electricity and Energy Utilisation (DGEEU)

The DGEEU within MEMR is a young unit, with two years of existence. DGEEU is responsible to coordinate DSM activities in Indonesia. They promote DSM mainly through workshops, conferences and seminars on energy efficiency. The coordinating staff from DGEEU involved in DSM activities seems to be somewhat limited.

The DGEEU intends to expand the existing energy audits program. A target of 300 audits has been set for the near future and would be mostly implemented by KONEBA. Currently, planned and completed audits by this state-owned company include four buildings and three industries.

- PLN

EE and DSM activities are coordinated within PLN by the DSM working team.

This working group includes various staff members from different divisions with responsibilities and priorities within PLN. As a result, staff members spend a limited time on DSM and EE and manage their priorities according to the team's potential for conducting simultaneous activities.

- KONEBA

KONEBA is dedicated to renewable energy and energy efficiency activities. KONEBA has been selected by DGEEU and PLN to perform audits in the industrial sector and, sometime, in the building sector. KONEBA estimates that these activities will expand next year and they intend to increase their staff to be able to perform around 300 audits in the year 2005-2006. Currently, KONEBA has not implemented EE projects within their market. This type of activity is not part of the organization's mission.

Seven staff dedicated to DSM and EE activities participated in the various meetings held with this public company. However, this company is responsible for its turnover without any apparent support from the government. It reports to the MEMR.

See more on KONEBA in Section 2.1.1 AUDIT PARTNERSHIP.

- Bandung Institute of Technology, Surabaya Institute of Technology and Gajah Mada University

Bandung Institute of Technology, Surabaya Institute of Technology and Gajah Mada University have been selected to conduct the audit program along with KONEBA. However, their involvement is currently low and should be increased so that the auditing program can be strongly developed. Whereas KONEBA conducts most of the energy audits in the industrial sector, Bandung Institute of

Technology, Surabaya Institute of Technology and Gajah Mada University were identified as responsible for conducting the audits in the commercial sector. Coordination efforts must be undertaken by PLN and DGEEU in order to increase their involvement in the auditing process.

- Consulting companies and private ESCOs

Consulting companies and a few private ESCOs are conducting energy audits under private agreements with commercial buildings and industries. Two of them were evaluated by the World Bank team. The first, PT. Narama Mandari, performs energy audits for industries and commercial buildings and proposes to install EE appliances directly in their customers' premises. This company evaluates the potential of such technologies, which it markets and implements for targeted customers. In recent years, it has proposed ESCO contracts based on performance agreements. This company also finances projects based on its own financial resources. It therefore limits its activities to its financing capacity. The company's current projects have a payback period of less than 2 years with a maximum contract of US$70,000.

The other consulting company, PELANGI Ltd, performs energy audits for hotels. They have not implemented yet the recommended measures. This company seems to be very active as it is targeting 30 audits in various hotels. The program is seeking financing for the audits and, according to the EE Manager; their clients are sensitive to the input of the auditing approach.

Key Aspects of the DSM Program Designed by PLN

PLN has based its current strategy on developing appropriate tariffs and building attractive incentive tariff structures for the program. This is a complex exercise. In this regard, it is important to enunciate the key principles that guide the development of the incentive structure that we intend to develop through DSM programs:

- Cost-effectiveness for PLN, which essentially requires that saved energy prices do not exceed for PLN the economic costs of the least-cost alternative supply options available to PLN (i.e., PLN's "avoided cost").
- The financial requirements of the end user as well as the financial implications for the promoter of the program (PLN) need both to be considered.
- Equity considerations, which relates to how any financial surpluses are appropriated.
- Easy implementation of the incentive structure.
- Efficiency considerations
- Avoided costs are the costs that the promoter -- PLN -- can defer as a consequence of the implementation of DSM programs.

1.3.1 Presidential Targets

On July 22, 2005, the Minister of Energy and Mineral Resources issued Decree No. 31/2005 "Implementation Guidelines for Energy Savings." The decree outlines energy saving measures for

commercial buildings, government institutions, households, industry and transportation. Under the decree, private vehicles with an engine capacity of more than 2000 CC, particularly in Sumatra, Java and Bali, are advised to use the higher quality and non-subsidized Pertamax fuel instead of premium fuel. Another measure is to limit air-conditioned room temperatures to 25 degrees Celsius (77 degrees Fahrenheit) for all commercial and government buildings. In addition, all private homes are asked to reduce their electricity consumption by 50 watts during the peak period from 5p.m. to 10 p.m. The Minister also issued an "Energy Consumption Card," which instructs government agencies to submit progress reports on energy saving activities every six months. So far, PLN has claimed savings of approximately 600 to 900 megawatts (MW) of electricity during peak periods since the implementation of the decree.

1.3.2 Current DSM Programs

As the most important part of the IRP program, PLN started to implement Demand-Side Management (DSM) several years ago. The DSM Program includes the introduction of energy efficiency lamps, energy labelling for household appliances, and some financial incentive schemes for customers to encourage them to shift their peak demand and/or improve their energy efficiency. It also includes energy audit services. It has four sub-programs, namely DSM Terang (DSM to promote the awareness of energy efficiency to household customers at capacities below 900 VA), DSM PJU (DSM for Public Street Lighting), DSM Peduli (DSM for poor household customers with capacities up to 450 VA) and Partnerships for auditing with large customers in the industrial and commercial sectors.

This last program started in 2003 and continued in 2004. Until now, five manufacturers (mainly in the textile and steel sectors) and eight commercial buildings accepted to have a free-of-charge audit conditional to providing their annual energy consumption in the future. The program targets low-cost, no-cost measures and PLN is not offering any other kind of incentives for the implementation of the identified EE measures. The achievements over two years seem rather limited compared to the market potential.

1.4 OBJECTIVES OF THE PROJECT

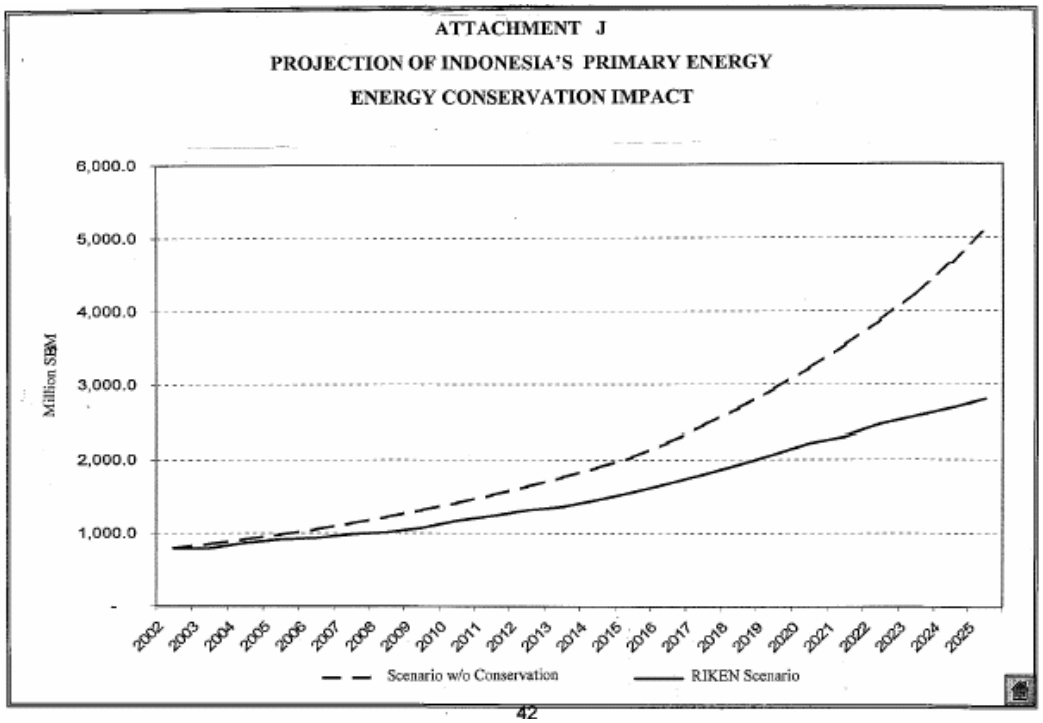
The objectives of the project are to assist the Ministry of Energy and Mineral Resources, and PLN together with other relevant government agencies, to implement the proposed DSM Program and, in particular, to:

- Assess PLN's and Government's ongoing DSM Program.
- Strengthen PLN, KONEBA and DGEEU's capacity for implementing DSM programs in the industrial and commercial sectors.
- Develop a preliminary but more comprehensive DSM program for potential industrial and commercial customers.

1.4.1 Medium to Long-Term DSM Programs

This section clarifies the objectives according to the findings of the missions conducted in Indonesia in June and September of 2005.

The potential impact of the implementation of DSM programs in Indonesia has been evaluated in terms of potential primary energy savings from 2002 to 2025. The results presented along with the National Energy Management (NEM) policy provide the potential impact of DSM and energy conservation in the country:



*SBM: acronym in Bahasa standing for Oil Barrel Equivalent

Figure 8: Potential Impact of DSM in Indonesia

It is noticed that this evaluation is based on the targets set by the NEM of a 1% reduction of the energy consumed every year. This target seams high and requires a long-term strategy and adequate investments in human resources and material resources. It will also need the creation of new operators considering that the existing ones are somewhat limited.

On the short term, the objective can be expressed up till 2010 (5 years), where the reduction is estimated to be: 300 - 350 million SBM. To assess if this target is in line with PLN DSM objectives, the following data were collected :

- Cumulated energy savings targeted for electricity is approximately 14.3 TWh for the period 2005-2010 period, with 3.2 TWH for the year 2010 alone.
- Based on a theoretical ratio of 1 kWh=0.086 Toe and a theoretical efficiency of 0.30 for electricity generation-transmission-distribution, this corresponds to: 1 KWh= 0.29 Toe in consumption. Therefore, the electricity savings in 2010 as evaluated by PLN would be equivalent to 928 Mtoe or 125 MSBM, which represents close to approximately 40% of the target set by the NEM.

This confirms that the target is in line with the national policy for energy conservation set by NEM in the blueprint.

Indonesia's DSM objectives must take into consideration special policies related to energy efficiency. To maximize the use of existing potential energy resources, particularly non-renewable fossil energy resources, the Government has prepared a policy regarding the sustainable supply and utilization of energy, which is known as the Green Energy Policy, to ensure the country's sustainable development.

This Green Energy Policy is a combination of:

- The optimum utilization of renewable energy.
- The utilization of clean energy.
- The adoption of efficient energy use technologies (from renewable or fossil energy resources).
- Instilling the EE concept within the population.

As far as the national energy conservation program is concerned, which is intended to create a community culture that is energy efficient, the energy utilization policy is directed as follows:

- Implementation of energy efficient technologies through the development of partnerships between industries, energy research and development entities and energy users.
- Enhanced awareness regarding the benefits and the meaning of energy conservation.
- Improvement of energy users' technical knowledge in what relates to technologies and the different means to save energy.
- Implementation of energy efficient principles in planning, operating and monitoring energy utilization.
- Implementation of an energy efficient culture in day-to-day life.
- Utilization of cleaner fossil fuel technologies.

The present assessment of the ongoing DSM programs in Indonesia outlines the expected contribution to the target established for the electricity sector.

1.4.2 Expected Outcomes

The present project developed by DGEEU and PLN is intended to reinforce the ongoing programs and to launch several new concepts that could be complementary to the ones that have already been

developed, most especially for the industrial and commercial sectors. The outcomes can be evaluated based on the six key elements of an effective DSM planning process:

- Regulations:
- Based on the current DSM programs and voluntary efforts, determine if regulations are required in order to reach the annual expected target of 1% in energy savings.
- Convert the Action Plan identified in the July 2005 Energy Conservation Decree into practical DSM programs.
- Determine the support mechanisms and conductive conditions for implementing energy conservation, such as tax deductions, soft loans, etc.

- Education/awareness programs:
  - Identify awareness activities to support the green education program.
  - Enhance the population's knowledge and experience regarding the meaning and benefits of energy conservation.

- Tariffs:
  - Determine the adjustments required on existing tariffs to support DSM programs.
  - Determine the appropriate modifications to introduce inexistent tariffs to make them supportive of future DSM programs.

- Labelling:
  - Identify labels and standards adapted to Indonesia.
  - Elaborate a labelling activity plan for the three basic household appliances: refrigerators, AC and CFL.

- Savings by design:
  - The schedule for an Indonesian Building Code.

- DSM programs:
  - Market research on Indonesia's electricity consumption, especially during peak periods
  - Determine the optimal DSM program applicable to the industrial and commercial sectors.
  - Enhanced DSM awareness programs in all sectors.
  - DSM program funding, monitoring and evaluation methodology.

In order to reach the target of reducing Indonesia's energy intensity by 1% annually, realistic energy conservation programs that are in harmony with the green energy policy are to be prepared in the near future.

2 ONGOING DSM PROGRAM ASSESSEMENT AND EVALUATION

The assessment of ongoing DSM programs included various activities such as a review of the existing audit and survey reports and the evaluation of Terang, Peduli and other programs. The seminar organized in Jakarta on September 2005 was the opportunity to bring detailed DSM program achievements from international experiences such as Canada. The present evaluation intends to highlight the improvements to increase the outcomes of the on going programs.

2.1 DSM PROGRAM ASSESSMENT

2.1.1Audit Partnership Program and Survey Reports

Program design and implementation

This program is a voluntary program established in 2003 to raise awareness among large electricity customers in the industrial and building sectors. The program is financed by PLN for the building sector and by DGEEU for the industrial sector. DGEEU is implementing it with KONEBA (a Government agency linked directly to DGEEU). While the building sector program is implemented by Bandung Institute of Technology, Surabaya Institute of Technology and Gajah Mada University in collaboration with PLN.

The audits are conducted and transferred free of charge to customers. Our opinion is that similar practices give poor results since the customers do not pay any attention to such projects. It should be noted that the main objective of an audit is to raise customers' awareness in energy efficiency matters. Unfortunately, a free-of-charge audit generally does not reach that goal, in particular with head officers. Industry and commercial building energy audits are conducted on an ongoing basis with the purpose of assisting companies to improve their energy efficiency performance by an average of 20%. In 2003 and 2004, 10 industries and 14 buildings were audited. The energy saving potential identified varied from 5% to 23 % for industries and from 0.5% to 12% for buildings.

The audits seem to target the process as a priority. This requires that process experts conduct the audit. In general, such experts are not easily available and more so in emerging countries. More over, KONEBA's involvement does not seem to be appropriate to convince the customer to favourably receive the audits' conclusions.

One of the options under consideration is to make the audits mandatory as opposed to voluntary. We recommend that the customers pay up to 5 to 15% of the audits cost and that they select their own consultant. Involving industrial associations and/or technical organisations could also facilitate the audit program implementation and support the actual implementation of recommended energy efficiency measures.

KONEBA is a team of 16 engineers with a total of 50 employees. As a government agency, it may be badly perceived by the customers. PLN and DGEEU would improve their impact through involving the private sector in this program and establishing it under a Public-Private Partnership (PPP) rather than as a governmental program as is presently the case.

KONEBA seems to have a good expertise in EE and DSM. However, even being a public entity,,the company, is not supported nor enough involved in governmental programs and efforts in the EE field. .It should be more appropriate to take advantage of KONEBA's expertise in the awareness and dissemination process. PLN and/or DGEEU would assess the performance and effectiveness of their subcontracts with KONEBA.

According to KONEBA, the success ratio of their marketing efforts is ten to one customers. The major barriers to recruiting customers for the program are the following:

- The term ''audits'' is badly perceived by customers, especially when the auditing process is performed by a public agency like KONEBA.
- Energy is low in priority for most customers because energy is still perceived as being inexpensive.
- The invitations for auditing are sent by MEMR and the audits are therefore perceived as a control strategy rather than a support service. In 2005, a test with the Ministry of Industry sending the invitation letter will be conducted to skip that barrier.

As far as EE measures implementation is concerned, KONEBA has confirmed that only low-cost, no-cost measures are being implemented directly by the customers. Several barriers discussed in the present report may be the reasons for such low implementation level. Among them, we think that free of charge audits for customers and lack of financing mechanism are the most obvious barriers.

Review of Examples of Audits Conducted in the Industrial and Commercial Sectors by PLN and/or Consultants:

The original audit reports are written in Bahasa. Some are commented next:

Pada Bangunan Komersial Audit

The principle of including illustrations in each audit report is good. It allows the reader, who is not necessarily fully aware of the installation, the building or the equipment that has been audited, to have an idea of what the auditors are referring to. However, the quality of the illustrations should be improved for future reports. The energy auditing teams should use digital cameras and proceed to an appropriate compression of the illustrations.

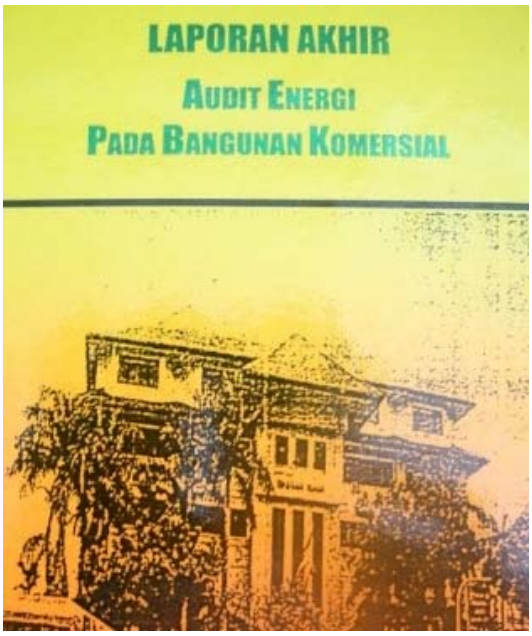


Figure 9: Front Page of an Energy Audit Report for an Indonesian Commercial Building

The report demonstrates good data collection. In the following case, it allowed the auditors to produce the load profile of the building.

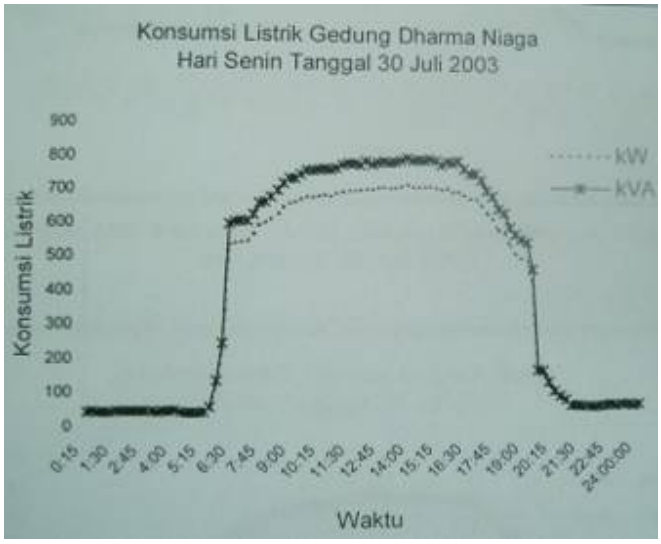


Figure 10: Daily Load Profile of an Audited Building

The audit seems to stress on office lighting systems, as many of the graphs presented below are intended to be presented to the customer:

Figure 11: Ada Bangunan Komersial Audit – Architectural Diagram of the Lighting

The report reveals few descriptions of the technical EE measures proposed to the customer. This aspect should be emphasized in future audits for industry and buildings.

Vastex Prima Audit

The audit report demonstrates good data collection and an effective analysis of the processes of the industry.

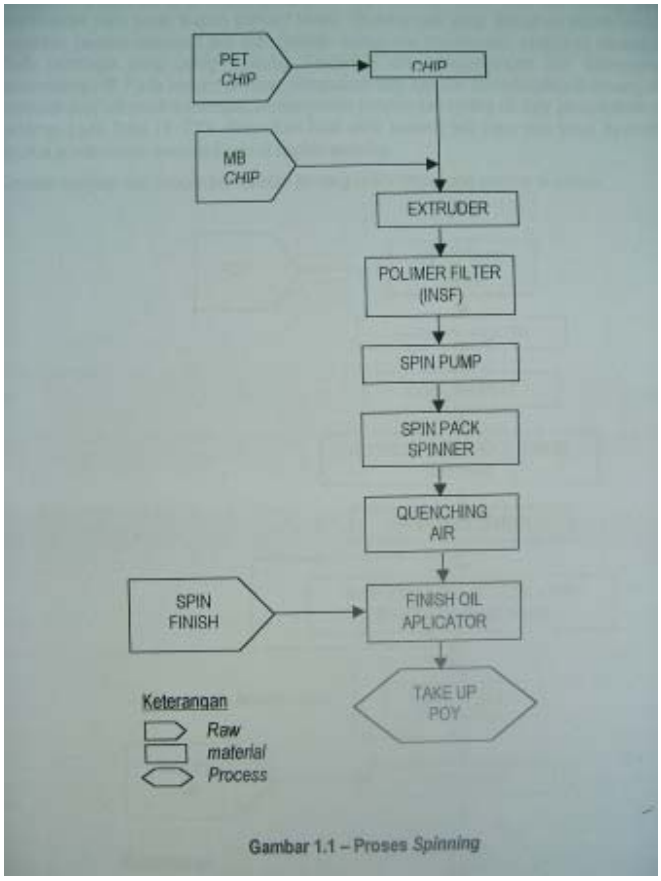


Figure 12: Process from Audit Report of Vastex Prima

The analysis of the energy balance is - for this audit - well done. It presents the share of consumption by end-use. The energy balance could be improved by making sure that all labels correspond to specific end-uses. Under the current form, some end-uses and labels are not clear. The purpose of the desegregation by end-use is to target EE measures for clearly identified technologies and end-uses.

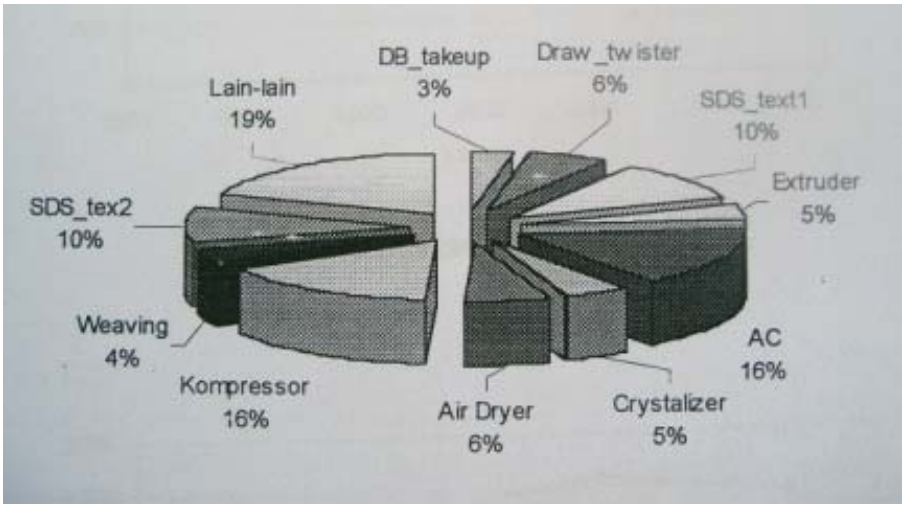


Figure 13: Energy Balance by End-Use for Vastex Prima

The table summarizing the EE measures is well built and targets low-cost, no-cost EE measures. However, the recommendations for EE measures are still not sufficiently developed. EE recommendations should be detailed in a technical manner.

Tabel 3.1 - Rekomendasi Implementasi Konservasi Energi di PT. Vastex Prima

No	Peluang Implementasi Konservasi Energi	Penghematan Energi kWh/tahun	Total Penghematan Rp/tahun	Prosentase terhadap biaya energi total	Biaya Implementasi Rp	*Simple Pay Back Period*
1	*Sheduling Ciller*, dengan mematikan 1 unit *Chiller*	747.360	373.680.000	3,64	*Low Cost*	-
2	*Resetting* suhu ruangan di *texturizing* (25 – 27) °C menjadi 29 °C	622.080	227.681.280	2,22	*Low Cost*	-
3	*Resetting* suhu ruangan AHU *spinning* dari 20 °C menjadi 22 °C	364.953	133.573.017	1,30	*Low Cost*	-
4	Memasang penyekat antara ruangan SDS dengan ruang mesin lama	120.960	44.271.360	0,43	*Low Cost*	-

Figure 14: Table of Recommendations for EE Measures at Vastex Prima

The review with PLN of samples of audits conducted in the Industrial and Commercial Sectors by Consultants came up with the following conclusions:

i) The reports are more oriented towards audits for analyzing the existing situation.
ii) In general, the tools and methodologies used seem to be deeply structured on a theoretical level. However, they are lacking practical results allowing customers to understand the results and bring the identified projects to their implementation phase.
iii) The energy balance is not using a rigorous methodology. This energy balance must be done per end-use in order to understand where the highest consumptions are. While a measuring instrument was used to establish electrical consumptions, simulations of the operations were not performed, which resulted in poor calculations of the achievable savings. A typical reports model will help to solve these issues.
iv) There are practically no descriptions nor typical assessments of the EE measures proposed, particularly in the case of the building report the World Bank team received. Technical and economic descriptions of proposed EE measures are not presented.

As part of the present project, three audits are conducted in selected customers' facilities and intend to highlight the auditing methodology and assess the barriers by a direct communication with customers. The audits reports are separate for each facility. Two audits are walkthrough audits and one is a detailed audit.

The audit program conducted as part of the present project included capacity building of Indonesian staff involved in DSM activities. This was done through training sessions and energy audit walk-through. The team is presented below with the executive staff from Chitatex:

Figure 15: Capacity Building of DSM Staff for Energy Auditing

«Challenges»

The audit program started at a slow pace and has resulted in a limited number of studies conducted so far. The challenge for this DSM program is related to increasing the number of the audits performed at the national level. An appropriate marketing and promotion program aiming at raising awareness of targeted customers about the audit program should be specifically addressed to the commercial and industrial sectors. .

Additional auditors will have to be trained. Only a limited number of energy auditors from KONEBA and UoI are currently conducting these activities. Developing the audit program on a large scale will

involve a much larger number of auditors. These will need to be trained adequately in order to to properly carry out their activities.

As said before, the audits are presently free of charge. The issue to ask customers to pay a small percentage of the cost has been raised with PLN and DGEUU. This is discussed in Chapter 3 herein after based on experiences in other countries.

Finally, the auditors should have a clear responsibility in convincing commercial and industrial decision makers to implement EE projects as recommended in the energy audits. So far, hardly any energy saving projects has been carried out following the audits.

2.1.2 CFL Programs

Program Design and Implementation

The major CFL programs implemented in Indonesia are DSM Terang (DSM for awareness of energy efficiency for household customers with capacities below 900 VA) and DSM Peduli (DSM for poor household customers with capacities up to 450 VA).

These programs have produced considerable results at the national level. Imports of compact fluorescent lamps have increased significantly (23 million units in 2002, 36 million units in 2003 and 48 million units in 2004). PLN indicated in their 2004 evaluation that most of the CFL are used in the residential sector. In the context of its DSM assistance to the GoI, the experts are pointing the following additions to the assessment of the current situation:

- The proportion of new construction in the country.
- The ratio of CFL per new m2.
- The proportion of CFL installed in the commercial and industrial sectors.

The survey conducted by PLN in 2002 reported the use of 2.6 to 6.6 units by customer>450 VA with a penetration rate of 78%. This needs to be confirmed, as the resulting figure will lead to a higher value than the import figure. Most of the imports (87.6%) are from China. The life expectancy of these lamps may be lower (as low as 1,000 hours) and so replacement figures are considered in the present evaluation.

It is recommended that PLN re-evaluate the ways to include the reimbursement of CFL through their electricity bills, especially for poor household customers with capacities of up to 450 VA, based on a maximum of twelve equal instalments. This methodology was tested by PLN but their financial department refused to consider it. The program can also be extended to Fluorescent Tube Lights (FTL). A detailed survey should be conducted to assess the existing market and whether PLN should support the introduction of T5 and/or T8 to replace the T12 and T8 tubes in the residential, commercial and industrial markets.

To the best of our knowledge, the CFL and FTL Indonesian market was assessed based on similar experience elsewhere. The hypothesis used for the evaluation of this market was as follows:

i) Targeted penetration rates per sector:
   - Residential: 4 eligible lamps per house, for households with >450 VA and 1.6 lamps for households with a connected capacity of 450 VA
   - Commercial: estimated at 10 CFL per shop, for 70% of the shops
   - Public: estimated at 50 CFL for 60% of P.1 customers
   - Industry: estimated at 30 CFL per industry, for 40% of the industries

ii) Efficient FTL (T5 + electronic ballast) market estimated at 20% of the CFL market.

iii) Load and energy savings:
   - CFL: 15 W minimum load unitary saving
   - FTL: 10 W minimum load unitary saving
   - Load peak coincidence factor: 0,4
   - Residential: 330 days, 6 hours
   - Commercial: 290 days, 12 hours
   - Public: 365 days, 11 hours
   - Industry: 290 days, 9 hours

Table 2: Estimated CFL and FTL Market Assessment

Areas	Electrified Customers for Indonesia (2005)	CFL Market	FTL (T5 + electronic ballast) Market
Residential 450 VA	19 052 817	21 300 000	4 260 000
Residential >450 VA	12 860 722	41 200 000	8 240 000
Commercial	1 435 989	10 100 000	2 020 000
Public	821 624	24 600 000	4 920 000
Industrial	52 020	9 900 000	1 980 000
Total estimated market	34 223 171	107 100 000	21 420 000
Annual replacement (considered after 5000 hours)		40 400 000	8 100 000
Total imports (2004)		48 000 000	
Ratio imports / market		32,5%	

For all areas, the CFL market is estimated to be around 147 million. This market potential reveals that there can still be stronger efforts to promote CFL in Indonesia. The total imports in 2004 only reached 48 million CFL. Once the market is reached, the annual replacement figure is estimated to be 40 million. The assessment for FTL reveals a potential market of 29 million and 8 million in annual replacements.

Therefore, as far as CFL are concerned the 2004 imports represent a ratio of 32.5% of the market potential. The impact of the efficient lighting program on energy consumption and on peak demand is therefore estimated to be:

Table 3: Impact of the CFL and FTL Program

Areas	Load saving (MW)	Energy savings (GWh)
Residential 450 VA	140	280
Residential >450 VA	280	490
Commercial	70	240
Public	170	680
Industrial	70	180
Total	730	1870

«Challenges»

The CFL program can be considered to be successful. However, the assessment of the impact is being conducted without any desegregation by sub-sector. The monitoring and evaluation of the results should take into consideration the share of CFL being installed in residential, commercial and industrial sectors as it is based on the imports of the whole country.

The challenge for the future penetration of CFL will especially be related to low-income categories of customers and customers lacking access to financing. The ongoing new pilot project launched in August 2005 has enabled poorer customers to pay for their CFL through equal instalments billed to them by PLN. No interest is charged on the amount. PLN would be well advised to include monitoring in this specific activity. It is recommended that PLN, at this time when its process is at it very beginnings, identify indicators for the measurement of its effects and changes and assess the expected outcomes in the target communities.

It is also recommended that the process be supported by an appropriate dissemination program for CFL. PLN may use the same message to expand it to other energy efficient household appliances that consume energy. If this project is successful, a large-scale replication should be considered at the national level.

2.1.3 Street Lighting Programs

Program Design and Implementation

The DSM program for street lighting is titled DSM PJU (DSM for Public Street Lighting). This program promotes the replacement of mercury lamps by HP sodium lamps throughout the street lighting network. Clients are the Municipal Corporations (MCs).

The model used for the Municipal Corporation of Semarang (MCS), a city of 4 million inhabitants, is innovative. MCS selected a product provided by Philips; they signed a MOU with local contractors to replace the lamps; MCS are phasing the implementation by limiting their annual investment to the achievable annual savings from the previous phases already implemented. This allows them to keep their initial budget without any additional financing resources. Also, MCs are pre-negotiating the price for lamps. based on the total investment. Up to now, 48,000 lamps out of a total of 60,000 lamps have been replaced since 2002, the year the program was launched.

The driving factor that brought MCS to this kind of EE project was the new tariff introduced by PLN in 2002, which impact was the doubling of their bill. The new tariff was based on a flat rate: for example, for a 400 W lamp, PLN charged a price equivalent to a 1,000 W (including a power factor of 0.5 and the ballast consumption) lamp without consideration for the type of lamp used and its real efficiency. Moreover, 10% of the lamps are out of order permanently. The MCS' annual energy bill is around 1.6 billion Rp in a total budget of 700 billion Rp. This is a small percentage and is not significant enough to entice any MC towards this kind of project. The MCS pays all its bills on time and does not have arrears.

The payback period of the MCS project is less than ten months, and should generate a great deal of interest on the part of other cities. MCS should initiate an awareness campaign for the population, as many of them do not appreciate the yellow colour of the new HP sodium lamps. MCS has indicated that the quality of the electricity supply is good (confirmed by PLN- Semarang) and that they do not suffer from power shortages or voltage fluctuations.

However, they are conscious that the practical life expectancy of the lamps is much lower than the theoretical 12,000 hours. They explain this by the quality of the products available on the Indonesian market.

MCS automatically switches off major parts of their street lighting after 1 a.m. This is an effective measure and should be evaluated with other crosscutting issues like security on the roads, gender requirements, etc.

MCS does not have any plan to expand this type of EE project to other technologies and/or other consuming units such as: load management systems for street lighting, buildings, sports facilities, etc.

MCS is not able to obtain loans from financial institutions and must therefore rely on the budget allocated by the Government. It was noted that PLN collects 2.5% of the total customers' bills on behalf of the Government to compensate for the costs of energy provided for public street lighting.

In order to develop this street lighting program, PLN and DGEEU must increase their involvement. Until now, PLN only provides the installation services of the new meters. It is recommended that PLN introduces a new awareness campaign with the enrolled metered MCs as partners. This would not apply to non metered MCs since PLN could suffer revenue losses and the benefits earned from peak reductions would not be sufficient to justify such revenue losses.

PLN would rather review the existing reactive power compensation for the street lighting network (it seems to be done at the transformer level) to compensate within the new breaker panels provided with the new meters. PLN may want to introduce penalties in the street lighting sector for reactive power to encourage MCs to implement the technology (actual power factor around 0.6).

It was mentioned that the total consumption of the P-3 tariff corresponding to street lighting is around 2.31% of the overall Indonesian consumption. However, there is no allocation for peak periods, where they should be:

- 6 p.m. - 10 p.m.: Four hours during peak periods (57% of the total).
- 10 p.m. - 1 a.m.: Three hours during off-peak periods (43% of the total).

These ratios should be readjusted for other cities where street lighting is kept on all night. If we consider 45% of the total energy consumed as a realistic estimate of the consumption during the peak time, this represents a consumption of 85,000 KWh on PLN's March 2005 balance during peak periods, corresponding to 14% of the total energy consumed in Indonesia during peak periods. Any adjustment to the consumption in this sector will reduce PLN's peak load by 3 to 6 % of the total peak.

«Challenges»

So far, the involvement of PLN and DGEEU in street lighting has been very basic, whereas the CFL program has benefited from their strong involvement. While the CFL program has had good results, street lighting activities can be considered to be insignificant. The challenge for PLN and DGEEU is to increase their individual contribution in order to launch new street lighting projects across the country. Future projects for municipalities should include financial support since the cities have limited capacities.

2.1.4 Interruptible and Curtailable Incentives

Interruptible Incentive

Interruptible service (IS) is a demand-side option that is widely used and accepted by electric utilities and utility customers in many countries. Interruptible service allows a utility to interrupt load to a customer in accordance with specified provisions. For this privilege, the utility reduces the customer's bill by a specified amount each month, or allows a tariff reduction during the peak period, or a different tariff structure procuring savings for the customer, or any combination of these options. In regard to the daily operations of generation facilities, IS improves reliability and operating flexibility. In the longer term, IS allows the utility to build less generating capacity. A well-designed IS tariff provides substantial benefits to both the utility and the customer.

Under an IS tariff, the customer sign a contract with the utility for a fraction of its load the customer is willing to remove from the system when requested to do so. This load is then considered to be non-firm. The IS tariff specifies an advance notice period that may be as long as 24 hours to as little as 15 minutes.

While in some cases the utility may have direct control over the customer's load, most often the interruption is triggered by a phone call from the utility to the customer. This seems to be the situation with PLN. Special metering equipment that records usage on a continuous basis is also required to ensure compliance with the magnitude and time of requested interruption. An interruptible tariff is particularly well suited for customers who have standby generation capacity available. Under these options, PLN interrupts service during peak hours to customers who sign up for the program. These customers are then responsible for meeting their «lost» load if they need so. This can be made from excess self-generation capacity, if so they choose.

In July 2005, PLN published two Board Circulars: No SE No. 0013.E - Services for Additional Power beyond Power Contracted to Industrial Customers for tariff incentives, and SE No. 0016.E - Saving for Electricity Used on Peak Load for Business, Industrial and Government customers. This last circular intends to create tariff disincentives. This, added to increasing the K factor, going from 1.4 to 2.0, during peak time, raises the economic value of IS contracts. The new tariff structures were developed in the following manner:

SE No. 0013.E- Services for Additional Power beyond Power Contracted to Industrial Customers for tariff incentives

i) DAYAMAX SERVICES were targeted for industrial customers wishing to reduce their power demand on peak load and moving it to off peak periods.
ii) The customers can use additional power beyond the capacity contracted during off peak periods up to the same amount of reduced power on peak load.
iii) Example: An industrial customer has a contracted capacity of 5 MW. The customer's average peak is 4.5 MW. If this customer reduces his power on peak load by 1 MW, then during off peak periods, this customer may use the power from PLN up to 6 MW (5 MW contracted + 1 MW saved on peak load).

SE No. 0016.E - Saving for Electricity Used on Peak Load for Business, Industrial and Government Customers

This circular deals with additional energy charges (DIS-INSENTIVE) for customers using a new tariff allowing them to maintain their energy consumption during peak times at a level less than 50% of their actual average consumption. The additional charge is twice the tariff during peak hours.

Example: A customer has a contracted capacity of 100 MVA. During the last 6 months, his average electricity consumption was 80 MWh. So the limit is 50% x 80 MWh = 40 MWh during peak times. Additional charges for above the limit of power (kva) during peak hours are calculated based on a limit of 50 % over his contracted capacity. The additional charges depend upon the region:

- Java-Bali System: Additional power x 50 % transfer price of Java Bali System.
- Outside Java-Bali: Additional power x 2 (Two) x demand charge.

It would be interesting for PLN to conduct an evaluation of the impact on load curve for the different regions.

Incentive Buy-Back Rates

In the1990s, many companies decided to generate their own power because the national energy supply was unreliable. An estimated 7,000 to 10,000 MW was installed then in these companies to escape power supply shortages from the PLN system. This captive power may still be available and could transform in a complementary supply source for PLN through Incentive buy-back rate program.

Incentive buy-back rate programs are geared to the purchase of power from those customers who have on-site generation, in order to help meet the utility's load management objectives -- typically, peak shaving. This type of tariff design is based upon establishing a power purchase tariff that provides a financial incentive for the customer to engage in the transaction -- i.e., the tariff should be higher than the customer's cost of self-generation, and simultaneously, not exceed the utility's avoided cost.

To illustrate the financial incentive under a capacity value of Rp. 6,156/ckW-mo. (i.e. 25 percent of full avoided capacity cost), consider again the previous example wherein a 5 MVA contract demand customer offers to sell 1 MW of firm capacity on-peak. In this case, the captive power seller will receive an additional benefit of Rp. 12,321,000/month, for a total bill reduction of nearly 11 percent each month. As a percentage of the company's profit margin, this would typically represent a much higher amount.

To our knowledge, PLN is presently not applying this kind of tariff incentive and would gain to evaluate it in the near future. This would meet one short-term solution for 2006-2007 the government might consider. Potential estimates will have to be performed through a detailed questionnaire on the web. As a preliminary estimate, PLN could buy as much as 1000 MW from the estimated 7,000 to 10,000 MW installed capacity of captive power.

2.1.5 Labelling Household Energy Appliances

The labelling activities of the Government of Indonesia are targeted towards reducing the evening peak demand. This peak is mostly created by the electricity demand from households. The GoI's current labelling activities include the 3 following components:

i) Energy Labels for household appliances SNI 04-6958-2003.
ii) DGEEU Decree No. 238-12/47/600.5/2003 on the Procedure of Energy Efficiency Label Attachment.
iii) The preparation of the DGEEU Decree related to the Procedures and Requirements of Lembaga Sertifikasi Produk (LSPRO) Appointment.

The label presently considered for household appliances is showed here. The purpose of this label is to promote energy efficient appliances through convincing consumers of their low energy consumption

Figure 16: Label Envisaged for Household Appliances

The labelling activity is at its early stages in Indonesia. It should be appropriately designed to ease its buy-in from equipment suppliers and manufacturers. In the following chapters, we present the main activities for restructuring the labelling programs to be launched in Indonesia.

2.2 INFORMATION AND AWARENESS PROGRAM ASSESSMENT

Ongoing Awareness Program Review

The current situation regarding information and awareness programs reflects the energy policies established by the GoI. Awareness activities are part of the National Energy Management policy as they are included in Strategy 5:

- Strategy 5: Increase Community Empowerment in Sustainable Energy Development Management, through:
  - Increase National capability in energy development (Main Programs 15, Supporting Programs 1 and 3)
  - Conduct alternative energy socialization continually (Main Program 14)
  - Increase business opportunity and fabrication industry with focus on renewable new energy (Main Programs 11 and 15)
  - Increase community awareness in energy efficiency (Main Program 14, Supporting Program 3)

  Source: Blueprint of the National Energy Coordinating Board policy

Currently under PLN control, the awareness activities related to DSM and EE are centralized at the corporate office. New awareness concepts can be suggested by any PLN department but any new concept must go through the corporate office for approval.

The following table shows the awareness activities related to DSM in Indonesia, which were gathered through PLN DSM working group. It presents the type of targeted customer, a documentation reference (lecture, media, radio, TV, etc.) and other information related to the activity:

Table 4: Summary of Current Awareness Activities

Customer Targeted	Type of Activity	Material Used (lecture, media, radio, TV…)	Date / Period of Activity	Contact Person
Households	Television announcement for 50 W saving	TV	May-July 2005	Public relation Dept
Industry	Incentive for off peak shifting load	Circular letter	Oct-Dec 2003	Commercial Dept
Industry	Off peak consumption promotion	Circular letter	2005	Commercial Dept
Household	CFL promotion for DSM Terang	TV	2002	Corporate office with DSM team
Household	DSM Peduli	Posters installed at payment points	2003	Local PLN offices
Households	How to save energy	Brochures	Ongoing	Local PLN offices
All	Various campaigns	Radio	-	Local PLN offices
All	Press releases	Press	-	Corporate office
Industry	Policy to local office of PLN	Circular letter	2005	Commercial

Seminar on EE: Workshop on International Experience

As part of our mandate, the workshop: 'International experience on energy savings for the industrial and commercial sectors: Case studies for steel, textile and building sectors'' was held on September 14, 2005 at the head office of the WB in Jakarta.

The Ministry of Energy and Mines (DGEEU) invited the following participants:

- PLN managers and staff
- KONEBA
- Ministry of Energy and Mineral Resources
- Ministry of Industry
- Consultants, traders of EE equipment acting in EE fields
- Industrial Associations: steel, textile, etc.
- Commercial Sector Associations: hotels, hospitals, administrations, malls, etc.
- Representatives from the industrial and commercial sectors
- Household Associations

The details of the workshop are appended to this report, while an overview of the content is given hereafter:

08.30 - 09.00	Registration
09.00 - 09.15	Opening ceremony and speech (by Mrs Maryam)
09.15 - 10.00	Setting up the target for Indonesia - Presentation by DGEEU - Presentation by PLN
10.00 - 12.00	Presentation by Consultant (Econoler) Assessment of the current DSM program and its applications for the industrial and building sectors; Canada's and other countries' experience in DSM and Energy Efficiency in the building and industrial sectors Energy Audits and Labelling - assessment of Indonesia's and other countries' experience Questions and answers
12.00 - 12.30	Financing of DSM program by Pendanaan Nasional Madani (PNM)
12.30 - 13.00	World Bank experience in financing DSM and EE programs (World Bank)
13.00	Closing and Lunch

The workshop was a very good opportunity to establish a direct contact with stakeholders and companies involved in the DSM and EE fields. A very animated question period was held with the contribution of all participants. The following key aspects were discussed during the workshop:

i) Targets were set according to the Presidential directives of July 2005.
ii) Need to support audits in the targeted two sectors.
iii) Main barriers to EE and DSM project implementation:
   - Financial barriers are among the hardest to mitigate in the present situation of the Indonesian EE Market: collateral, access to financing, bankable audit reports, etc.
   - Lack of market knowledge; difficulties in setting the baseline requirements for DSM programs.
iv) Project implementation is still the final target; developers should keep this target on top of the list of their DSM planning activities.
v) Similar DSM experience in Canada, Vietnam, China, India and the Philippines were outlined by the moderators. Indonesia is at its early stages of DSM development.
vi) Involvement of EE technology manufacturers may be a good way to improve the expansion of DSM programs.
vii) Development of ESCOs may be one of the appropriate options to enhance the Indonesian EE market.
viii) The evaluation of the effectiveness of the awareness and dissemination activities should be focused on.

The impact of awareness activities has been positively evaluated by PCB for the Java Bali load. The increasing number of imported CFLs is an indication of the positive introduction of this technology on the Indonesian market. On the other hand, the incentive for industries to consume off peak electricity is not effective. The new circular letter has not been evaluated yet.

2.3 DSM PROGRAM EVALUATION

2.3.1 Peak Load and Consumption Impact

It is important to evaluate the impact of the ongoing DSM programs in order to assess the peak reduction generated. Therefore, monitoring the results of current DSM programs is an essential activity that should be implemented by PLN along with DGEEU at the beginning of the programs. Presently, there are no tools available at PLN for the monitoring of electricity savings. The market study performed in the residential sector in 2002 provided useful information on this sector. Similar studies for the assessment of CFL and FTL should also be launched for the building and industrial sectors. PLN performed a global evaluation of the load and consumption evolution for Java-Bali as indicated in the following table. Each program should be assessed based on specific market indicators. This process will allow isolating the impact of each program on the peak load and energy consumption.

Table 5: Global Evolution of the Peak Demand in Indonesia

2. Evaluation of DSM Program on Jawa-Bali Peak Load Reshaping

YEAR	PEAK LOAD (MW)	INCREASE (%)	ENERGY SALES (GWH)	INCREASE (%)
2001	12 577		67 928	
2002	13 374	6.3	69 960	3.0
2003	13 682	2.3	72 190	3.2
2004	14 323	4.6	79 793	10.5

Noted : Net peak load

The growth of peak load year 2003 and 2004 are smaller compare to the growth of energy sales , its caused improvement of load factor

For the first time, in 2003, the increase in energy consumption went beyond the increase in demand. And the trend seems to be continuing. It is considered that the DSM programs for the promotion of CFL have contributed significantly to this encouraging status.

PLN's savings calculations are based on the following methodology:

Table 6: Monitoring Methodology of CFL Program Developed by PLN

2. Evaluasi Pengurangan Beban Puncak Sistem Jawa-Bali

- **ESTIMASI PENGURANGAN BEBAN PUNCAK, AKIBAT PENGGANTIAN LAMPU PIJAR DENGAN LHE PADA PELANGGAN RESIDENSIAL**

  - **ASUMSI PENGGANTIAN LAMPU DAN PENGHEMATAN DAYA :**
    PELANGGAN R < 450 VA, LAMPU PIJAR 25 WATT DENGAN LHE 8 WATT, PENGHEMATAN DAYA 17 WATT
    PELANGGAN R > 450 VA, LAMPU PIJAR 25 WATT DENGAN LHE 12 WATT PENGHEMATAN DAYA 13 WATT
  - ESTIMASI PENGURANGAN DAYA :
    R < 450 VA ; (21 251 882 - 13 851 785) X 17 WATT = 125 MW
    R > 450 VA ; (45 788 284 - 24 391 675) X 13 WATT = 278 MW
    TOTAL PENGHEMATAN = 403 MW
    BILA COINCIDENT FACTOR DENGAN WBP 0.7 = 282 MW
    BILA 68 % PENGGUNA LHE PADA SISTEM JAWA BALI, MAKA
    ESTIMASI PENGURANGAN DAYA PADA WBP = 192 MW

The initial assessment of 200 MW for Java-Bali is therefore consistent with the evaluation of 192 MW indicated here.

The assistance provided by the World Bank team includes the recommendation and development of a tracking protocol. The proposed monitoring system takes into consideration PLN's load curves, which are obtained based on the following procedures:

i) www.pln.co.id, Bahasa section.
ii) "Kurva Beban system", Java-Bali region (or other regions).
iii) Choice of day with the function "Graphik Hari Lainya".

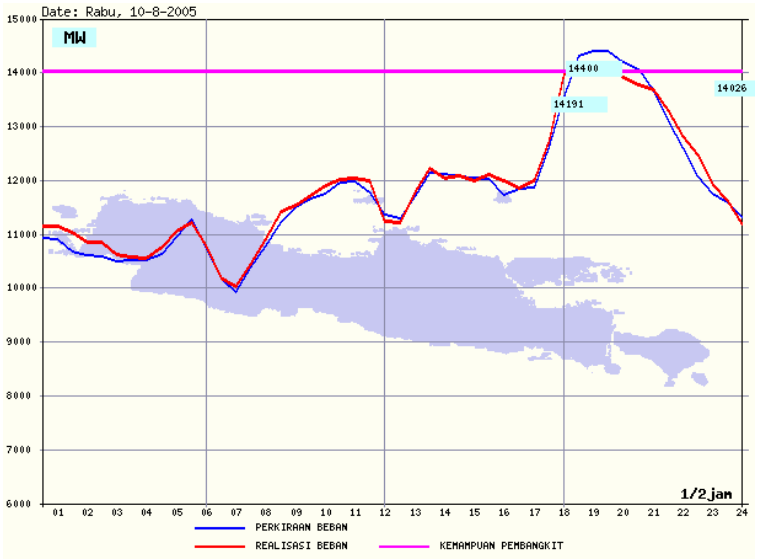


Figure 17: Load Curve of Java-Bali for August 8, 2005

The monitoring system will however require the desegregation of the load curves by end-use and by sector. Such desegregation requires a detailed knowledge of the hourly consumption of the different sectors: Residential, commercial, industrial, etc. during selected typical peak days. This knowledge will be based on metering registration for different categories of consumers combined with the end-use equipments with their different adjusting factors i.e. residential individual, multi-residential, urban v/s rural, etc. The market assessment should be completed by the economic growth of each sector for the next 5 and 20 years. Therefore, in order to assess the impacts of DSM and EE technologies, PLN and DGEEU will need to provide the DSM task force with this desegregation on a daily and monthly basis.

Methodology of the Monitoring Protocol:

The principle of evaluating project impacts is to compare a business as usual (reference) scenario with an EE scenario in which DSM programs are implemented. The methodology and protocol to be used for tracking the DSM program impacts has to follow the following phases:

Business as Usual (reference scenario):

i) Elaboration of the average load curve for weekdays and weekend days (from averages of curves available from www.pln.co.id) for the periods 2006-2010-2025.
ii) Desegregation of the curve of a typical day and for the maximum loaded day by sector (industrial, residential, commercial, others).
iii) Desegregation of the sector load curves by sub-sectors (e.g. industrial: steel industry, textile, wood,etc.).
iv) Desegregation of the curves by end-use.
v) Forecasted evolution from 2006 to 2010, then from 2010 to 2025.

vi) Identification for the targeted end-uses during peak demand periods (in MW) and of the average daily consumption (in GWh) for weekdays and weekend days.
vii) Calculations of the installed capacity of the targeted end-uses (from sales databases).
viii) Cross checking of the end-use peak demand and consumption:
ix) Calculations of the operating capacity of the targeted end-use during peak hours.
x) Taking a coincidence factor and installed capacity into account.

EE Scenario:

i) Calculation of the unitary savings achievable by the EE technology for the targeted end-use.
ii) Calculation of the impact of the EE program on the desegregated load curves (by end-use, sub-sectors and sectors).
iii) Consider the coincidence factor for the expected EE technology.
iv) Consider the coverage factor of the technology considering the current barriers to the introduction of the EE technology.
v) Yearly monitoring of the achieved load and consumption savings:
   - comparison of the forecasted load for the year analyzed.
   - verification of the amount of savings reached for the year.

2.3.2 Load and Generation Forecast

The monitoring of the DSM impact will need to take into consideration the load and generation forecast for the period considered. Projections for load and generation forecasts have been provided by PLN for the period of 2006-2015. The analysis allows comparing the planned installed capacity with the peak load of the country.

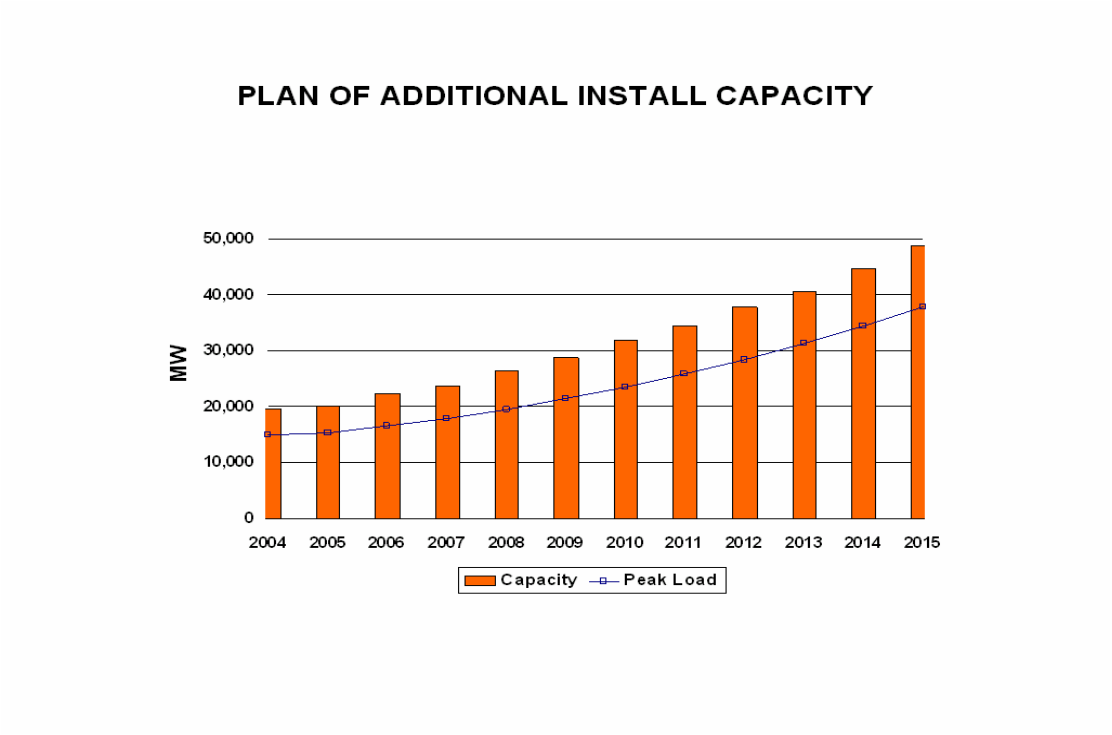


Figure 18: Comparison of Forecasted Capacity with Peak Demand[2]

This planning is driven by the target country economic growth and electricity consumption of around 6%. The actual DSM impact is not considered nor the future planned DSM reinforcing activities described in the present project. The graph reveals that the capacity which is planned to be installed in future years should cover the peak demand of the country. The impact of the ongoing program could be assessed after completion of the desegregation activities of the present peak load. This analysis should also be completed by Indonesian region data because they do not reflect the fact that some regions are overloaded while other regions are under-loaded. This is the case for Java-Bali, as illustrated previously, which faces a higher demand than its installed capacity can provide.

In terms of primary energy use, the strategy of PLN for the future decade is to optimize the use of the coal provided at the national level. This strategy is reflected by the following graph which provides the desegregation of electricity generation by primary energy:

[2] PLN Electricity Provision Planning

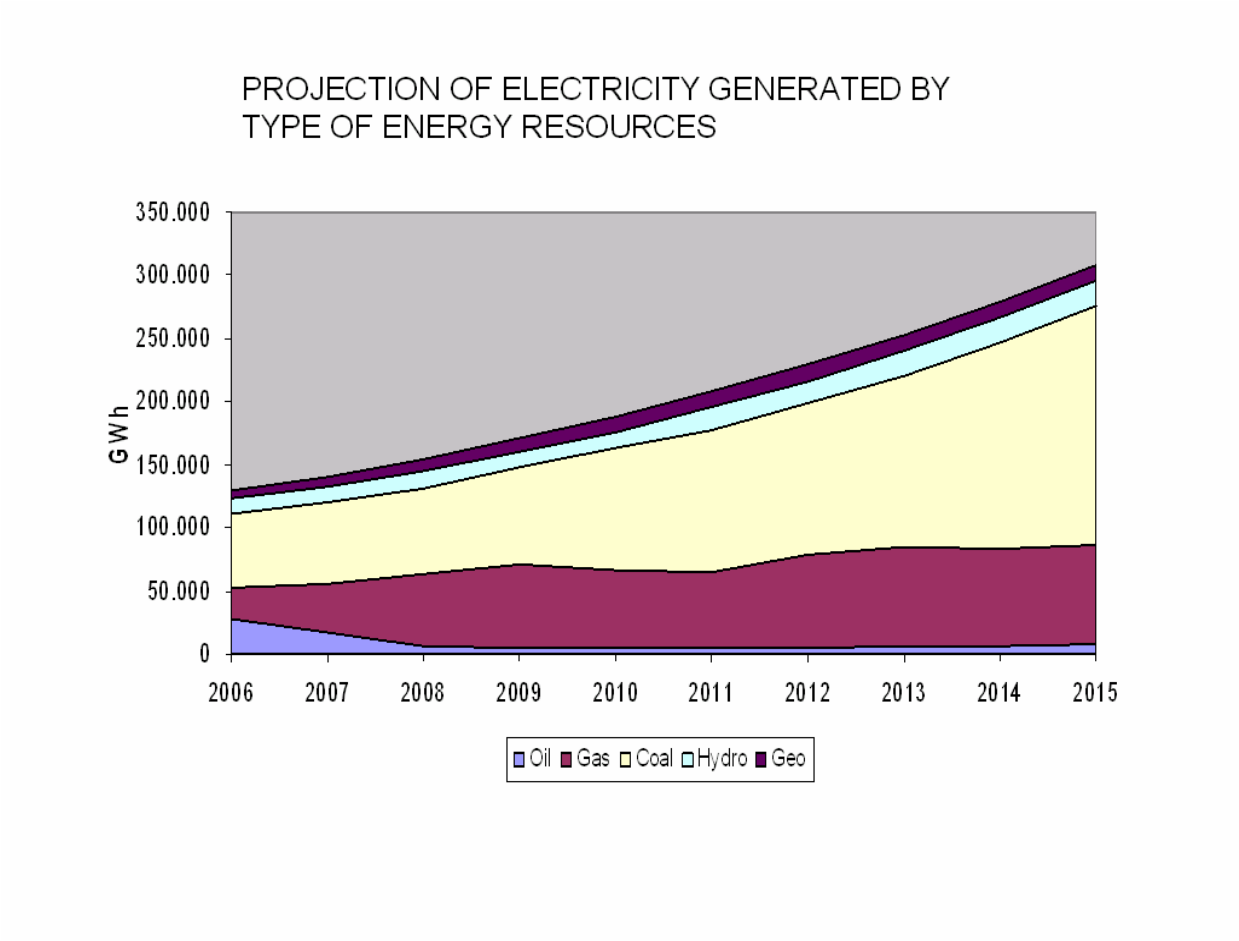


Figure 19: Desegregation of Electricity Generation by Primary Energy for the 2006-2015 Period

3 PROPOSED DSM INITIATIVES AND EXPECTED RESULTS

3.1 DSM INITIATIVES

3.1.1 Information and Dissemination Programs

According to our assessment, there is a need to develop material for awareness purposes for the industrial and building sectors on the short term and for households on the long term. The following table summarizes these fields that should not be considered as an exhaustive list:

Table 7: Basic Future Awareness Activities to Develop

Table Future Awareness Activities to Develop

Customer Targeted	Type of Activity	Material to be Used (lecture, media, radio, TV…)	Proposed Responsible Organization
Industries	Case studies for industries	Textile and steel magazines	PLN/KONEBA
Industries	Conference	Lectures and workshop on shared experiences	DGEEU
Commercial buildings	Case studies for commercial buildings	Newspaper diffused in major Indonesian cities	PLN/KONEBA
Industrial and building sectors	Promotion of "energy cost reduction"	With the PLN bill, join a "leaflet" to promote energy cost reduction through realization of energy audits	PLN
Households	Promotion of energy Labelling	Television announcement	DGEEU

In order to highlight a targeted industry or building, case studies are recommended. These should include one or two small illustrations as well as the results achieved as detailed in the following chapters, which deal with each of the residential, building and industrial sectors.

DSM Initiatives for the RESIDENTIAL SECTOR

CFL PROGRAM

The ongoing programs for the residential sector have been enhanced by an additional CFL project. Proposed residential programs must take into consideration the results of this initiative. In September 2005, PLN launched a CFL pilot project in ten locations in Indonesia. In these locations, PLN offers to customers CFL which payment is based on six equal monthly instalments**.** The instalments are charged to the customers on his bill.

The purpose of this pilot project is to test the scheme and mechanism of collecting the money by instalments.

In the context of this pilot project, PLN is collaborating with 6 major lamp manufacturers:

- Philips
- Osram
- GE
- Panasonic
- Chiyakoda
- Lightmax

The final objective of this pilot project is to test the willingness of low income households to pay for energy efficient devices.

The marketing responsibility is shared between PLN and the manufacturers; however an issue is still pending on cost sharing, as is the case for the existing program. PLN does not charge interest to the customers nor does it charge the customer for additional billing services. The evaluation of the project should be available in October 2005.

Further information campaigns should take advantage of past experiences with other technologies, especially those successful ones such as the CFL information dissemination activities for households.

New messages should therefore include a reminder of the CFL information, which should also be considered for other DSM programs.

A labelling program should be considered a priority in this CFL program. A limited number of brands (five to six), the quality of which varies significantly, is now available in the market. PLN is ready to start the labelling campaign and is awaiting the Government's approval to proceed.

The information campaign can make use of the success rates of other ongoing DSM awareness campaigns. A televised information campaign was launched based on the principle of "reducing the number of lamps in operation in households". The purpose of this campaign is to implement load peak shaving. PLN has produced 30-second Public Services and television advertisements.

The **target for each household is to achieve 50 W in savings, which is equivalent to the power required by 2 lamps.** In order to avoid any "technical" aspect in the message, the TV ad does not specify whether the lamps referred to are CFL or incandescent.

As far as government efforts are concerned, information campaigns are generally conducted by ministries other than the MEMR. The Ministry of Industry often takes the initiative to launch specific campaigns on EE. The GoI has launched an awareness program on energy matters, which is called **"Green Learning Room".** The idea was initiated by PLN and implemented with the collaboration of the GoI's Ministry of Education. An information campaign on energy audits is planned in the near future by the MEMR.

Promotion of Energy Labelling for Households

The households' energy labelling promotion proposed program is designed to raise the awareness of families regarding the energy consumption of household appliances.

The labelling process is currently being implemented under the coordination of DGEEU.

The proposed program consists in a television ad launched by DGEEU. The announcement will present the actual label, as shown here:

The TV ad will explain, in a simple manner:

- What the energy label is for: to reduce the peak demand and avoid national blackouts.
- That the label is now available.
- Which household appliances will be concerned: CFL, refrigerators, fans, etc?
- Who to contact for further information: DGEEU on an open hotline.
- Where the label will be displayed: at retailers, in shops and at household appliance distributors.

DSM Initiatives for the COMMERCIAL SECTOR

EE STANDARD FOR AIR CONDITIONNING

Air conditioning is one of the major end-uses in the commercial sector that contributes to the national peak demand. So far in Indonesia, there are no efficiency standards that establish the minimum required level of efficiency for this particular end-use. A program to be proposed to the commercial sector is the launch of a Minimum Energy Efficiency Standard for AC.

ENERGY EFFICIENT EQUIPMENT PROMOTION INITIATIVE

An important step is to determine the minimum energy efficiency standard to be applied to a some specific products as a prerequisite to be satisfied by manufacturers or importers of these products This program would enhance the transparency level of information about which equipment is efficient and which is less efficient. As a result, manufacturers and importers will strive to sell products with higher levels of efficiency in order to maintain their competitiveness on the market. In the long run, a market transformation will have taken place, where efficient equipment is readily available on the shelves and low efficiency equipment is not and needs to be ordered from manufacturer.

A step by step approach is recommended. Should this program run smoothly, after a certain period of time, the minimum energy efficiency standard can be reviewed and increased to a higher level. However, if the program is unsuccessful, it will need to be modified or replaced with another more appropriate program.

CASE STUDIES FOR COMMERCIAL BUILDINGS

This proposed program is intended to raise the awareness of decision makers in commercial buildings. The main component of this program is to elaborate case studies which should be widespread in newspapers and specialized magazines. Case studies can also be the subject of TV reports or documentaries that would include the interactive reactions of all the project's partners including PLN. The proposed case studies format is similar to the format presented in the industrial program. Technical photographs can be inserted to illustrate specific buildings and targeted end-uses.

The case studies should present:

i) The energy balance of the targeted buildings.
ii) The desegregation of the load and consumption by end-use.
iii) A technical presentation of the EE measures considered.
iv) The economic and financial evaluation of the EE measures.
v) Benefits and, in case of inconveniences, the mitigation solutions considered for a given case study.
vi) Applications where the proposed EE technologies can be replicated.

DSM Initiatives for the INDUSTRIAL SECTOR

ELABORATION OF CAMPAIGN MATERIALS FOR AWARENESS PURPOSES

The elaboration of materials must take into account successful activities implemented in Indonesia. This would include PLN's television ads on peak load reduction in households.

Case studies can be developed under the format of an information sheet. A suggested format is illustrated in the next figure identified below as:

Figure 20: Suggested Format for Case Studies

DEMAND-SIDE MANAGEMENT PROGRAM

Saudi Arabia

CLIENT:
The World Bank

BACKGROUND:
Saudi Arabia's rapid growing population and economic development are the main reasons for the significant increase of demand for electric energy of about 5% or more per year. It is estimated that the country will need up to 66,400 MW of power generation capacity by 2023, compared to the current capacity of 27,260 MW.

Due to relatively low energy prices, the demand for electricity in the Kingdom has grown at very high levels. Also, as a consequence, little attention has been paid to the efficient use of energy. In the last few years, prices of energy have increased by more than 30%. However, electricity rates are still low at international levels, particularly for the first block or residential customers' consumption, where lifeline rates are provided to those with consumption of less than 2,000 kWh per month.

Government authorities, in particular the Ministry of Water and Electricity, were determined to confront the issue, both from a supply and demand perspective. To cope with the increase in power demand and to assure reliable electric supply, a plan has been developed to expand power generation capacity. Also, simultaneous actions targeted towards the reduction of peak demand were being considered. These included setting up limits on maximum power delivered to large electricity customers, demand side management actions, and the rational use of electricity.

The Government of Saudi Arabia approached the World Bank to take a fresh look at the existing challenges, compare and contrast with international experiences and best practices, and make some initial, practical recommendations on how to move forward to leverage Demand-side Management (DSM) efforts in the Kingdom.

MANDATE:
Econoler International was therefore mandated by the World Bank to accomplish the following tasks:

- Analyze the current situation of the effectiveness of energy efficiency and DSM programs in the Kingdom.
- Develop and implement a roadmap for implementing appropriate policies, legislation and regulation which promoted energy conservation and demand-side management, and understood how existing regulations (or lack thereof) have impacted energy conservation and demand response.
- Provide examples of best practices in the world, particularly in countries in the MENA region facing similar energy conservation challenges, namely growing consumption in summer months. Tunisia and Morocco, which have introduced time of use tariffs with some success.

REALIZATION YEAR: 2004

PROJECT COST: N/A

CONTRACT VALUE: US$54,000

MAIN EXPERTS: Hakim Zahar, Project Director
Stéphanie Nour, Technical Expert

REFERENCE:
Tjaarda P. Storm van Leeuwen, World Bank

CONFERENCES AND SEMINARS

This program intends to get industrial companies sharing their EE initiative experience among their peers. Some factories have successfully implemented EE projects with significant savings. In order to convince other industries to follow their example, conferences and seminars should be organized across Indonesia on a regular basis and in sufficient numbers to have a significant impact. Such conferences should be wisely planned to take into account the competitive context in which stakeholders operate, which often impact on their willingness to share information about their operation. After this problem has been coped with, conferences should be set up for top managers first to review EE principles and economics, and then for technical operators to deal with technical aspects.

PLN can also seek the support of specialized social clubs to incite senior management to focus on the benefits of EE technologies. Clubs such as a Rotary Club can be solicited since the subject of EE is currently a priority in Indonesia and it should be disseminated to all the population in all social categories. Such conference would include lectures and workshops presenting shared experiences.

DGEEU and PLN can also support technical activities intended to generate employee awareness. Employees can be encouraged to suggest new concepts to their EE project managers. Basic new energy-saving habits adopted by an industry's personnel, such as turning lights and computers off at the end of the day, are no-cost measures that permanently save significant amount of money.

3.1.2 Energy Audit Program and Strategy

In accordance with the Master Plan of National Energy Conservation policy edited on July 2005, the energy audit program targets the following components:

- Supply side:
  - Increase energy supply capability
  - Optimize energy production
  - Conservation of energy resources

- Utilization side:
  - Efficiency of energy utilization
  - Diversification of resources usage

This is a general strategy. No specific requirement regarding auditing is included in this policy statement. Meanwhile, DGEEU auditing program is still operational and should be reinforced according to the recommendations described in the present Report.

End Users' Targets

Customers enrolling in the auditing program should focus on the reduction of their energy budget. A major concern identified by customers when discussing the topic is to implement energy efficiency measures while keeping their core commercial or industrial activities in operation. For example, hotels and industries are usually ready to implement energy saving programs as long as the recommended measures do not affect their production.

The project team developed three audits: two walkthrough audits in two buildings and one detailed audit in one industry. Energy audit reports template shows the various components analyzed for each case. This template was forwarded to the training participants. This template is customer oriented and is based on international experience in auditing. Customers are particularly interested in EE measures description and their impacts on energy consumption and energy budget. These various aspects are usually discussed with the auditors.

Based on international experience, it is usually easy to reduce the energy consumption by 10% through ''low cost no cost measures'' identification and implementation. This minimum saving is usually reachable after a detailed audit and measurement of the consumption pattern of the main consuming equipment. End users would like to get in the audit reports information on these low-cost measures. This initial potential will help the end-user to recover his initial payment for an energy audit (when applicable).

When initiating the audit, customers also express their interest on total potential savings when a comprehensive and detailed energy audit is conducted in their enterprise. This potential depends on several factors (see Para. 3.1.2.5.) therefore, it is difficult at that stage to give a realistic ratio before proceeding with the audit.

Making Energy Audit Mandatory

Regulation Policy

Making energy audit mandatory for customers requires the implementation of a regulation policy. Doing so is made to accelerate the implementation of the principles of the energy conservation program. The regulation policy, which is in accordance with the existing condition, covers energy audit and management, and energy efficient equipment availability in the market.

STRUCTURING THE EXISTING ENERGY AUDIT PROGRAM

This is to assist energy customers, especially big industries and commercial buildings, to fix the pattern of their energy consumption. Advisory services, including energy audits, for assessing the energy savings potential, are currently provided for free. These services are important to accelerate the implementation of potential energy conservation.

In the short term, the government may consider to promote private or public energy service companies (ESCOs). Doing so improves its capacity to offer technical support and advice to industrial and commercial building owners in identifying and implementing EE projects.

As said before, it is suggested in the future that the program be adjusted so that industry and building owners pay up from 5% to 30% of the audit costs. From discussions with PLN and KONEBA, an evaluation of amounts that customers could be willing to pay for an audit has been done in the event the electricity tariff would significantly increase. Industrial and building customers are willing to pay part of the total cost of an energy audit if the energy cost is a significant item in their budget. Even though the suggested percentage mentioned before represents little amounts, it is recommended to keep it as minimum target for the programme. When the program will be accelerating, the concept of ''taking in charge by customers part of audits costs'' will be in force and this is enough by itself to increase industries' interest towards EE.

The remaining audit costs (95 to 70%)will be covered by PLN and DGEEU as it is currently done but conditional to the fact that the end user engages to implement the agreed measures within a suitable period (i.e. three years).

On the other hand, it is suggested that the audit will be paid if and only the audit shows a 15% minimum energy and/or financial saving.

To enhance the actual conversion of the audits into consistent investment projects, it is suggested that PLN and DGEEU allocate partial grants for EE equipment used by customer (proportional to PLN peak reduction that the audit must determine).

The GoI may support the program through incentives such as tax exemption for EE systems according to an exemption procedure to be clearly set and agreed upon between DGEEU and the Ministry of Finance. A review of potential incentives to support EE projects need to be performed to identify their cost effectiveness for each stakeholder, including the GoI.

ENERGY MANAGEMENT MANDATORY FOR INTENSIVE ENERGY USERS

Energy management will first be made mandatory for intensive energy customers. For various reasons, including a strong economic incentive to control spending on energy inputs, these clienteles should be more receptive to save. Since ''I4'' and ''I3'' tariffs apply to these Intensive Energy users, PLN' list of customers gives the potential number of companies concerned involved in such a program:

- I4 tariff (more than 30 MVA): 57 customers
- I3 tariff (more than 200 kVA): 7,248 customers

It is recommended that a regulation is introduced to make audits mandatory with a periodicity of three to five years, for intensive customers. The limits will be set by DGEEU and revised every 5 years, according to the program implementation progress. This limit could be set to 12,000 Toe (Tons of oil

equivalent) per year including all types of energy (electricity, natural gas, fuel-oil, etc.) at the beginning of the program.

It is suggested that the customer be obliged to carry out the following:

- Appoint an energy manager in his facility.
- Prepare and implement an energy conservation program.
- Implement energy audits periodically (a period of 3 years is proposed).
- Report to DGEEU the implementation results of the energy conservation program on a regular basis.

One major component of such regulation is to identify the penalty to be paid by those that do not respect it. This usually depends on the local perception of penalties. They should not be too high to make it non-realistic and nor too low to be not considered by the recalcitrant end users. Based on international experience, a value of 2 to 3 times the audits costs should usually be efficient.

Barriers and Mitigation Solutions

Energy Audit Program Implementation Plan

To start with a simple modification could be introduced. Since customers often associate the wording of "audit" with an examination of the fiscal data and accounts of a company, it is recommended that the future terminology to be used is "energy analysis".

Energy audits program started in 2003 but is facing various barriers slowing its implementation for the last three years. One barrier results from allowing a major role to a public company (such as KONEBA) which is interpreted by industries as a control procedure. To overcome this barrier it is recommended to train and qualify other Indonesian auditors. It should be relevant to take advantage of this training to include EE management and implementation capacity with the trainees, so they could effectively get involved in the implementation process of the identified EE measures. Moreover, energy auditors should be motivated to do a better energy audit job to get their client's confidence and as such be invited to implement the next steps.

Energy audits are currently done on a voluntary basis. In parallel, the preparation of the new energy bill is done in 2005 and will be submitted by DGEEU to the parliament. This bill should foresee the option of having large industrial and building customers compelled to proceed to energy audits.

The program should consider the current barriers:

- Actual situation of facilities toward energy efficiency strategy: few pilot projects have been implemented in the Indonesian market.
- Energy tariff: the recent energy tariff increase has stimulated EE strategies in Indonesia.
- Availability of EE technologies on the local market: In Indonesia, nearly most of the recent EE technologies are imported.

- Knowledge on EE technologies and their practical application: few experimented experts are currently acting in Indonesia.
- Costing level of EE measures: the level of costing can be lowered when the government and/or stakeholders will decide to allocate incentives to EE implementation. This is not the case in Indonesia.
- Good chemistry between the end users management and technical staff and the auditors' teams: actually, the auditors are not well perceived in the Indonesian market.

The participation of DGEEU/PLN within the proposed energy audit program would be concentrated on:

- The promotion of the program to PLN customers.
- The supply of customers' energy data.
- The assistance from local PLN offices for energy auditing.
- The approval of audit reports.
- The construction of a database for the recommended measures and the assessment of their impact on the peak load.

This assistance would require capacity building to be done at local level, using the capacity building scheme implemented at the head office of PLN in Jakarta. Local staff has appropriate measuring instruments to realize energy audits. PLN staff could get involved in energy auditing once this capacity building is done. It will allow the energy audit program to increase its implementation speed, as now only KONEBA realizes energy audits.

Audit Results Dissemination Activities

It is common sense to say that "Attitude is everything". When it comes to energy efficiency and savings, a culture change is needed. We must keep our minds open to these new ideas and learn how to modify our behaviour. Studies have shown that a conscientious and permanent effort by individuals to avoid needless waste of energy and water can yield savings of up to 10%.

Changing attitudes can be achieved through a well-planned awareness program including:

- A video that describes the importance of energy awareness and conservation.
- A variety of printed materials.
- A travelling booth with information on the project.
- An energy hot-line that can be called at any time if the staff has any questions.
- Visits to every affected building by the project staff.
- Numerous lunch-time information sessions.
- Monthly newspaper articles and information sheets for project staff.
- Energy contests, which give away energy-efficient prizes such as fluorescent lamps, shower heads, kitchen appliances (microwave ovens and refrigerators) and even bicycles.

The strategy should be: "to bombard them with information from numerous sources to get the message across." In many countries, awareness programs such as the above have been a huge success. Traveling information booths were particularly effective.

Auditors Accreditation and Training

Accreditation

The accreditation process could be managed by DGEEU. Currently, there is no such structure in Indonesia. Therefore, DGEEU with the support of PLN may create an accreditation committee so that future auditors can be provided with appropriate certificates bringing credibility among the end users of the targeted sectors.

This accreditation committee will need to create the appropriate evaluation tools and forms in order to provide the required procedures for future auditors. The accreditation must follow international standards regarding the performances of energy audits by future auditors.

The accreditation committee will need to prepare a certificate with DGEEU so that future auditors have an official document proving that they are capable of realizing energy audits. This will be a condition for getting the DGEEU/PLN support for audit charges.

Training

The preliminary step to be set is the training of the auditors. The design of the training and the elaboration of practical case studies will be envisaged for the purpose of auditor's capacity building.

For the realization of the training program, a training centre is provided by PLN for DSM purposes. Considering the size of the Indonesian EE market and the urgency of the current energy situation, it is recommended that the auditor training program includes first the training of the trainers. Consequently the selection of the first group of participants should consider their capacity to become trainers (high potential, bachelor science degrees, past experience in teaching, etc.)

3.1.3 Suppliers' Support

The EE equipment suppliers' support is important for the implementation of a large-scale auditing program. Availability of technical and economical information for the targeted EE technologies is identified among the actual barriers to energy audits. Therefore, suppliers should make available such information to the auditors so that they can recommend EE technical options to industries and commercial buildings. On the other hand, equipment suppliers will have to make EE technologies available in the Indonesian market to satisfy a new demand driven energy audit results and recommendations. Equipment suppliers are therefore important stakeholders in many DSM program implementations and should take part in program and implementation procedures design to allow them to input their specific requirements related to making new technologies actually available in the market.

A market assessment of the targeted technologies should be performed during the program design to assess the existing situation regarding the availability of EE technologies in the Indonesian market and suggest appropriate move to start removing this barrier.

In several cases, other barriers related to the introduction of new technologies in the market are met; this includes the maintenance and after-sales services. DGEEU/PLN should also address these aspects in the market development for new EE technologies.

3.2 AUDIT PROGRAM MANAGEMENT

3.2.1 Measuring Equipment

In terms of measuring instruments for audit activities, PLN is equipped with all necessary tools. The PLN DSM working group does not have them in their offices, as the group is concentrating on strategic projects. Whenever PLN DSM group requires these instruments it asks the local units of the company.

As KONEBA is involved in energy audits, it is well equipped with measuring instruments.

These instruments were used during the walkthrough performed during the missions held in the framework of the present program.

3.2.2 Program Implementation Process

Audit Program Prerequisit

Implementing this program will require from GoI and PLN the following actions:

- Approval of the present energy audit program scheme.
- Enforcing of the eventual energy audit regulation for large customers.
- Creation of an energy auditing network across Indonesia.
- Realization of the first 200 energy audits.
- Promotion and dissemination of the first audits results.
- Organize and conduct annual workshop/conference to share experiences and follow up on the implementation plan.
- Update and adjust the plan along experience obtained through actual program execution.

Audit Program Design

Under the supervision of DGEEU and PLN, local or international experts to be the contracted will proceed with detailed program:

- Detailed yearly objectives for the program including the number of audits of each type of building that will be conducted annually (as presented in the previous table).

- Evaluation of available resources in Indonesia with appropriate technical skills to perform energy audits.
- Design tailor-made energy auditing training sessions to enhance the number of available audit experts and/or enhance the quality of audits to be performed.
- Identify program implementation milestones.
- Set up the organization chart for program implementation, review chart with stakeholders and obtain their approval.
- Set up selection procedures for industrial and commercial building (economic and energy consumption criteria).
- Set up procedures for contacting and contracting the client.
- Set up separate energy audit procedures for industry and building.
- Set up Customer services procedures.
- Set up Quality control procedures.
- Set up Management procedures.
- Identify equipment and facilities requirements and take action.
- Identify database requirements and take action.
- Set up Program evaluation procedures.
- Set up detailed monthly human resource requirement.
- Set up detailed monthly operation budgets.
- Set up detailed schedule of activities.
- Program evaluation, which essentially consists in verifying, during the course of the program and at its completion, the quantitative results achieved both in monetary and energy terms.

Audit Program Management

Under DGEEU and PLN leadership and control, the following tasks will be implemented:

- Selection of a consultant who will realize the detailed design of the program and the Action Plan for its implementation.
- Review Koneba and UoI mandates and adjust to program objective and design.
- In accordance with Koneba and UoI revised mandates, adjust the auditing program capacity through selecting and contracting additional experts.
- Selection of the consultant that will prepare the audit specification.
- Elaborate the database for program follow up and impact evaluation. Monitor database operation and periodically revise and up-date it (every 3 months is suggested).
- Set up day-to-day program management system and reporting mechanism.
- Monitoring of the program progress and adopt and implement corrective measures to achieve the target.
- Supervise and proceed with audit quality control procedure (external expertise is recommended).

Marketing Program

The audit program has been implemented at a very slow speed since its inception in 2003: only 17 audits have been achieved so far. Therefore, a strong marketing program needs to be launched to increase the number of energy audits done in the industrial and commercial sectors. The marketing done so far through "circular letters" needs to be enhanced through strong communication campaigns promoting the audit program.

The recent electricity tariff increase combined with the actual oil prices and its impact on the public fuel oil prices seem to create new interest toward energy efficiency among the end users. Koneba's General Manager estimates that his company will have to realize about 300 audits in FY2006.

The best recommended way to enhance the program marketing is to schedule a workshop for specialized sector end users: i.e. hotels, steel industries, pulp and paper industries, aluminium industries, chemical, multi-residential owners, etc.

Tools that can be used are described in Chapter 3.1.1.

Resources Commitment and Preliminary Cost Estimate

The energy auditing program costs includes the following components:

- Program planning: This includes a study to assess in details the set-up of the programme.
- Follow-up of the audits and summary report: This should be done at the deposit of each study and should include the evaluation indicators and a list of measures recommended.
- Realization of energy audits: this is including the DGEEU/PLN staff allocated to field visits and other supervision activities.
- Support for the development of an Indonesian ESCO new market: Several mechanisms should be tested during the audit programme to assess the barriers and the mitigation solutions for the ESCO concept development.
- Program management.
- Program execution (audits quality control and database): This is including the contribution of PLN/DGEEU to the audits.
- Evaluation of the program.

The costs of the expected program are described in the following table.

Table 8: Estimation of Audit Program Costs in US$

PERIOD	2006-2008	2009-2010	2011-2015	Total
Program planning	$300,000			$300,000
Follow-up of the audits	$90,000	$270,000	$1,350,000	$1,710,000
Realization of energy audits	$150,000	$450,000	$2,250,000	$2,850,000
Development of ESCOs market	$150,000	$500,000		$650,000
Program management	$240,000	$720,000	$3,600,000	$4,560,000
Program audit execution	$3,000,000	$9,000,000	$45,000,000	$57,000,000
Evaluation of the program	$300,000	$900,000	$4,500,000	$5,700,000
TOTAL	**$4,230,000**	**$11,840,000**	**$56,700,000**	**$72,770,000**

These previous estimates show that the government of Indonesia can save 760 MW if it restructures the audit program with incentives. Thus the investment cost for auditing programs is less than 10% of the savings achievable by PLN/DGEEU based on a required investment of US$1 million/MW in generation-transmission-distribution without considering the energy saved that would be made available for customers.

Due to the limitation in scope of this mandate and the lack of information that can be obtained from the utility, the calculation of avoided cost presented herewith is a simple avoided cost for a peaking power plant. It is recommended in the future to extend this initial estimate to a more appropriate calculation of program return using the neutral tariff test, societal test and customer test to determine the interest of this program for different stakeholders and the society in general.

3.2.3 Expected Results

The audits are an intermediate step, not a final one. It has to lead to an EE project implementation to take all its sense. Therefore speaking about expected results for audits can be assessed only with the number of customers that can be audited within a timeframe. The implementation of EE projects will depend on the incentives that will be put ahead by the government to enhance the results.

Considering that only few audits are realized, it is strongly recommended to size the audit program for the 6,350 customers of tariff I3 and I4. However not all the customers will realize audit. A realistic ratio of 50 to 70% should be targeted for a period of 10 years. The following table is in line with a realistic restructured audit program that includes adequate incentives for project implementation. It refers to a total of 3,800 audits to be implemented from 2005 to 2015. Additional 4,000 audits will then be completed in the period 2015 to 2025.

As adequate information is still missing at this point, a 200 KW theoretical average peak load reduction is used for large customers to assess the impact of the program on DGEEU/PLN.

On this basis, a 760 MW cumulative peak reduction is estimated for the whole period 2005-2015, which results in deferring investments worth more than US$800 million for at least 10 years.

Table 9: Expected Results for the Audit Program

	Period	Number of Audits	Load savings (MW)
Phase 1	2006-2008	200	40
Phase 2	2009-2010	600	120
Phase 3	2011-2015	3,000	600
Phase 4	2016-2025	4,000	800
Total	2006-2025	7,800	1,560

Basis= 200 KW load savings per audit for large end users

4 DEVELOPING ESCOs IN INDONESIA

4.1 EXISTING SITUATION

According to our assessment there is nearly one ESCO operating in the Indonesian market. PT Ultimate Solusi Indonesia (PTUSI). This ESCO is covering up-front payments for the supplied equipment and is paid upon achieved savings. The ESCO is investing its own equity and can implement a project for a total value of maximum US$70,000. This ESCO is recommending international EE equipment for which it arranges trading. The international equipment manufacturer is offering a performance insurance to cover the savings risks assumed by the Indonesian ESCO.

4.2 BARRIERS TO ESCOs DEVELOPMENT

The following barriers have been identified in the Indonesian market.

i) Lack of effective awareness programs targeting all the sectors of the Indonesian economy based on real assessment of the benefit of the electricity conservation activities.
ii) Lack of policy, legislation or regulation to promote the creation of a market for ESCO services.
iii) Lack of adequate tariff structure to support energy efficiency measures implementation.
iv) Lack of properly trained operators in the Indonesian market for the development and implementation of electricity efficiency projects with the ESCO's approach.
v) Lack of knowledge and experience of innovative electricity efficiency measures and financing mechanisms to increase the confidence of customers and financial institutions in the proposed projects.
vi) Lack of funding for ESCOs from the commercial banking system.

4.3 ESCOs PROMOTION STRATEGY

The ESCO concept has been adopted in many countries and is seen making the DSM activities sustainable. It promotes the development of specialized operators to act in the market.

The adoption of this concept in Indonesia will require a strong support from the Indonesian Government and the stakeholders. Support will have to be in legal, technical, and financial matters. As well it will require an adequate awareness activity to facilitate its understanding by Indonesian customers.

The ESCO concept is a natural step following the introduction of an energy efficiency program. It aims at implementing energy efficiency measures which have been identified through the auditing program.

DSM financing mechanism involving ESCO could be considered in Indonesia as suggested by PT Permodalan Nasional Madani (PNM). During workshop, it was suggested to work on the following business model proposed by PNM:

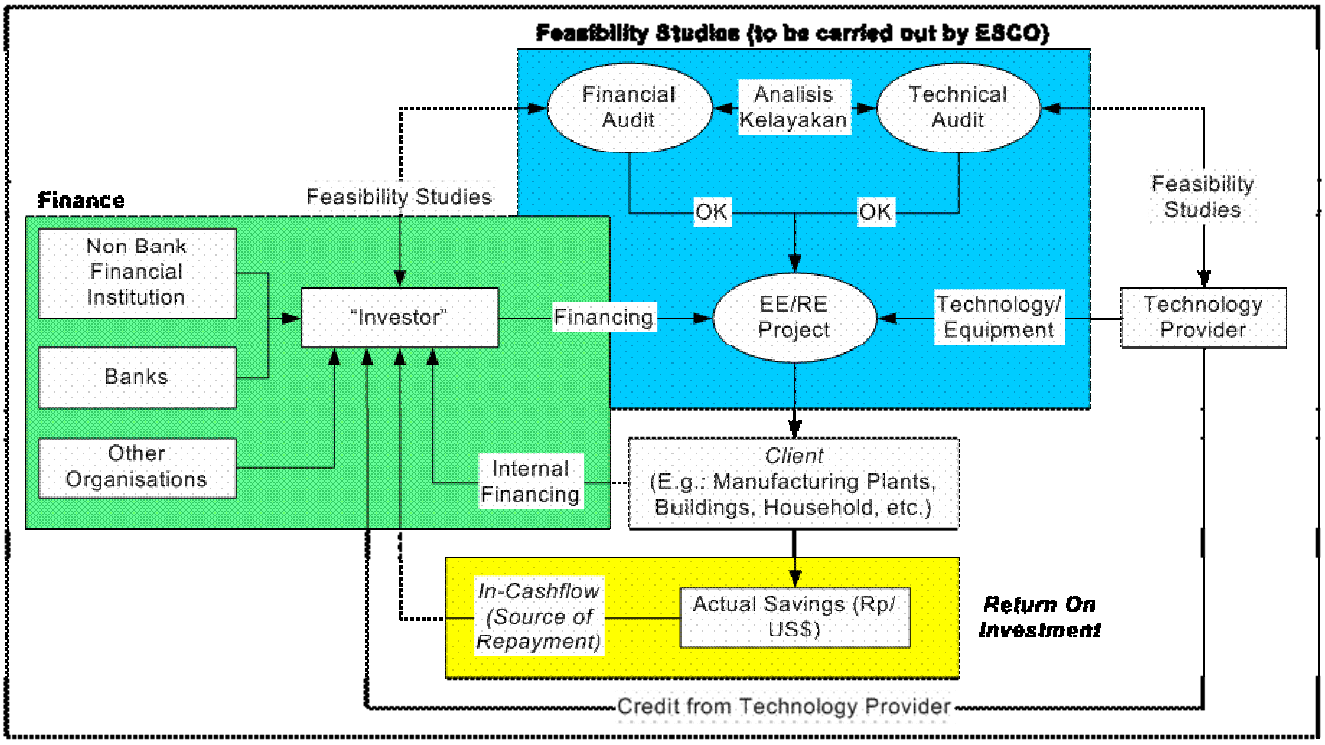


Figure 21: PNM Proposed ESCO Business Model

Creation of ESCOs could be launched with partnerships of DGEEU and PLN. The mechanism was presented during the DSM workshop on August 23, 2005 and is under consideration for a small hydro project and eventually photovoltaic projects with 1,000 PV units.

Such facilitation in investments for ESCO project implementation consists of several alternatives, which are, among others:

- *Built Operate Transfer (BOT)* pattern, in this case financial institutions are accompanying the ESCO in the construction or rehabilitation, operation, hand over of operations at end of contract period. The financial partner then takes part of the required equity.
- *Profit sharing operations cooperation* pattern, in this case the risks of installation, operations and maintenance are jointly supported by the financial partner and the ESCO.
- *Project financing,* in this case the risks of installation, operations and maintenance of conservation projects are supported by the project owner, which is the ESCO, while the financial institution provides investment funds.

A realistic schedule allows for two to three years after an audit program has been implemented before initiating an ESCO implementation initiative with reasonable probability to have a success. Therefore a detailed ESCO program and strategy is not required immediately.

5 LABELLING AND DISSEMINATION

5.1 LABELLING CONCEPT AND IMPLEMENTATION STRATEGY

Labelling is one of the most efficient ways to reduce widely used appliances energy consumption in the Indonesian market.

To illustrate the potential impact of such an initiative, labelling refrigerators in California have decreased their energy efficiency by 74% since labels have been introduced in 1974 (fig. 24). This result is a permanent one. Moreover, refrigerator manufacturers have developed their own energy efficiency expertise in their industry. And customers are now trained to read energy consumption labels before they choose a brand or a model. This is clearly a successful market transformation.

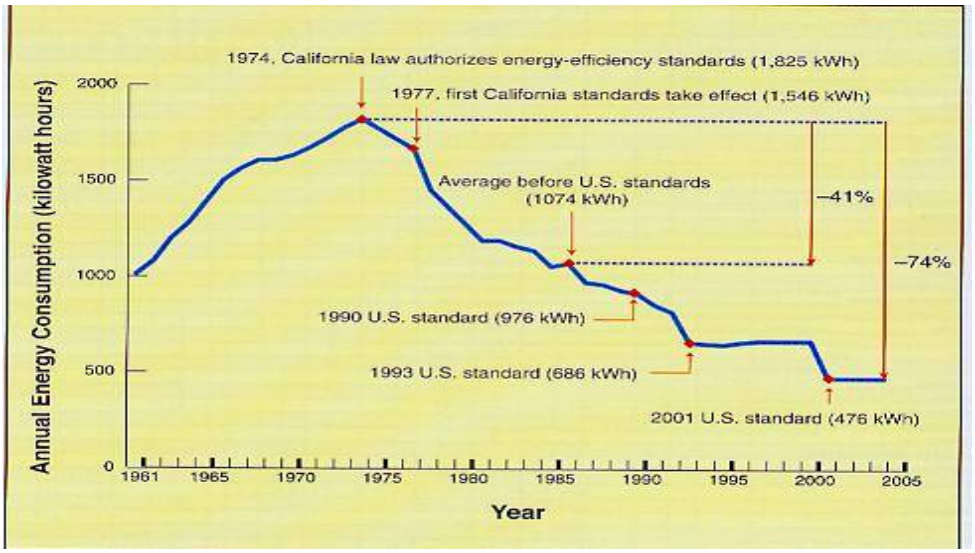


Figure 22: Unitary Energy Consumption of Refrigerators in the USA

A preliminary energy saving evaluation has been conducted, which results are presented in Table 14. The estimations take into account that 53% of the 56 million Indonesian households are electrified.

Table 10: Targeted Number of Appliances for the Labelling Program Implementation

	Estimated Present Market for Indonesia (numbers)	Average Unit Saving (W)	Total Potential Load Savings (MW)
CFL	59,000,000	5	295
Refrigerators	29,000,000	10	290
Fans	29,000,000	5	145
Washing machines	12,000,000	15	180
Total			910

These 910 MW are technically accessible. Labelling will significantly contribute to their actual implementation.

5.1.1 Implementing Labelling Process

Labelling requires a systematic process including the following steps:

- Step 1: Assess political, institutional and cultural factors.
  - For each projected appliance this will help identify the barriers and how to mitigate them during the program design.
- Step 2: Establish political legitimacy.
  - Discussion with stakeholders, including national manufacturers and retailers, are essential to identify and get approved the individual responsibility in any label program implementation to make a success. This will increase ownership of the label and/or standards and their legitimacy.
- Step 3: Consider regional harmonization.
  - Imported appliances are provided by neighbouring countries. It is therefore important to assess the situation of these partners regarding their own labels and standards.
- Step 4: Assess data needs.
  - Market studies detailed contents are well documented. As a very general overview, they will include general economic data on population, appliance industry structure and organization, sales data, market supply, current and future demand survey for new and replacement, elasticity research on appliance price, etc. It will also include the assessment of the government to acquire and manage data. The results should be summarized as presented in the following table for Tai refrigerators:

Table 11: Cost-Efficiency of a Thai Refrigerator

	Description	Annual kWh	Energy Saving (%)	Manufacturer Cost (Baht)	Retail Cost (%)	Benefit/Cost Ratio (see notes) This Step	Benefit/Cost Ratio (see notes) All Steps
	Base case	255	N/A	N/A	N/A	N/A	N/A
1	Add 1 cm insulation to side walls	234	8.4	47	1.5	2.9	2.9
2	Add 1 additional cm to side walls (add 2 cm total, including Step 1)	227	11.1	94	3.0	1.1	2.3
3	Add 2 cm insulation to back walls (2 cm were added to side walls in Step 2)	216	15.3	137	4.4	1.9	2.1
4	Small "Good" compressor: 52.9 kCal/hr, 0.92 COP* (replacing 58 kCal/hr, 0.89 COP compressor)	201	21.1	237	7.6	1.1	1.7
5	Add run capacitor to small compressor: COP=1.01	183	28.5	362	11.6	1.1	1.5
6	Improve door gasket design (reduce gasket heat loss by 25%)	171	32.9	442	14.2	1.1	1.4

Notes: • Baseline model is a 176-liter, 1-door, manual defrost refrigerator freezer.
• Each of the steps listed in this table is incremental to the previous step.
• The benefit/cost ratio is the ratio of the discounted net present values of the societal benefits to the societal costs.
* COP = Coefficient of Performance

Source: ERM-Siam 1999, p. 2-19

- Step 5: Select products and list them in priority order.

The following graph explains this procedure:

Figure 23: Procedure for Identification of the Labelling Targets and Products

5.1.2 Allocating Labelling Policy Responsibilities

The technical responsibility of a future energy labelling activity would be under the Ministry of Energy while the Ministry of Trade and Industry will have other responsibilities. As for other marking programs, the regulatory responsibility always comes from ministries.

One major responsibility for the ministries involved in labelling policies will be to make equipment test standard mandatory in the Republic of Indonesia Regulation

Implementing a labeling program requires to mandate appropriately an organization responsible to manage all aspects of the program, including close relationship with all stakeholders, mainly the industry representatives. Strong leadership and conviction is a prerequisite with this organization.

5.2 HOUSEHOLD APPLIANCES

The market study should set the consumption of the targeted appliances for households. To our knowledge these studies have not yet been developed by DGEEU/PLN.

For reference, are included in the following figure the results of the market assessment for China in 1995:

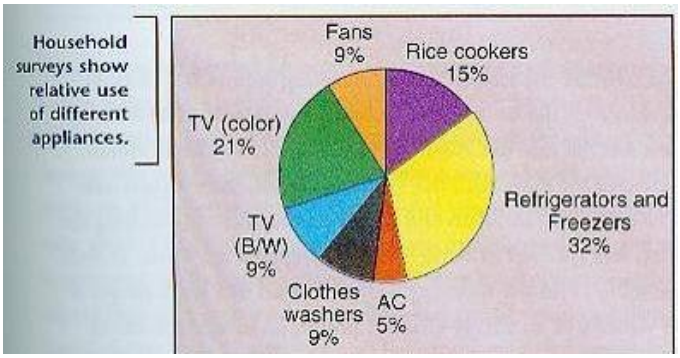


Figure 24: End-Use Electricity Consumption in China Households (1995)

This information is essential to evaluate the potential impact and of the label and/or standard for each targeted appliance and select strategy accordingly.

As most countries, Indonesia can implement labels or standards only for a limited number of products at a time. It is important therefore to choose first those with the greatest impact. Our previous experience show that the top candidates for minimum energy efficiency standards include among others:

- Household refrigerators, freezers and combined refrigerator-freezer units
- Air conditioners
- Clothes washers
- Fluorescent lamp ballasts
- Fluorescent tube lamps
- Boilers
- Storage water heaters

Information dissemination for residential appliances must be integrated with the current awareness activities targeting households. The marketing for efficient appliances should be done along with the

current CFL pilot project. The dissemination will need to raise the issue of quality of CFL in correlation with its life duration, energy saving and initial costs.

It should be appropriate to evaluate how the dissemination activities could take advantage of the ongoing "Edutainment" programs (education & entertainment). These programs are currently on air in four TV stations as listed here:

- One talk-show with humour, focusing on electricity issues (tariff, blackout)
- Reality show & quiz
- Sitcom
- Science & technology talks (more technical and serious)

5.3 IMPLEMENTING A LABELLING PROGRAM

The energy labelling program implementation for Indonesia would be coordinated by DGEEU who is already involved in the process. However, the ongoing energy labelling process is facing administrative problems.

The MEMR designed a label in 2003 for energy purposes. The principle of this labelling process was based on voluntary actions for CFL first, then refrigerators. This process still needs that manufacturers be equipped with testing laboratories to certify that the products actually meet the energy performance as mentioned in the label before they get the BNS (Bureau of National Standard) / SNI (Standard National Indonesia) seal. Consequently this labelling program is on standby due to legal aspects blocking its implementation. Therefore, no labels for EE of household appliances are currently set at the national level.

Restarting the labelling process needs first to raise awareness among manufacturers and get their support for future labelling development. Appliance energy efficiency improvement is a long term process (remember the California example) based on a strategy addressing both offer and demand side in parallel: creating a demand at customer level through awareness programs and regularly negotiating efficiency improvements with industry representatives.

General procedure required to implement labelling programs are:

- Energy label design coordinated with ASEAN's and OECD's experience and projects
- Discussions with manufacturers
- Determine and get approval upon minimum energy efficiency standards to start with and acceptable to manufacturers
- Labelling program approval by GoI
- Labelling activities supervision by DGEEU
- Implementation of energy labelling in the Indonesian market

6 APPROPRIATE LABORATORY TO CONDUCT ENERGY PERFORMANCE TESTS

The government encourages the implementation of energy efficient testing facilities/equipment to assess the performance of households and compare it with the feasibility of the standard system presently prevailing.

Even though, installing a laboratory to test energy efficiency of various equipments may be difficult. The table below shows the minimum requirements when selecting a laboratory for different appliances.

Table 12: General Approach for Testing Energy Performance in Major Appliances

Appliance	Description of Energy Test Procedure
Annual Energy Use	
Domestic Refrigerator	Refrigerator is placed in environmental chamber with doors closed. Ambient temperature is slightly higher than room temperature to account for door openings and food loading (IEC and U.S.). In Japan, doors are opened at specified intervals.
Domestic Water Heater	Storage losses are measured under specified conditions. The energy required to service specified hot water draw cycle is sometimes added to this (U.S.).
Efficiency or Efficacy	
Room Air Conditioner	Air conditioner is placed in calorimeter chamber. Heat removal rate is measured under steady-state conditions and at only one level of humidity.
Central Air Conditioner	Heat removal rate is measured using a combined air enthalpy approach at one or more load conditions.
Heat Pump	Heat removal rate is measured using a combined air enthalpy approach at one or more load conditions.
Motor	Motor is placed on a dynamometer test stand and operated at full load and normal temperatures (U.S.). Alternatively, input power and losses are measured, and the difference is assumed to be the output (Japan and IEC).
Furnace/Boiler	Furnace or boiler is operated under steady-state conditions. Heat output is determined indirectly by measuring temperature and concentrations of combustion products. Fan and pump energy is sometimes added to input energy.
Light	Light output is measured in an integrating sphere. Light input is measured differently for each component, depending on type of light, ballast, and other features. Combination yields an efficacy.
Energy Use per Cycle	
Dishwasher	Energy consumption is measured for a standard cleaning cycle. Cleaning performance may also be included (IEC).
Clothes Washer	Energy consumption is measured for a standard cleaning cycle. Cleaning performance may also be included (IEC).

A visit was paid to the PLN Laboratory for CFL labelling. The PLN laboratory is part of the research & development division of the company. The CFL labelling lab realizes tests that follow the standards set by BSN. These "type tests" relates to the safety criteria regarding CFL ballast, batteries, cables (1 kV), switches and fans. Energy performance is not part of these tests.

Based on our discussions with PLN Lab. Personnel, our opinion is that the existing laboratory has the capacity to be adapted for CFL energy labelling.

The measuring instruments installed and ready to be used for CFL are those shown below in the pictures: Illumination Level Measuring Instruments and Power Factor and Harmonics Measuring Instruments.

Figure 25: Illumination Level Measuring Instruments

Figure 26: Power Factor and Harmonics Measuring Instruments

The laboratory has new measuring equipment including life cycle testing equipment as shown in the following picture.

Figure 27: Life Cycle Testing Platform

Major complementary equipment refrigerators and fans labelling are:

- Data loggers for measurement of the temperature, setting the performance of the refrigeration equipment thus their life cycle.
- Thermal measuring probe for accurate instrumentation of refrigerators.
- Load meter and consumption meters.
- Certified room for standard measurements.
- Software for data collection, downloads and result analysis.

6.1 PROMOTING LABELLING FOR HOUSEHOLD APPLIANCES

Few labelling and marking activities are currently done in Indonesia. They consist of SNI marking on manufactured products. These mandatory standards have been set by the BNS along with the Ministry of Trade and Industry.

They concern safety aspects (and occasionally performance criteria for the following products:

- CFL ballast
- Batteries
- Cables (1 kV)
- Switches
- Home appliances: fan and others to come

For the energy labelling of household appliances, the BSN would have the responsibility to:

- Produce standards for minimum energy performance
- Elaborate the national certification program
- Certify other laboratories (such as PLN's laboratory)
- Prepare the infrastructure for the standard

The Association of South East Asian Nations (ASEAN) is considering the elaboration of a multinational program on safety labelling. In this context, a joint SEA label would be implemented at the end of 2010.

The label envisaged for Indonesia has already been designed. The number of stars (1 to 4) determines the energy efficiency level of the appliance: one for a "one star" appliance, which is less energy efficient, while the "4 stars" equipment is the most efficient:

Figure 28: Label Envisaged for Indonesia

6.2 DISSEMINATION AND INFORMATION ACTIVITIES

Usually, a communication strategy is built up on 7 steps that have to be developed according to the main goals and objectives set in Step 1 as shown below in fig. 31.

The Step 2 consists in program needs assessment and conducting research. The objectives are to identify the targeted customers, how to efficiently reach them, what original messages and\or success story to, what did not worked, etc.

The target audience is selected at step 3 and should be assessed in number, qualification (gender, age, etc.).

The Step 4 identifies and recruits the strategic partners either for the message or to reinforce it by explaining their past experience or to be selected as pilot and /or demonstration slides of end users.

The communication plan and the message should be developed in Steps 5 and 6 with testing procedure either in small group or selected community.

Step 7 would be specific for evaluation and feed-back sent to readjust the previous activities)

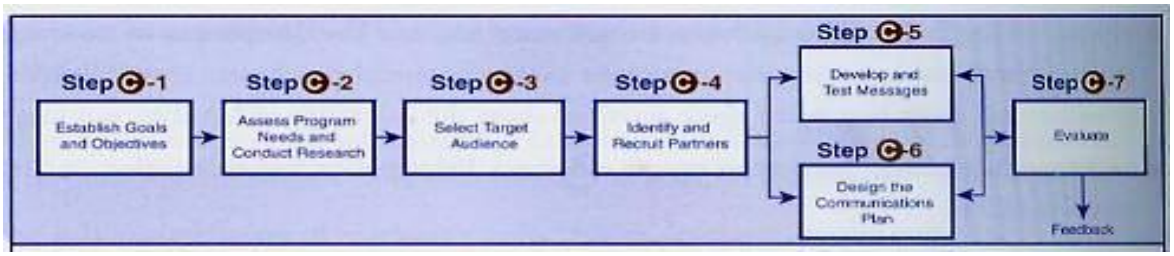


Figure 29: Major Steps in Creating Communication Campaign

The step of result assessment will require a good knowledge of the customers and their cultural habits and values. The following table shows the situation for US communication assessment for two categories of products:

- Heating and cooling products
- Appliances, electronic products.

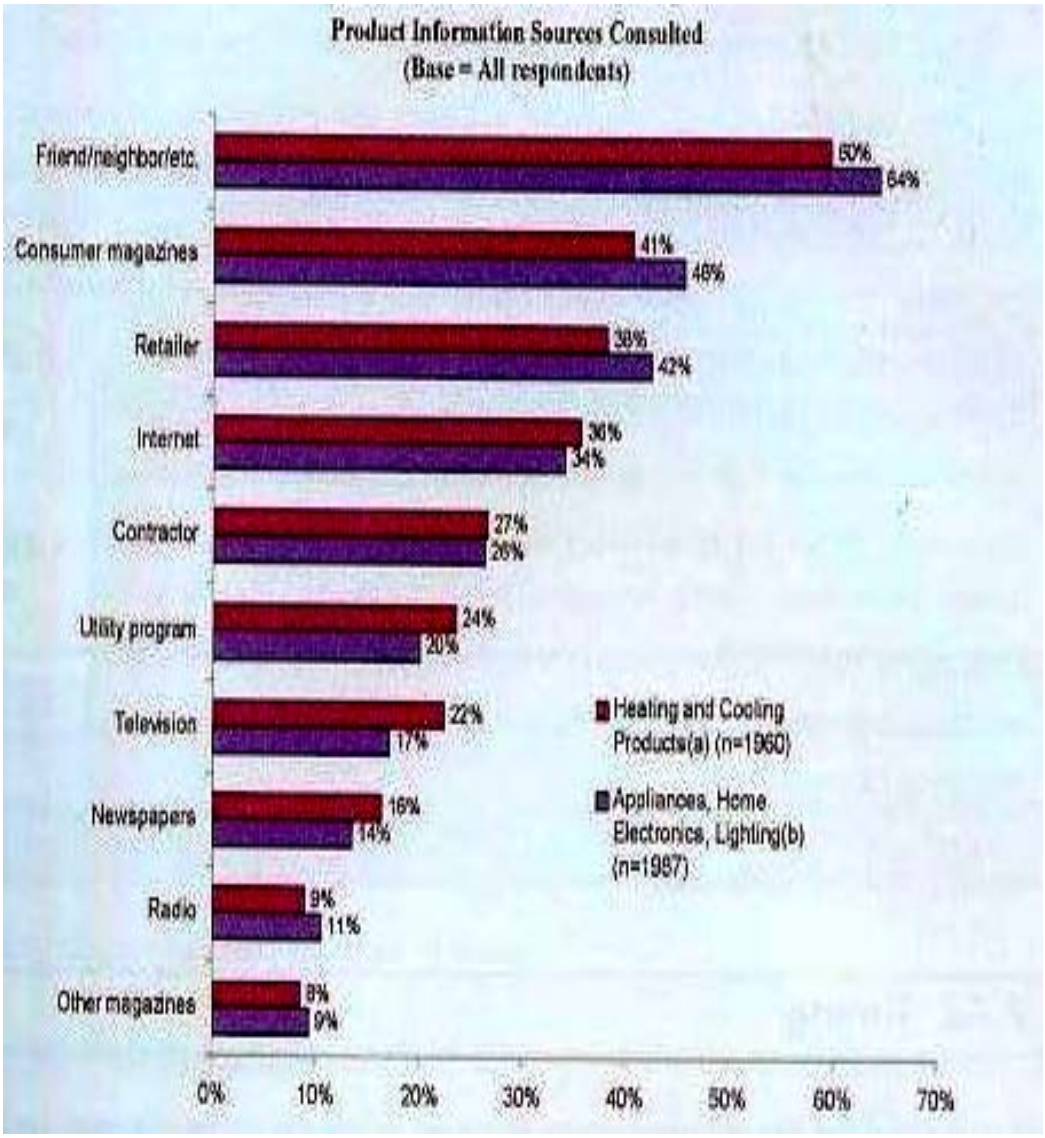


Figure 30: Information Sources that Consumers Consult

Evaluating a program is not a problem unless the evaluation process and tools related to it are not properly included in the program design stage, i.e. at the very beginning of the program.

As shown in Table 13, the evaluation focus can be:

- Formative: It targets to assess the strength and weakness of campaign material and strategies.
- Process: It measures efforts and direct outputs of campaigns and/or the campaign's implementation.
- Outcome: It measures effects and changes and assess outcomes in the target population or communities.
- Impact: It measures community-level change or longer-term results achieved.

Usually, the evaluation procedure includes one or a maximum of two focuses and set the indicators at program design stage

Table 13: Four Types of Evaluation Activities for Standards and Labels Communication Campaigns

Evaluation Focus	Purpose	Example Questions
Formative	• Assesses the strengths and weaknesses of campaign materials and strategies before or during the campaign's implementation	• How does the campaign's target audience perceive the issue? • What messages work with what audiences? • Who are the best messengers?
Process	• Measures effort and the direct outputs of campaigns – what and how much were accomplished • Examines the campaign's implementation and how the activities involved are working	• How many materials have been distributed? • How many and what types of people have been reached?
Outcome	• Measures effects and changes that result from the campaign • Assesses outcomes in the target populations or communities that come about as a result of program strategies and activities • Measures policy changes	• Has there been any affective change (beliefs, attitudes, social norms)? • Has there been any behavioral change? • Have any policies changed?
Impact	• Measures community-level change or longer-term results achieved as a result of the campaign's aggregate effects on individuals' behavior, and the behavior's sustainability • Attempts to determine whether the campaign caused the effects	• Has the behavior resulted in its intended outcomes (e.g. higher sales of efficient appliances)? • Has there been any system-level change?

Source: CCMC 2004

6.3 MONITORING OF LABELLING

The monitoring of labelling consists in the inspections at retailers and distributors premises that labels are placed on appropriate equipment and are easily accessible for customers. Inspections will include:

- Evaluation of the labelled stock on sale.
- Evaluation of the labelling process.
- Evaluation of the Label actual visibility and accessibility.
- Assessment of the consumers' receptivity regarding labelling.
- Influence of the label on the decision process of consumers.
- Information program implemented in the retailer shop on labelling.

The monitoring of labelling must be coordinated by DGEEU along with the support of an experimented consultant to perform such activity.

To evaluate the labelling program cost-effectiveness, impact of its contribution on load reduction and energy savings must be calculated in the period 2006-2010 and then in 2010-2025.

7 DSM PROGRAM FINANCING

DSM is a cost-effective activity with positive economic savings at Government, public utility and customer's levels. There are few situations where governments can get involved in such a win-win program. Henceforth the government should seriously consider to get involved in financing program up to a point where economic benefits for all stakeholders meet the program cost. Financing is necessary to insure its development.

7.1 PUBLIC FINANCING SCHEMES EXAMPLES

The following example compares the costs of DSM programs and an addition of a thermal power plant in Thailand. DSM cost represents 26% of the alternative power production cost: The cost per kWh is 1.3¢ for DSM and 5¢ for a new power plant.

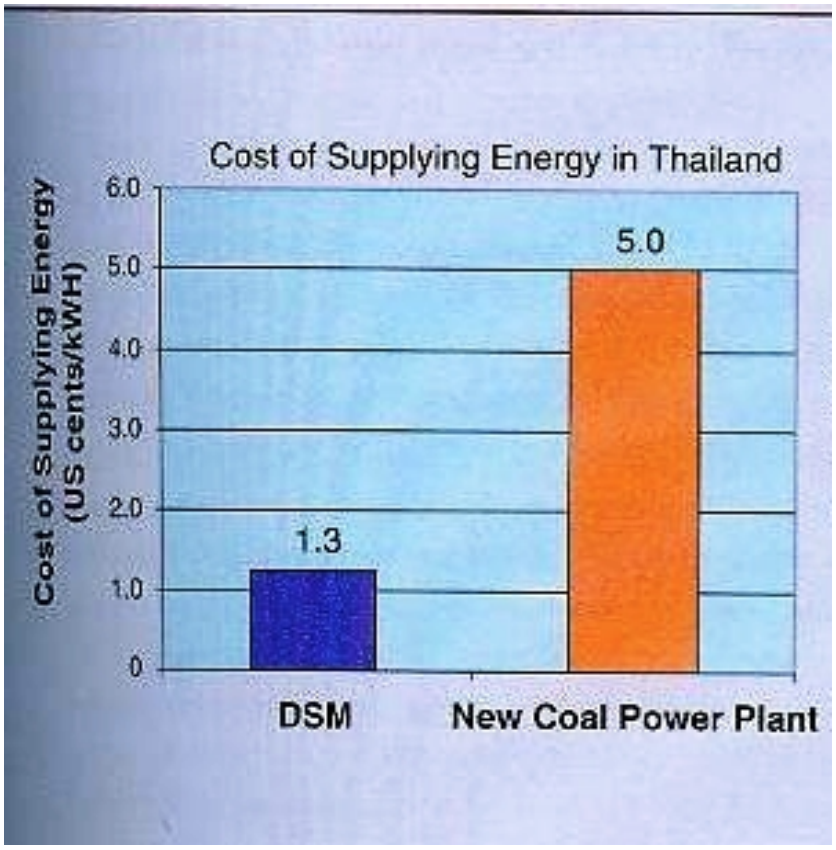


Figure 31: Comparison of DSM and Electricity Supply Costs in Thailand

The example should not be interpreted as if DSM activities will completely replace investments in generation, transmission and distribution of electricity in Indonesia as the need is still big. However,

DSM programs will certainly reduce the requirements for supply side investments. Thus DSM complements the traditional investments by adjusting the demand of electricity.

Financing DSM initiatives needs a more detailed analysis in what relates to the level of funding EE measures and the mechanism to raise funds and manage them. To illustrate what the raising funds mechanism scheme could be, we comment on the existing street lighting bill payment procedure which is as follows:

i) A tax (1% to 10%) is charged by PLN to households in their electricity bill to cover street lighting costs.
ii) PLN collects the electricity bill from households.
iii) PLN pays to municipal government the collected money.
iv) The municipal government pays to the Public Lighting Utility the collected amounts.

Increasing the tax percentage in the customer's bill would provide funds to be spent in street lighting improvement initiatives. Savings should be shared with customers through a tax decrease according to decreased electricity demand by street lighting system.

Hotels and industries are interested in EE projects. Financing their projects through banking system suppose a credible guaranty by collaterals. GoI could provide collateral guarantee to companies willing to invest in EE projects.

7.2 GENERAL PUBLIC FINANCING APPROACH

The governmental approach must take into consideration various financial instruments for incentives regarding energy efficiency and DSM fields. It has the objective to support the use of energy efficient products and to facilitate investments in energy conservation projects as well as to cover the following suggested programs fiscal incentives and to subsidy assignment.

- **Fiscal incentives** have the objective to provide facilitation for people who need investments in energy conservation activities, therefore realization of such activities become more financially attractive.
- **Subsidy Assignments** are efforts to encourage the use of energy efficient equipment/goods by providing incentives in the form of money or price deduction for the purchase of certain energy efficient equipment. As an example in the DSM program (DSM Terang) assessed in this report, for each purchase of an energy efficient light bulb, consumers obtain a quite attractive rebate.

The experts detailed in December 2005 these financing approaches in a complementary Report: "*INTERNATIONAL REVIEW OF ENERGY EFFICIENCY POLICIES AND POTENTIAL STRATEGY FOR INDONESIA*".

- GoI as well is well aware of the various existing financing programs promoted by international institutions and may be willing to increase its participation in such programs to generate additional funding for DSM programs in Indonesia.

7.3 PLN'S APPROACH

PLN's current approach is to consider DSM as an immediate target without long-term vision. Its strategy is based on two major activities that require no or limited financing. Those activities are tariff restructuring and supporting DSM programs with limited financing requirements such as CFL program or street lighting program. However, DSM requires a long-term strategy and a detailed knowledge and permanent follow up of the market to initiate timely appropriate programs. With the existing limited resources, PLN cannot build up a comprehensive and permanent DSM program unless the government and/or other stakeholders can support it.

8 NEXT STEPS

8.1 GOVERNMENT OF INDONESIA'S SHORT AND MEDIUM TERM DSM ACTION PLAN

The action plan will need to be in line with the Energy Conservation Policy. GoI has completely formulated the "Blue Print on National Energy Management 2005-2025". It emphasizes on the use of energy in an efficient, equitable and sustainable way and widening public accessibility to energy with reasonable price. On the other hand, energy diversification is pursued by exploring new renewable energy sources and alternative energy to reduce dependency on fossil fuel. Presidential Instruction No 10 concerning Energy Efficiency, issued on 10th July 2005 and the "Blue Print" constitute the main guidelines for managing energy at the national level.

The recommended DSM medium-term strategies to be developed in the future in Indonesia are:

- Conducting energy audit in energy intensive industries as mandated in Presidential Instruction.
- Reviewing and update policy and regulation on energy efficiency and energy conservation (EE&EC).
- EE&EC programs being an integral part of energy law should include a regulation for obligatory audits and labelling.
- Developing the energy efficiency reporting system (on-line system) for buildings and industries and exploring the potential to convert the results into a comprehensive benchmarking system.
- Creating a revolving fund to support future DSM programs.

The programs that will be launched in Indonesia are in accordance with the Indonesian strategy for awareness, auditing and labelling.

The next phase of the DSM action plan is being developed around the following activities:

- Development of a guidebook for energy conservation (awareness).
- Assessment for energy efficiency market analysis with mainly three outputs:
  - Setup of baseline data for the electricity consumption pattern per sector.
  - Setup of targets (benchmarks) for specific economic sectors.
  - Identification of the potential for new EE technologies in Indonesia.
- Preparation of the funding request for the identified sources of funding.
- This activity of market assessment intends to develop information similar to the one detailed for Thailand as shown in the following table:

Table 14: Thailand Market Assessment and DSM Targets

DSM PROGRAM	TOTAL NO. OF CONS.	PROGRAM TARGET	TARGETED REACTIVE COMPENSATION	DEMAND REDUCTION	EST. ANNUAL ENERGY SAVING	TOTAL PROJECT COST	EST. ANNUAL COST SAVING	ANNUAL FLY ASH REDUCTION	ANNUAL ENVIRONMENTAL BENEFITS THOUSAND		
			MVAR	MW	MILLION KWh	MILLION RUPEES	MILLION RUPEES	THOUSAND TONS	TONS CO_2	SO_2	NO_x
WATER PUMPING SYSTEM IMPROVEMENTS FOR HIGH RISE BLDGS.	4000	1000 PUMPING SYSTEMS	3	2.0	10	40	32	1.76	15.0	0.3	0.1
CAPACITORS FOR LTMD INDUSTRIAL CONSUMERS	6000	5000 CONS.	50	5.5	23	25	80	4.03	30.5	0.6	0.3
CAPACITORS FOR LTP INDUSTRIAL CONSUMERS	30000	15000 CONS.	30	2.5	14	15	53	2.45	25.0	0.4	0.2
LIGHTING IMPROVEMENTS (RESIDENTIAL & COMMERCIAL)	800000	800000 LAMPS	90	13.6	42	320	80	7.35	63.0	1.1	0.5
AMC WATER PUMPING SYSTEM IMPROVEMENTS	800	200	5	0.8	4.5	4	9	0.79	6.7	0.1	0.1
TOTAL	840000		178	24.4	98.5	404	254	16.36	142.2	2.4	1.2

8.2 OTHER SUGGESTED DSM ACTIVITIES

Benchmarking

To set targets for industries, it is proposed to develop a benchmarking system for the industrial and building sectors. The benchmarking allows comparing the unit consumption for companies of a same sector. As presented in the September 14, 2005 seminar, DGEEU has developed a benchmarking system for 65 buildings of the following sectors:

- Hotels
- Offices
- Shopping malls
- Hospitals

From these analyses, unit consumption was done per m², allowing other buildings to compare themselves with these figures. The benchmarking data synthesizing the work done in Indonesia is summarized here:

- Hotel: 198.2 kWh/y.m2
- Office: 203.4 kWh/y.m2
- Shopping Mall: 228.9 kWh/y.m2
- Hospital: 249.9 kWh/y.m2

The average for all sectors is: 216.2 kWh/y.m2

Creation of an energy efficiency fund

The idea of a revolving fund creation has long been envisaged in Indonesia. So far, no implementation has been done. The decision to grant the initial funding and the mechanism to make it revolving will have to be agreed upon by GoI as a strategic processing.

Creation of ESCOs to target the industrial and building sectors

The experience of other ASEAN countries has revealed that ESCOs have significantly contributed to the development of EE and DSM programs. For Indonesia, the launch of ESCOs would be required in a second step, once the awareness and information on EE have been widely disseminated. This initial stage of information must be widely spread in order to generate the growth of the EE market.

Cogeneration as an interesting DSM channel (with the involvement of PLN, PNM and in coordination with natural gas distributors)

The cogeneration is the combined production of electricity and steam (or hot water). The walkthrough audits and detailed audits done as part of this project have identified interest from companies for cogeneration. For Chitatex, the analysis was done for a 4MWe coal fired cogeneration plant that would allow the company to get substantial annual savings on its electricity bill.

In the past, cogeneration has been widely developed in Indonesia. Cogeneration could be revived through DSM program and so contribute effectively to peak demand reduction through load shaving.

DSM program for the governmental buildings

The Presidential Instruction #10 of July 2005 identifies EE and DSM as an important target for Indonesia. In order to give the example to other economic sectors, the government should implement first what it recommends to others. In consequence, the DSM program for energy auditing and EE implementation in buildings should first be launched in governmental buildings. Such a program would allow significant energy and financial savings for all administrations, and send a positive message to other sectors for EE promotion.

Load shifting for A/C including a revision of the K factor

As presented during the EE seminar of September 14, 2005, the air conditioning starts up during the peak period: from 5 p.m. to 10 p.m. A/C load shifting consists in displacing the cooling load from peak period to off peak period. Ice storage systems may be the solution as they will operate during off peak period in order to restore their frigories during peak time. The use of a significant K factor in the PLN's tariff (percentage increase of tariffs during peak hours) is required to promote the implementation of such load shifting EE technology. Other potential solutions will be developed in case GoI and PLN choose this option of A/C peak shifting such as remote control of major centralized A/C systems with special interruptible tariff.

APPENDIXES

APPENDIX A - WORKSHOP

International experience on energy savings for the industrial and commercial sectors – Presentations.

PT PLN
(PERSERO)

Direktorat Energi
Baru Terbarukan
dan Konservasi
Energi

THE WORLD BANK

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International Experience of energy savings in the industrial and building sectors

Presented by :

Hakim ZAHAR & Dominique GIRAUD

Econoler International Inc.

Jakarta, September, 2005

Objectives:

- Review of DSM principals:
  - Awareness creation
  - Financing DSM programs
- Assessment of DSM success stories for industry and building sectors
- Canada and other countries experiences on DSM and Energy Efficiency in building and industry sector

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Objectives:

- **Energy audit and Labelling - assessment on Indonesia and other countries experiences:**
  - **Case studies for Steel, textile and building sectors**
  - **Industrial and buildings energy audit program**
- **Setting targets for Indonesia**

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Review of DSM principals: why do we do DSM programs ?

- **Strategic reasons :** reduce new demand and/or increase self sufficiency and/or Increase clients' satisfaction and loyalty
- **Economic reasons :** negawatts cost less than megawatts - competitive edge for industry
- **Environmental reasons** : reduce harmful emissions
- **Social reasons :** job creation - population mutation
- **Regulatory reasons :** comply with laws, regulations and standards
- **International** : comply with international financial institution's requirements

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Energy savings contribute to sustainable development!

Review of DSM principals

The instruments of the Indonesian DSM and energy conservation programs:

- Current regulation
- Educational programs
- Strategic tariffs for DSM
- Labelling (Saving by design)
- New buildings (Saving by design)?
- DSM programs:
  - CFL
  - Public lighting
  - Partnership audit program

Is it sufficient?

What can be successfully initiated?

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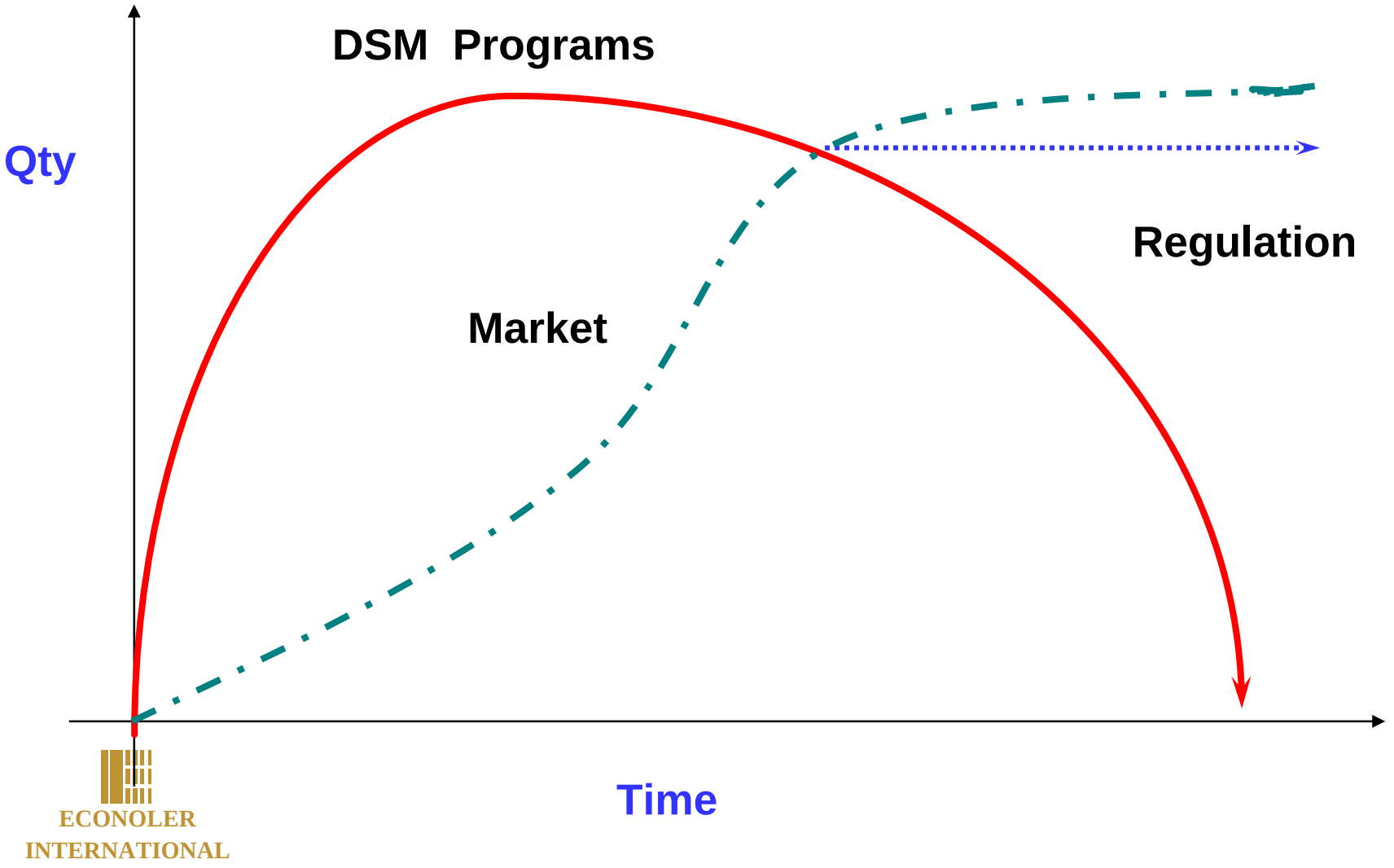
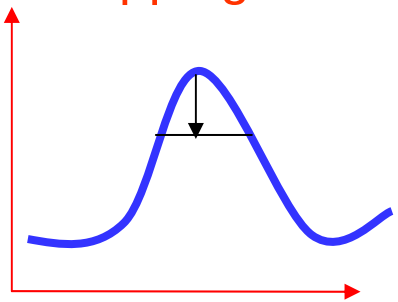
Enticement to coercive regulation

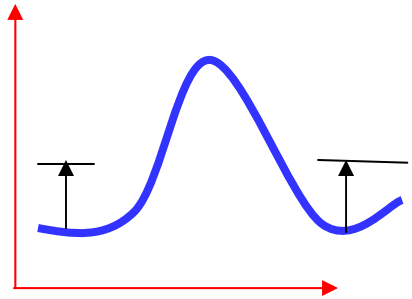


Types of energy impacts

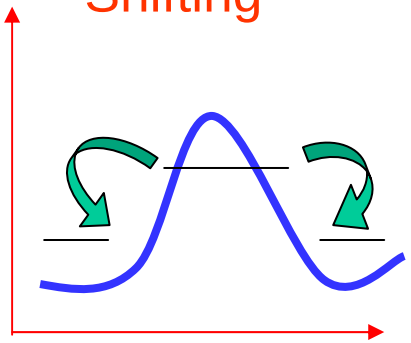
Peak Clipping

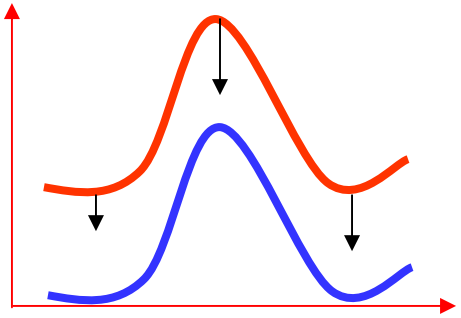


Valley Filling



Load Shifting





Strategic energy conservation

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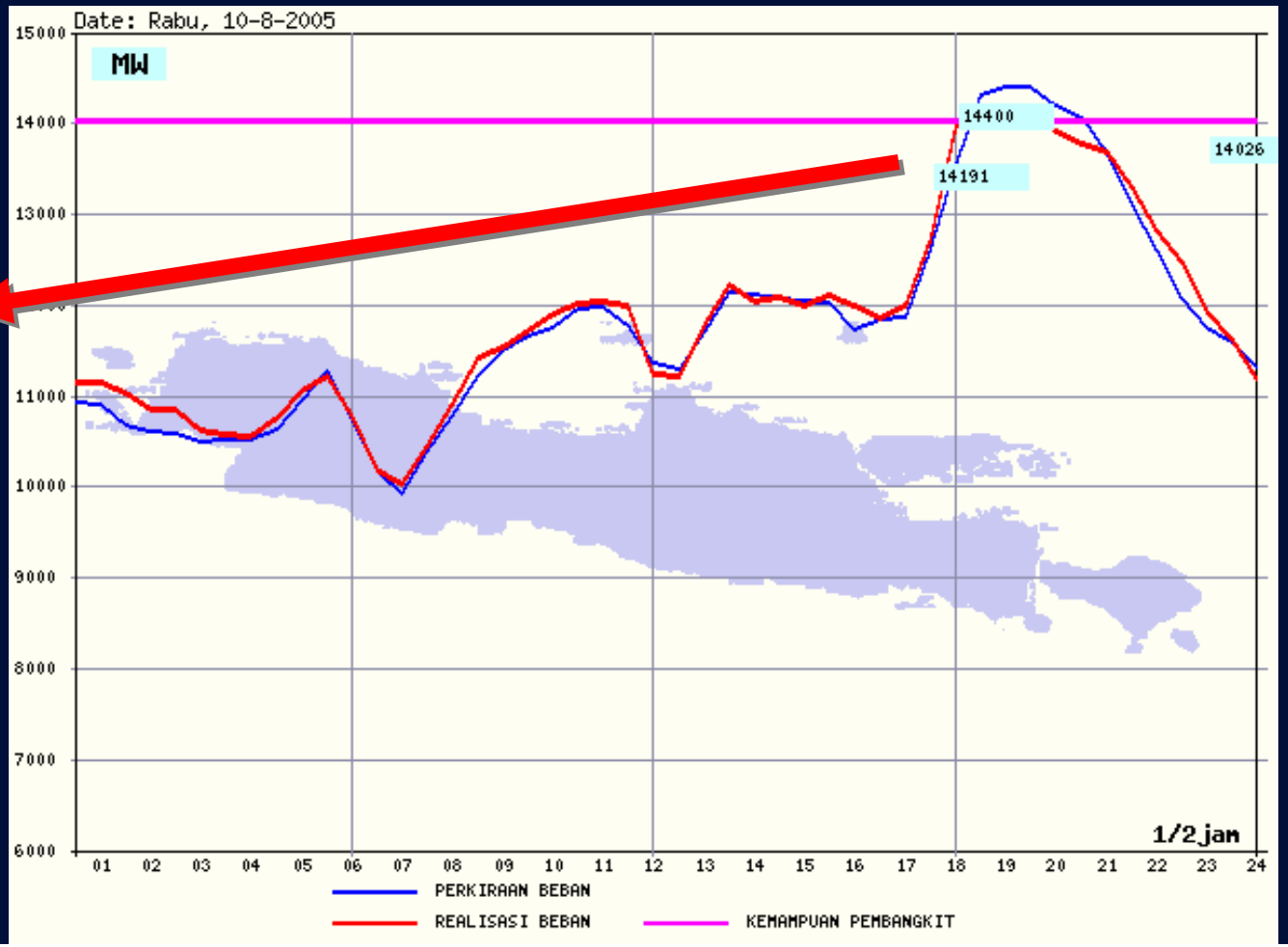
WHY DO WE DO IT IN INDONESIA?

- **STRATEGIC REASONS : No margin is available during peak period**

Availability is problematic for all economical sectors!



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WHY DO WE DO IT IN INDONESIA?

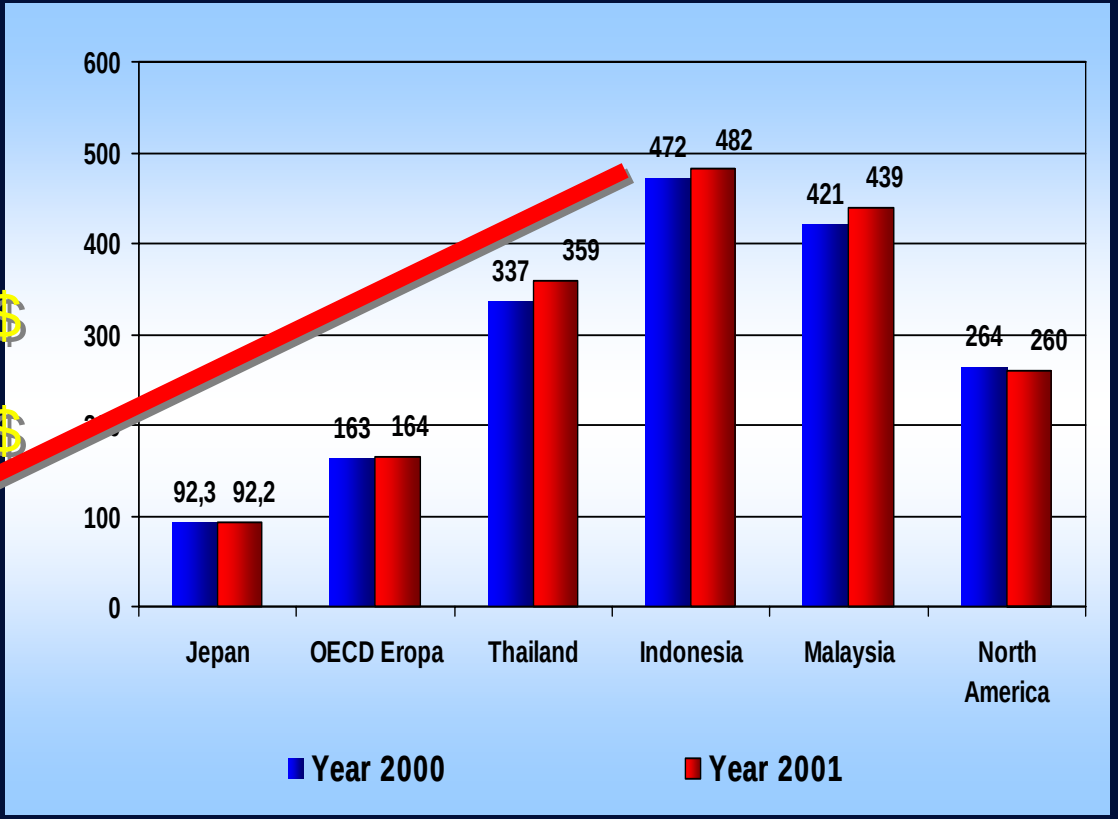
- **STRATEGIC REASONS :** Energy intensity (Toe/1000 US$) is among the highest

Industry:

2001: 176 Toe/1000 US$

2003: 188 Toe/1000 US$

35 – 45% of the total



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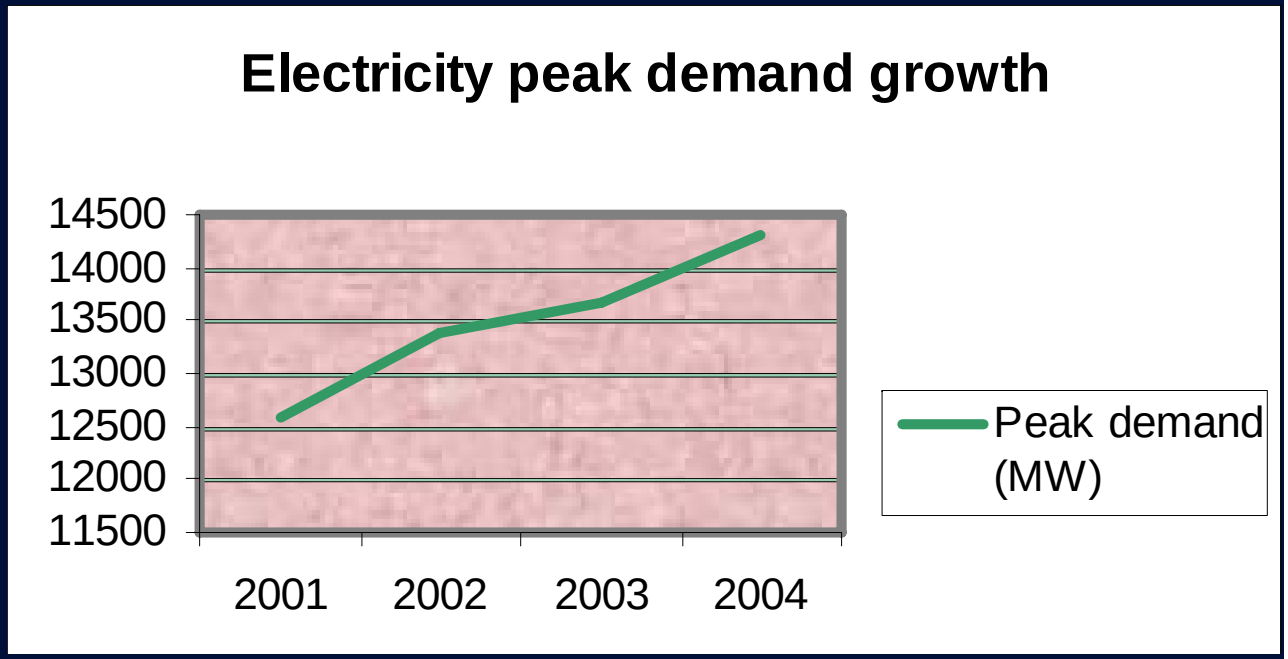
WHY DO WE DO IT IN INDONESIA?

- **STRATEGIC REASONS : Electricity peak demand is growing despite the weak availability**

Investment requirements in power in Indonesia are more than

6 Billions of US$



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Assessment of on going DSM program

DSM Peduli and Terang:

- **What are the learned lessons?**
- **How to replicate the CFL success story to other applications:**
  - ✓**Fluorescent lighting**
  - ✓**Refrigerators**
  - ✓**Air conditioner**

DSM PJU (public lighting):

- **Financed by Municipalities**
- **PLN/ DGEEU support: metering**

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Assessment of on going DSM program

- Partnership for auditing with large consumers of the industrial and commercial sectors:
  - Voluntary program started in 2003
  - Financed by PLN (building sector) and DGEEU (Industrial sector)
  - Audits free of charge for end-users
  - 13 Audits achieved
  - No project implemented

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Canada's DSM programs as a typical country example

- Why, when and how Hydro-Quebec, 4th largest utility in the world, is doing DSM for more than 20 years?
- The impact on the industrial and building sectors.

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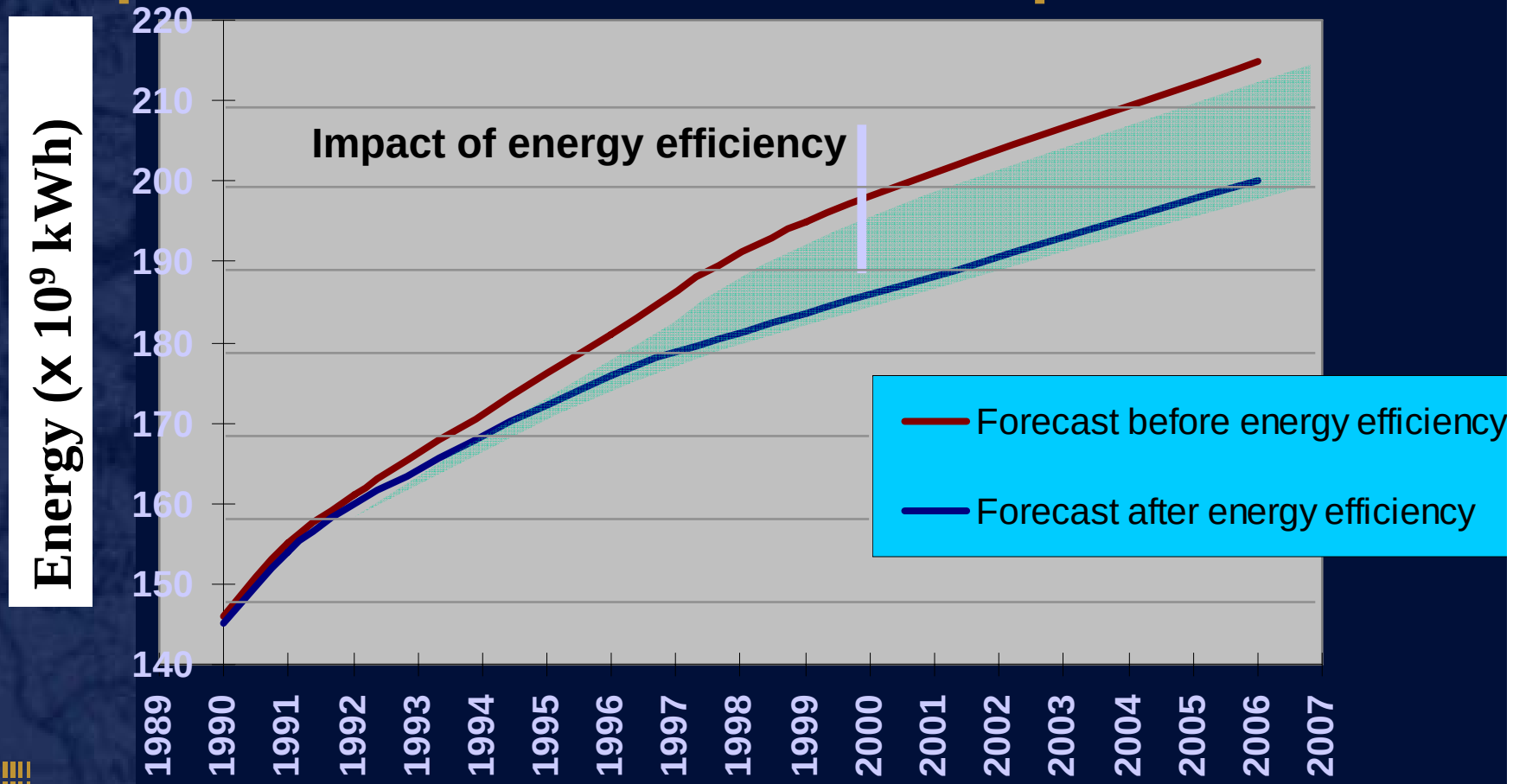
Why Energy Efficiency Programs ?

- **Reduce the rate of increase of the power demand and consumption**



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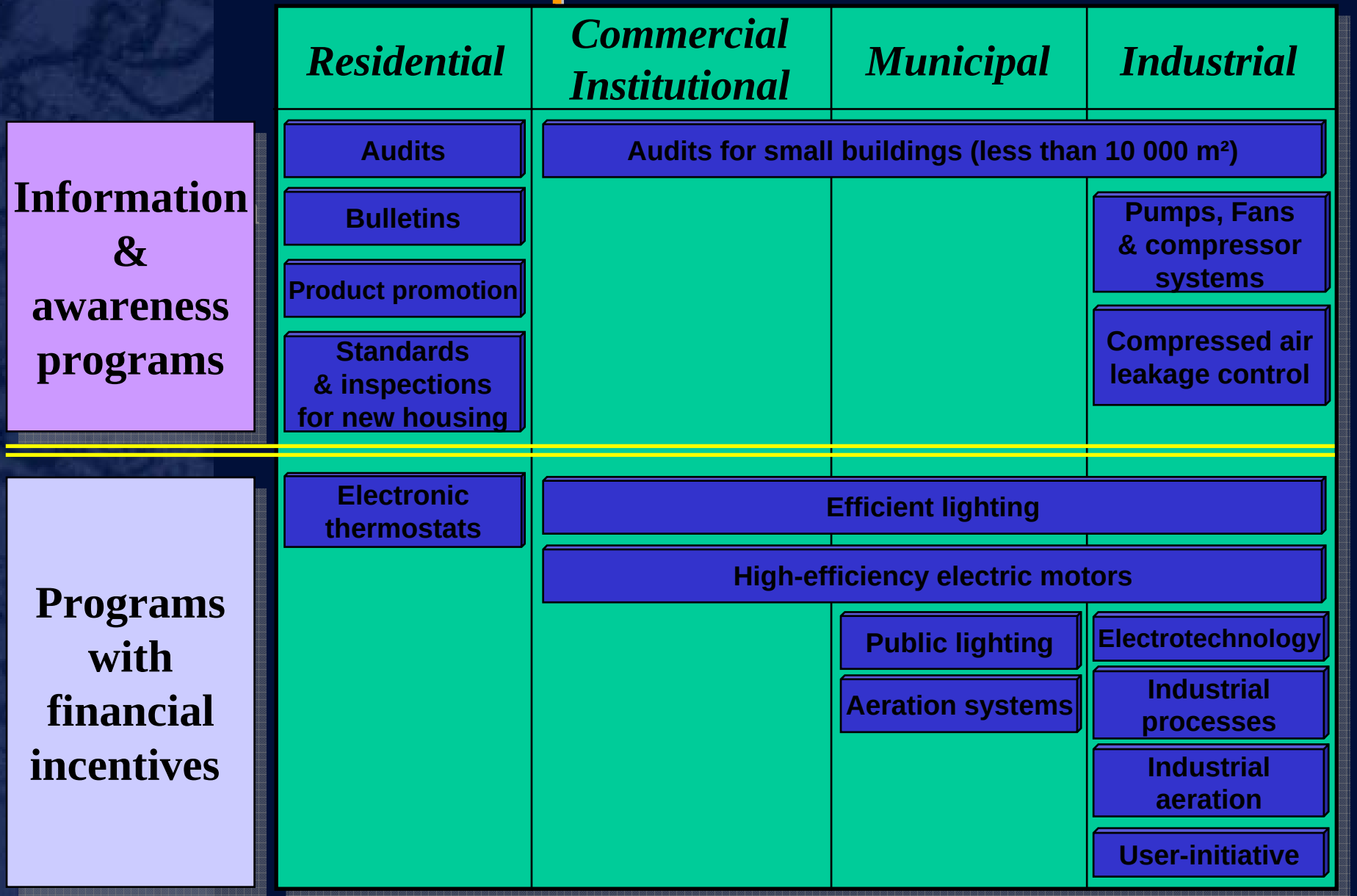
Source: Hydro Québec

Examples of Programs summary developed in Canada



Residential

- Information and awareness
  - Free computerized energy audit
  - Information bulletins
  - Promotion in new construction
  - Promotion products
- Financial incentives
  - Rebates on energy saving accessories

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Commercial and Institutional

- Information and awareness
  - Building energy analysis program
    - 15 000 energy audits in 6 years
    - $ 26 M (US) total program cost
    - $ 1 730 (US) average cost per audit
    - 12.0 % potential energy savings identified
    - 6.0 % actual savings obtained by client

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Commercial and Institutional

- Financial incentives
  - Energy efficient lighting program
    - 16 063 requests for financial assistance received
    - 143 x 10^6 kWh annual impact
    - 20 M$ (US) cumulative expenses (management, market studies, financial assistance, ...)
    - 14¢ (US) invested per annual kWh saved
      or
    - 1.4 ¢ (US)/kWh saved, based on a 10 year life for the selected technologies
- High-efficiency electric motor rebate program (same as industrial)

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Municipal

- Information and awareness
  - Building energy analysis program
- Financial incentives
  - Public lighting conversion program
    - 225 000 light fixtures committed
  - Energy efficiency improvement program for aeration systems
  - Energy Efficient lighting program (Same as commercial)
  - High efficiency electric motors rebate program (same as industrial)

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Industrial

- Information and awareness
  - Energy optimization program
  - Compressed air leakage control
    - 320 requests for study and measurements
    - 62 x 10^6 kWh annual impact
    - 3.2 M$ (US) cumulative expenses
    - 5.2 ¢ (US) invested per annual kWh saved
  - Pump, fan and compressor systems:
  - Building energy analysis program (limited to small industries - less than 1 MW power demand)

    (same as commercial)

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Industrial (cont'd.)

- Financial incentives
  - Electrotechnology implementation assistance program:
    - Microwave radiation heating,
    - Induction heating, Infrared heating, Resistive heating,
    - Mechanical steam recompression and Electrochemistry
    - 178 funding projects
  - Energy efficiency improvement program for industrial processes

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Industrial (cont'd.)

- **Financial incentives**
  - **Energy efficient lighting program (same as commercial program)**
  - **High-efficiency electric motor rebate program**
    - **32 601 subsidized motors for clients**
    - **85 x 10^6 kWh annual impact**
    - **9.6 M$ (US) cumulative expenses**
    - **11.3 ¢ (US) invested per annual kWh saved**
  - **Energy efficiency user-initiative program**

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India DSM experiences

- Electricity Act: 2001
- Creation of Bureau Energy Efficiency
- Electricity Reform Process:
  - underway for 21 states
  - Restructuring power sector
  - including SSM and DSM

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India DSM experiences

- DSM programs:
  - Awareness (implemented)
  - Street lighting
  - Capacitor banks
  - CFL, solar water heaters
  - Agriculture pumps
  - Captive power
- Based on more than 100 pilot projects realized

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IMPROVING OUR KNOWLEDGE OF THE INDONESIAN MARKET

- Existing 13 audits
- 3 new Audits:
  - Walk-through audits:
    - PLN building n°1
    - Chitatex (textile industry)
  - Detailed audit:
    - Abadi Barindo Autotech (steel & automobile industry)

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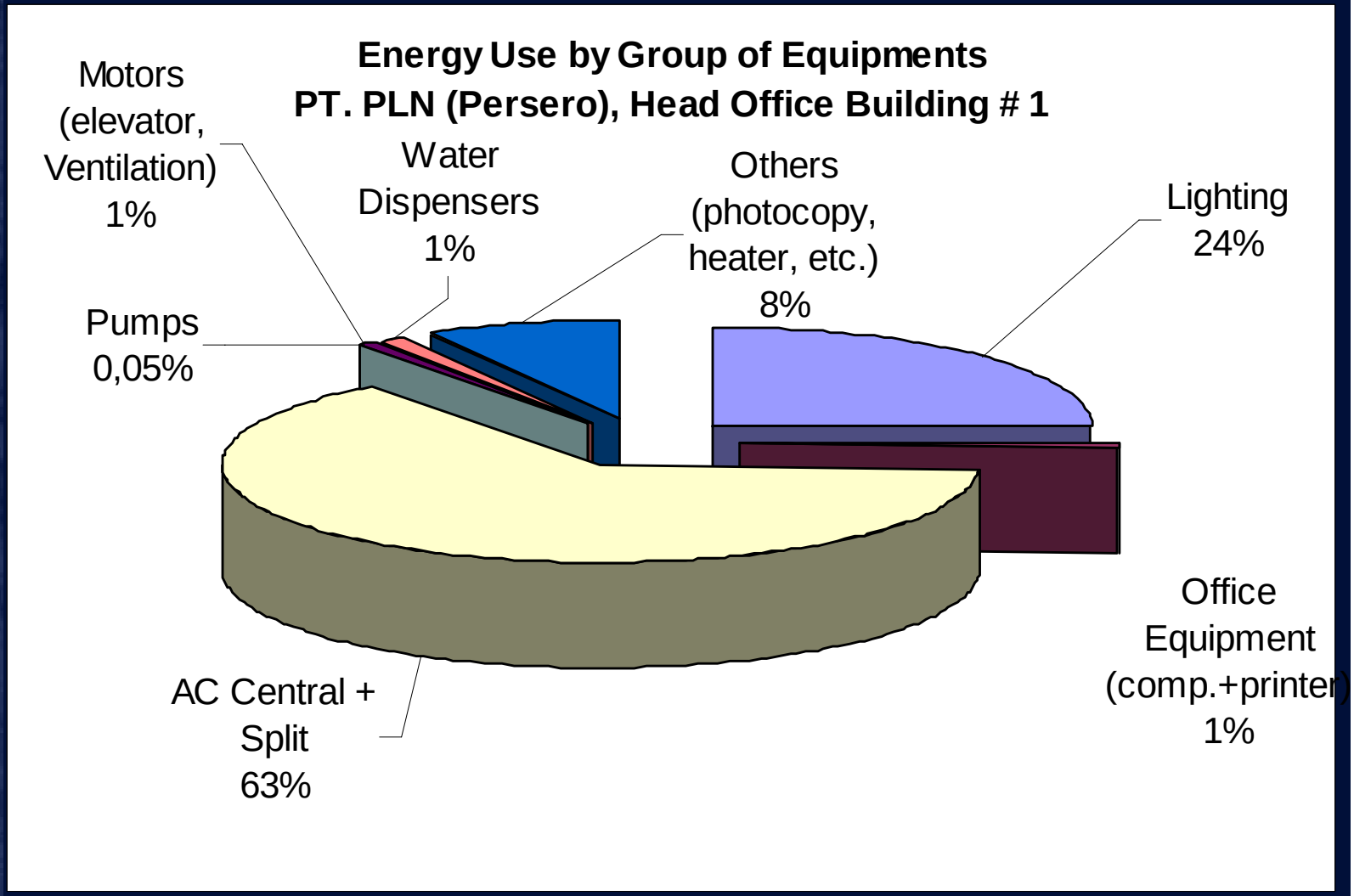
DSM program –Building energy audit
Example: PLN building n°1



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DSM program – industry energy audit Chitatex

	TYPE OF MEASURES	Tot. Financial Saving (Mill.Rp/Year)	Total Cost (Mill.Rp)	Simple Payback (Months)
EEM1	Natural Lighting	18,58	9,90	6
EEM2	Lighting Zoning Switches	18,58	41,40	27
EEM3	Compressed Air Leakage Reduction	164,37	8,00	1
EEM4	Replacement of T8+Magnetic Ballast by T5+Electronic Ballast	37,15	80,83	26
EEM5	Variable Speed Drives for Motors	102,32	106,50	12
EEM6	Steam leakage reduction programme	319,60	9,00	0,3
EEM7	Thermal insulation for Boiler	95,88	81,00	10

PBP= 5 months

Savings : Coal= 13%

Electricity= 4%

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DSM program – industry energy audit Abadi Autotech

	TYPE OF MEASURES	Tot. Financial Saving (Mill.Rp/Year)	Total Cost (Mill.Rp)	Simple Payback (Months)
EEM1	Ventilation optimization with use of natural fluxes	20,55	1,00	1
EEM2	Reduction campaign of Compressed Air Leaks	45,44	9,00	2
EEM3	Fluorescent lighting: installation of T5+Electronic Ballast	85,43	188,50	26
EEM4	Installation of Variable Frequency Drives on process Motors	55,61	213,00	46
EEM5	Reduction programme of steam leaks	38,75	13,00	4
EEM6	LPG boiler & pipes thermal insulation	11,07	41,00	44

PBP= 22 months

Savings : LPG = 9%

Electricity= 10%

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Industrial and buildings energy audit

Innovative components:

- **Benchmarking : kWh / ton, kWh / meter textile….**
- **Reconstitution of the energy balance per end use**
- **What EE measures to prioritize in DSM perspective?**
- **Energy efficiency for utilities of industrial plants**

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Industrial and buildings energy audit program

The current issues:

- **Voluntary efforts v/s obligatory audits**
- **Free of charge v/s partial support from the program**
- **Private participation v/s governmental : accreditation of auditors**
- **How to convert audits into actual EE projects?**

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Recommended efficient technologies for industries and buildings sectors

Repetitive components and best practices!

- HE motors
- Efficient pumps
- Efficient ventilation
- Efficient A/C
- Efficient compressed air
- Lighting

Energy recovering systems

- From cooling systems
- Chimney
- Wastes

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Recommended efficient technologies for industries and buildings sectors

Load peak management:

- Peak shaving:
  - alternative energy for heating process
  - Load management systems (industries, etc.)
- Peak shifting:
  - Ice storage for ACs
- Cogeneration

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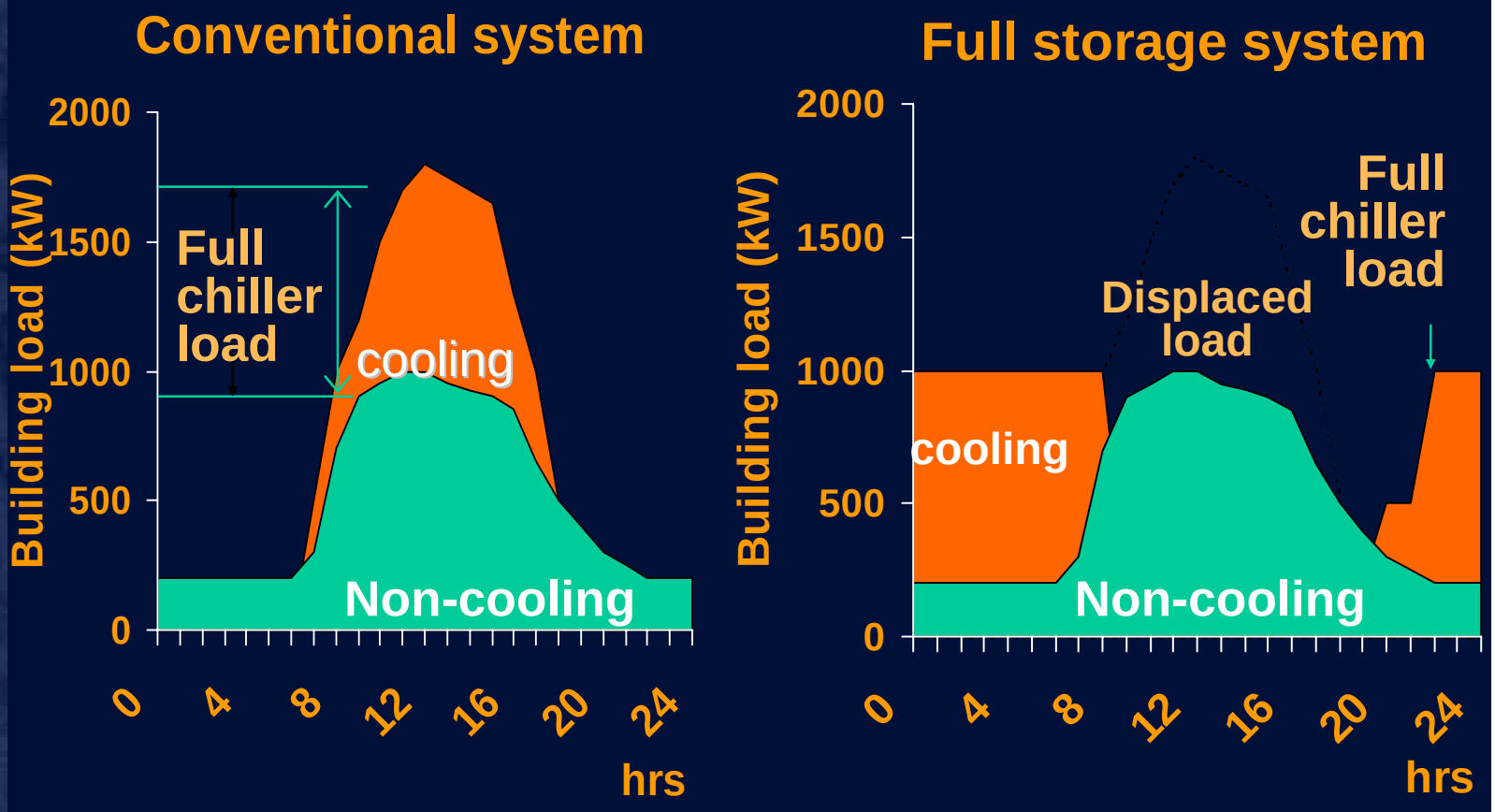
Potential ideas for AC in Indonesia (Cont'd.)

Daily profile for conventional and full storage system



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Why DSM program ?

What is a program ?

- Its a governmental or utility intervention to increase the volume of activity of the market.
  - Identification of the good barrier to remove is important.
  - Removing barriers

    - Information not available ?
    - Technology not available ?
    - Low interest from consumer ?
    - No expertise from consultant ?
    - Consumer don ’t have fund available for this type of activity ?

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Why DSM program ?

What a program imply ?

- Commitment of resources (human and financial) for the implementation of activity that would change the market

What strategy ?

- Improvements attractive to clients:
  - awareness programs
  - training
  - suppliers support
- Improvements not so attractive to clients:
  - Sharing of PNL benefits through financial incentives to clients

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DSM program implementation process

- **Step I - Audit program planning**
  - Evaluate the potential of an energy audit program and compare to others alternative in order to retain the most appropriate.
- **Step II - Audit program design**
  - Define the process for this activity, the targeted market, the type of incentive, the annual objectives, the budget and resources
- **Step III - Audit program implementation**
  - Develop the tool required, forms, database for program management, training of the auditor and implement the program

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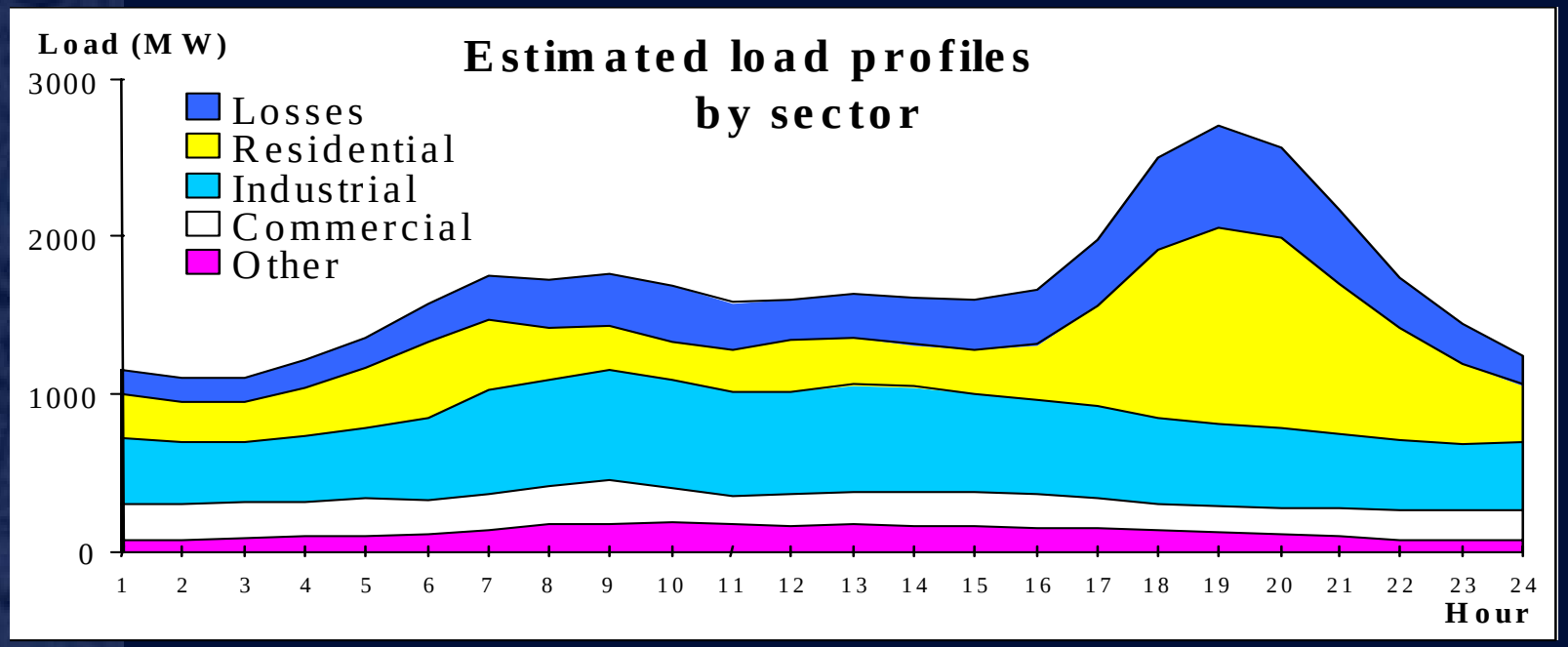
Data collection level of details

Example: Breakdown of Vietnam Electricity Demand



A similar planning is required for implementing effective DSM programs in Indonesia!

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DESIGNING DSM PROGRAMS : THE ESSENTIAL BOND

The marketing aspects

- The behaviour aspects
- Not a technological problem
- Convincing is the challenge
- Prescriptive measures are sensible to marketing techniques.
- After prescriptive adopt performance measures.

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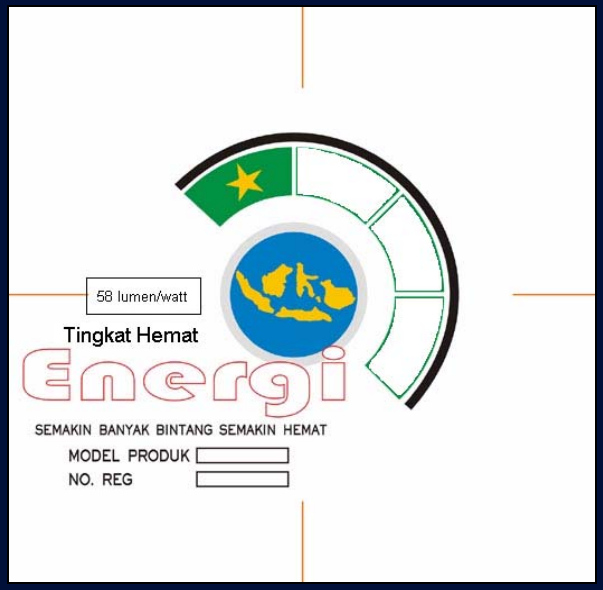
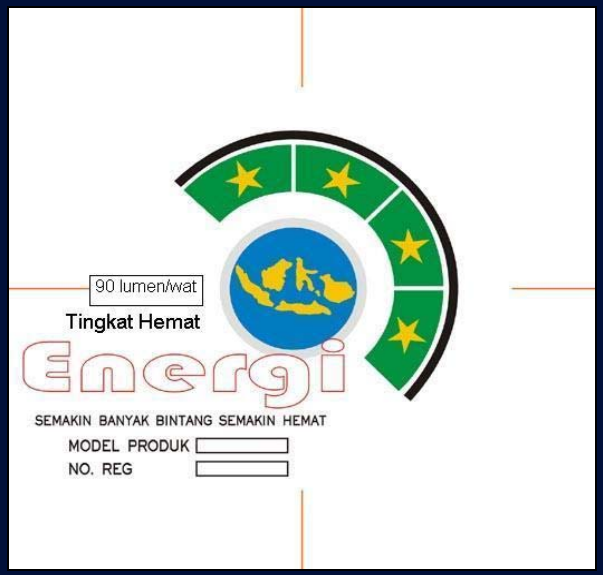
Labelling and dissemination

- Labelling DSM program for Indonesia
- Dissemination & information activities

DESIGN CFL LABEL FOR INDONESIA





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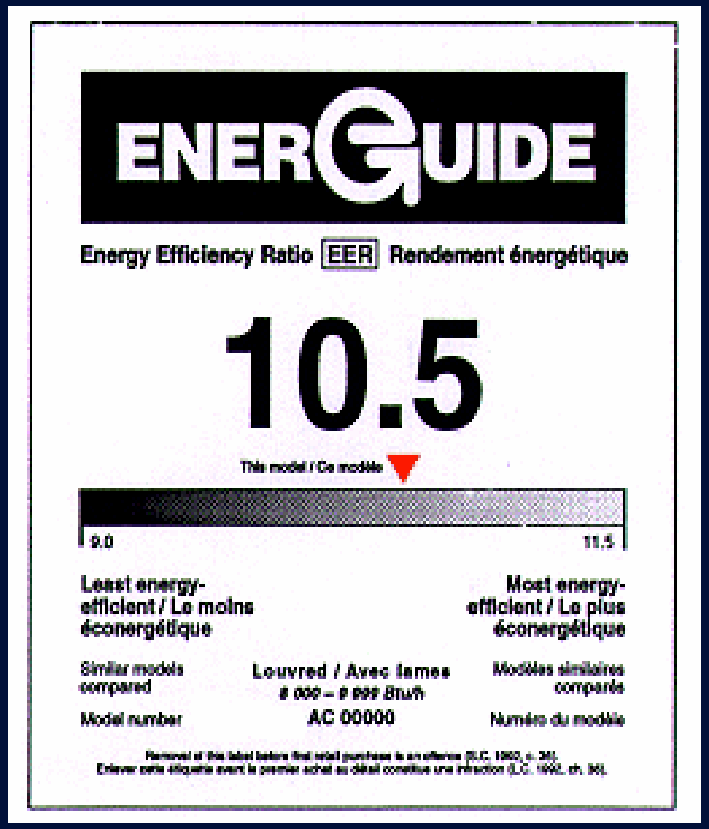
Some potential measures for AC in Indonesia (Cont'd.)

Window/wall unit and rooftop

- Example of an Energuide label in Canada
- Labelling and setting minimum Energy efficiency standards



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Some potential ideas for AC in Indonesia

Window/wall unit - comparison of different SEER

- equipment capacity : 3,5 kW
- energy cost : 0,082 US$ / kWh

Energy cost in US$					
Operating hours	6 SEER	8 SEER	10 SEER	14 SEER	18 SEER
1 000	163	122	98	70	54
1 500	245	184	147	105	82
2 000	326	245	196	140	109
2 500	408	306	245	175	136

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Potential ideas for AC in Indonesia (Cont'd.)

Example of chiller replacement

- 20 years old scroll chiller: 0,9 kW/ton
- New centrifugal chiller: 0,55 kW/ton
- 39% difference

Energy cost for a 100 tons chiller operating 2000 h/year, @ 0,08$/kWh

20 yrs old :100 x 0,9 x 2000 x 0,08 = $14 400

New : 100 x 0,55 x 2000 x 0,08 = $ 8 800

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Labelling and dissemination

CFL labelling DSM program :

- **Would amplify the growth of the market with quality products**
- **Appropriate laboratory for labelling**

- **Labelling process identified**
- **Need of coordination by DGEEU with support of PLN**

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Labelling and dissemination

Dissemination & information activities:

- Success of TV DSM advertisement on 50 W load reduction (households)
- Replicate mass media actions
- Enhance information targeting industries and building sectors
- Use of PLN local offices to spread energy saving concepts
- Conference with share of experiences on EE pilot projects

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Awareness creation

Recent Campaigns

Customer Targeted	Type of Activity	Material Used (lecture, media, radio, TV...)	Date / Period of Activity	Contact Person
Households	Television announcement for 50 W saving	TV	May-July 2005	Public relation Dept
Industry	Incentive for off peak shifting load	Circular letter	Oct-Dec 2003	Commercial Dept
Industry	Off peak consumption promotion	Circular letter	2005	Commercial Dept
Household	CFL promotion for DSM Terang	TV	2002	Corporate office with DSM team
Household	DSM Peduli	Posters installed at payment points	2003	Local PLN offices
Households	How to save energy	Brochures	Ongoing	Local PLN offices
All	Various campaigns	Radio	-	Local PLN offices
All	Press releases	Press	-	Corporate office
Industry	Policy to local office of PLN	Circular letter	2005	Commercial

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DSM awareness

- What are the effects of DSM programs at short, medium and long terms?
  - Emergency solution
  - Reduce peak demand and consumption
- Raising the awareness for DSM in the industrial and buildings' communities

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Innovative financing DSM programs

- ESCO financing schemes:
  - A company invest in EE projects based on performance contracting
  - Savings shared between company and end user
  - Reimbursement of investment based on achieved results
- Contribution from carbon credits
  - Indonesia ratified the Kyoto protocol
  - Carbon Finance (World Bank) may be interested

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How the program would be co-financed by Indonesia?

- Governmental approach : govt budget directly = income taxes or others
- Utility approach :
  a) by considering avoided production cost = only measures that affect the peak would be considered,

  b) by increasing electricity rate
  = all measures could be considered.

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Financing schemes for specific measures

- Financing scheme for some technologies guaranteeing production reduction cost:
  - Peak load reduction control systems
  - Ice storage systems
  - Variable speed drives for non-coincident load with AC load
- Excluded : lighting control at night, variable speed drive for peak load, most equipment replacement.

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Evaluation of the impact of DSM programs structuring on the market penetration

- **Business as usual:**
  - **Scenario in which no DSM policy is implemented**
  - **Economical development with no energy concern**
- **Acting in the market:**
  - **legal (EE law)**
  - **regulation (obligatory auditing, labelling)**

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Evaluation of the impact of DSM programs structuring on the market penetration

- **Acting in the market:**
  - **pricing (TOU: K factor to be adjusted)**
  - **education**
  - **saving by design**

- **Sustainability :**
  - **ESCOs: multiple actors v/s 1 actor**
  - **EE consultants**

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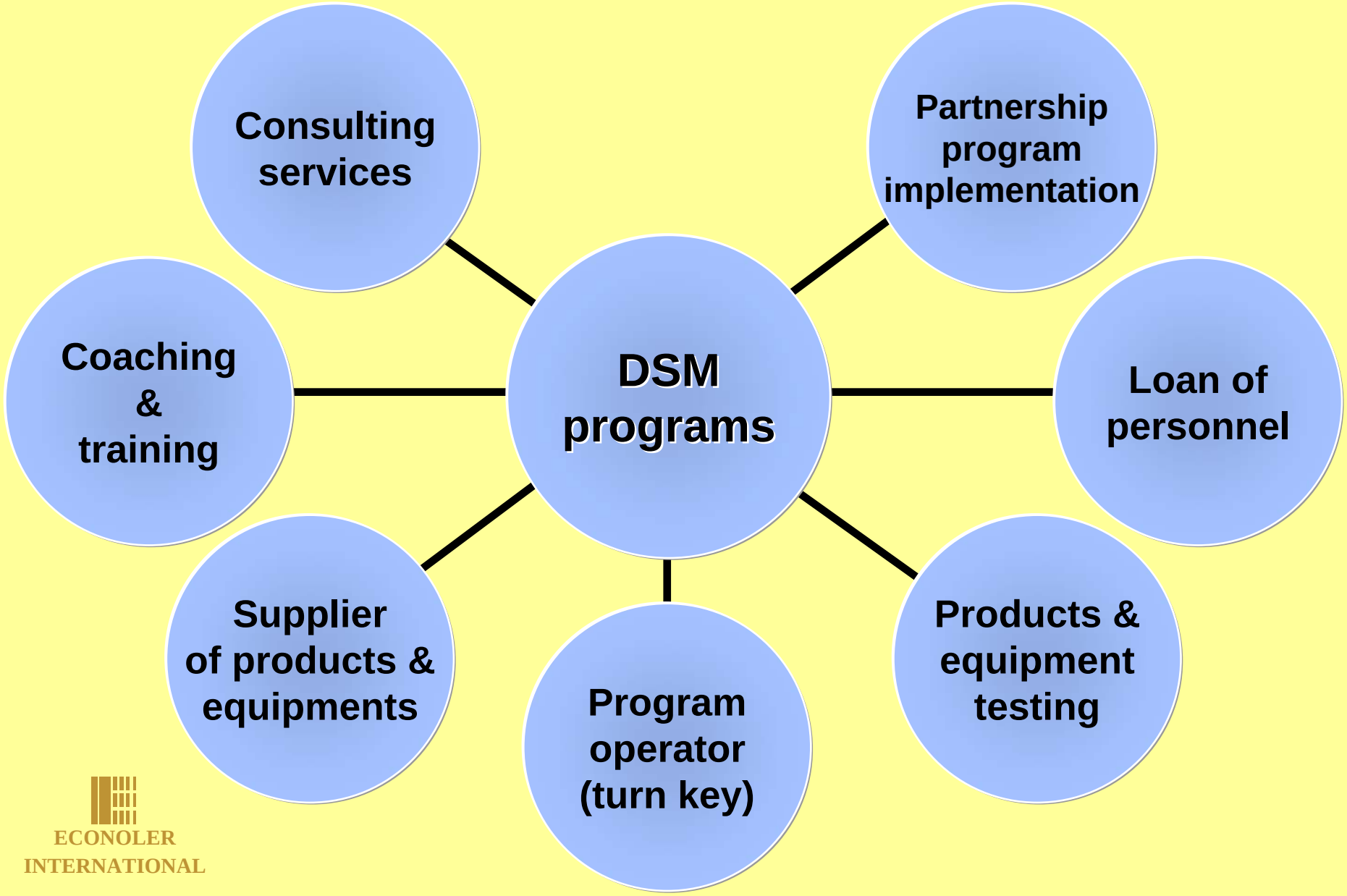
Types of role for DGEEU/PLN



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What is next?

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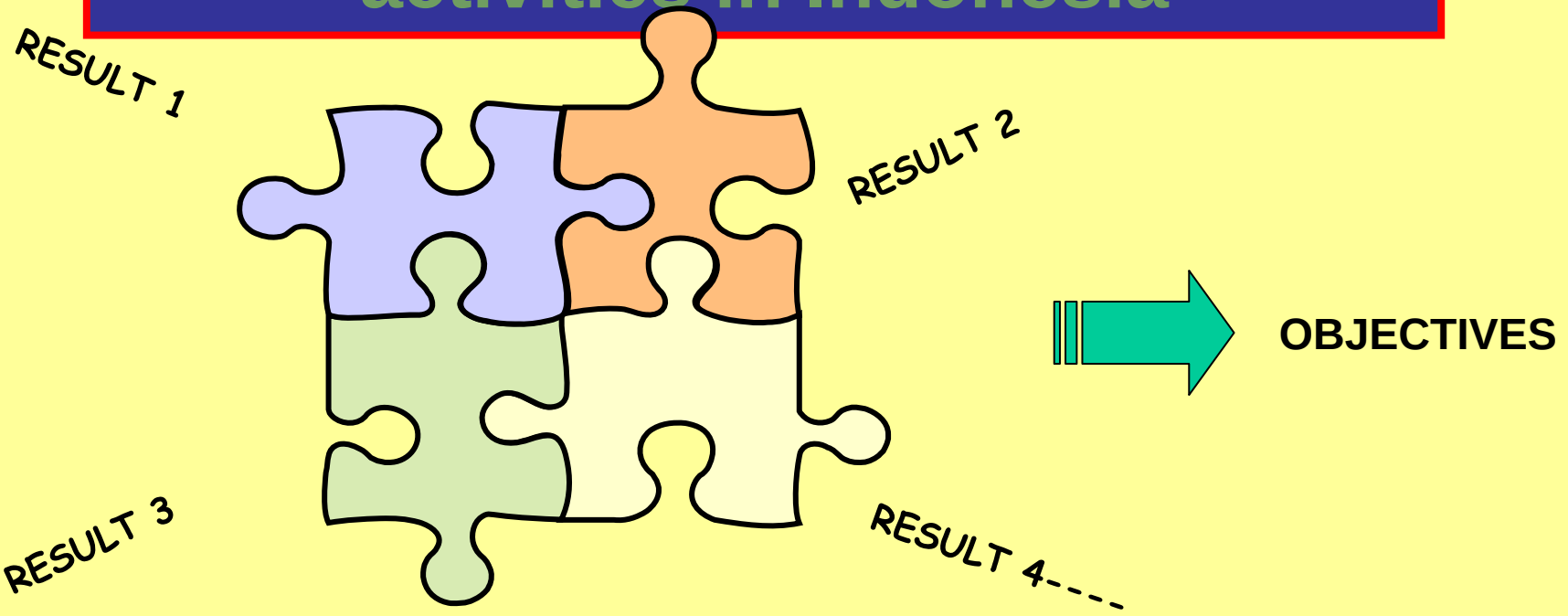
Review of the DSM's objectives:

Enhance Energy Efficiency and Demand Side Management activities in Indonesia



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Terima Kasih

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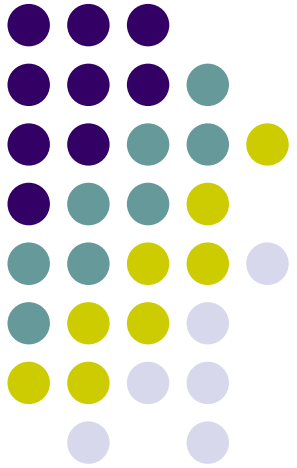
EE/RE Financing Strategies & Barriers in Indonesia

Lery Wongsonegoro
PNM Venture Capital
Jakarta – Indonesia
lery@vc.pnm.co.id
www.pnm.co.id



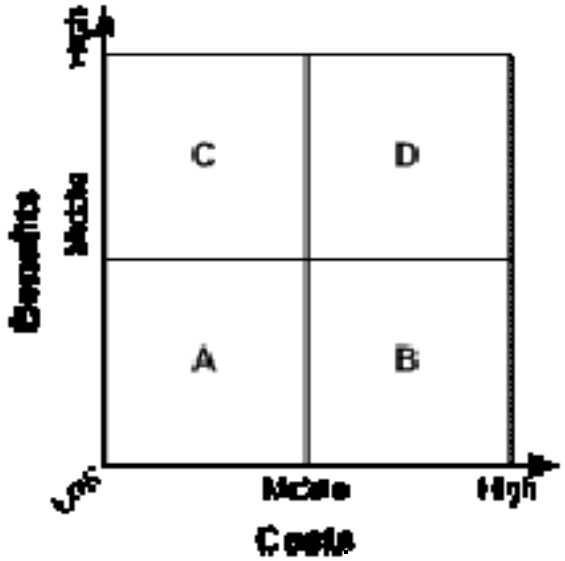
Financing Scope: Benefits VS Costs

Group C
Low to Medium Costs
Medium to High Benefits

Example:
- Light Modifications
- Proven Technology on Mass Scale/Economic Production Units

Group A
Low to Medium Costs
Low to Medium Benefits

Example:
- Regular Maintenance
- Light Modification



Group D
Medium to High Costs
Medium to High Benefits

Example:
- Overall Redesign/Use of Proven Technology
- Specific Technology

Group B
Medium to High Costs
Low to Medium Benefits

Example:
- New & Unproven Technology
- Individually Designed Technology

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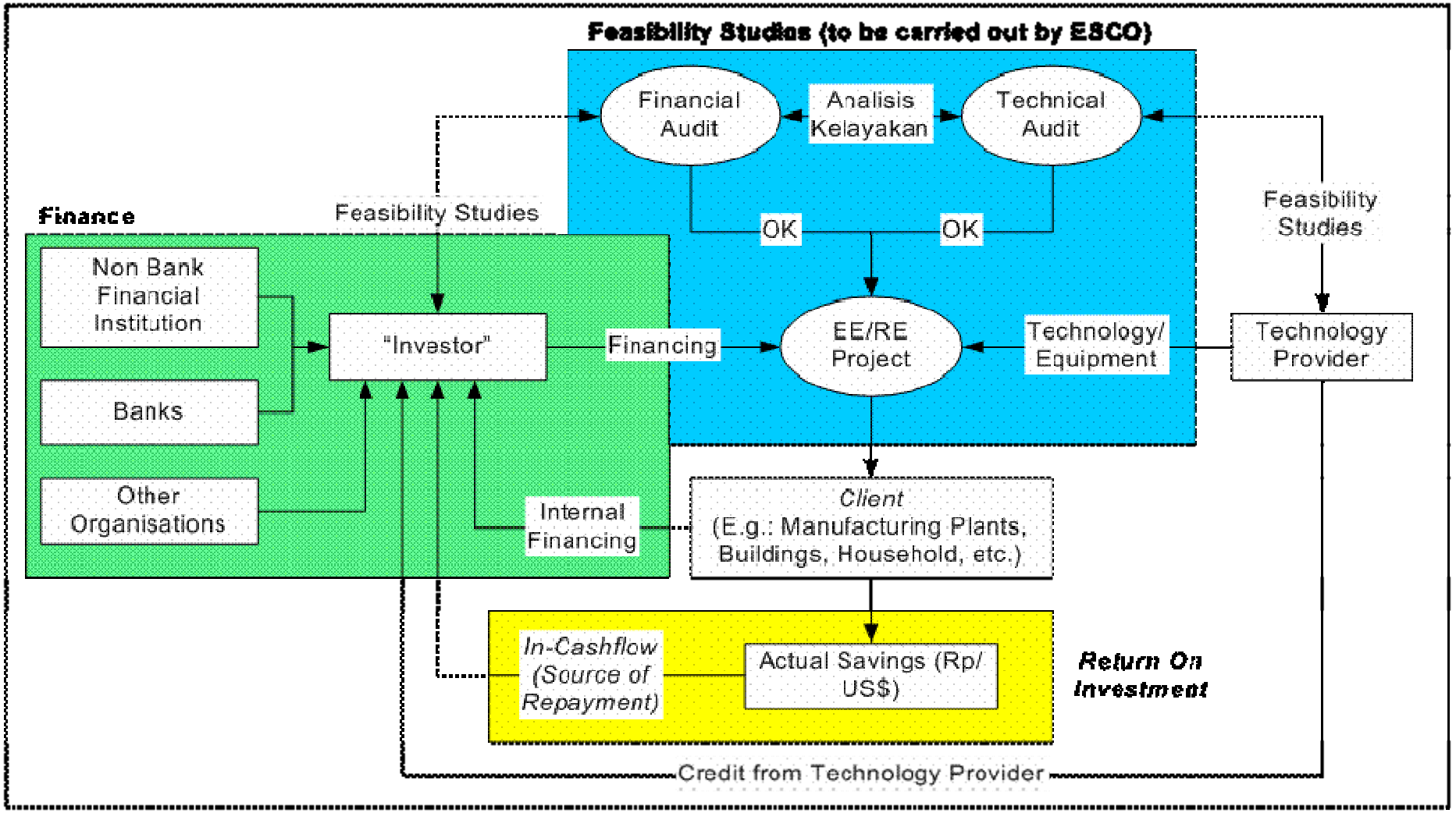
Business Model



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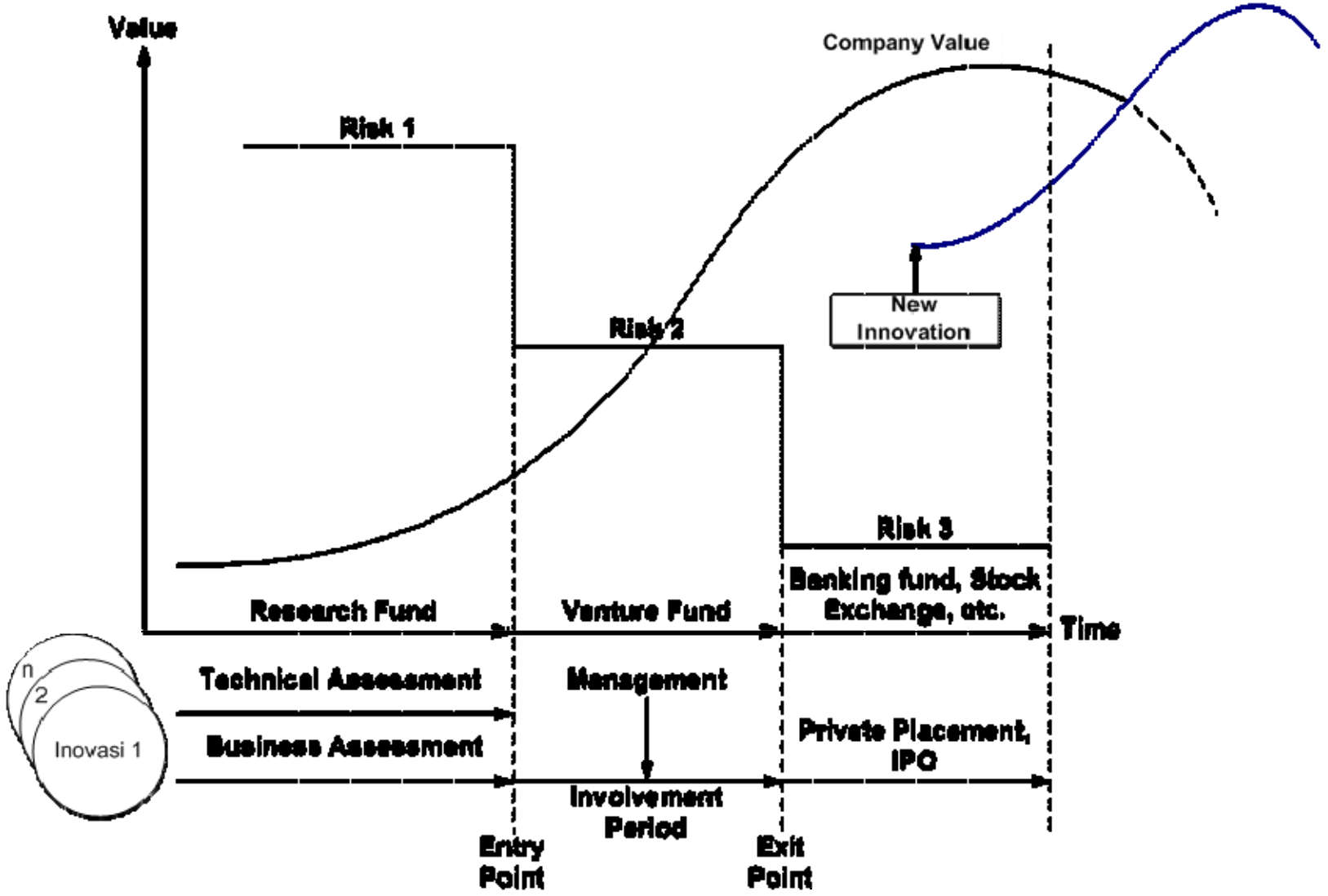
EE/RE Investment: Risk Profile



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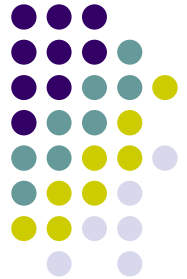
Feasibility Studies



- Detailed Financial Audit and Technical Audit are carried out at this stage to indicate the feasibility of an EE/RE financing.
- A trustworthy ESCO is most preferable and a clear indication of opportunities and risks should be outlined to enable investors to make appropriate judgement.
- These audits form the base of contractual aggreement between parties involved.

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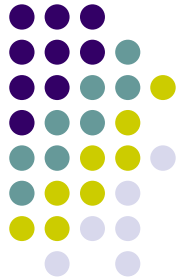
Finance



- As described within this document, there are many ways to obtain financing for renewable energy and energy efficiency projects.
- It can be a sole financier using internal funding or a group of investors representing different bodies. B
- ased on ESCO’s report, the financier would then decide terms and conditions of the investment. .

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Return On Investment

- Savings made or enhanced power output are the key income generation of the project.
- This should be bigger or adequate enough to pay the financing obtained for the project.
- The amount of profit generated should equal or not be far off from the predicted savings.

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Sources of Finance

1. Internal Financing
2. Equity Financing
3. Debt Financing
4. Lease and Lease-Purchase Agreements
5. Grant Financing
6. Energy Performance Contracts

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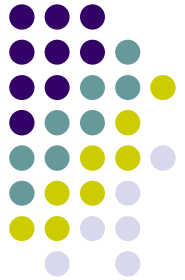
Barriers



1. High Capital to O&M Cost Ratio
2. High Project Development to Investment Cost Ratio
3. Small Total Investment Requirements
4. Difficulty Guaranteeing Project Cash Flow
5. Weak Basis for Non-Recourse Financing
6. Inaccurate Perception of Risk
7. Incompetent Project Manager/Developer
8. Culture and Politics

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ENERGY EFFICIENCY ON ELECTRIC SECTOR

CURRENT STATUS OF PLN'S DSM PROGRAM

AUGUST 2005

By

Syaiful B Ibrahim

Working Team of DSM Program

PT PLN (Persero) Head Office

Background of Energy Efficiency Programs

- High growth of energy demand after economic crisis
- Limitation of power supply especially during peak hour
- Limitation of investment fund for build new generation plant
- Uneconomic price of tariff
- Rising price of fuel oil

PLN's IRP STRATEGY FOR ALLEVIATE THE GAP

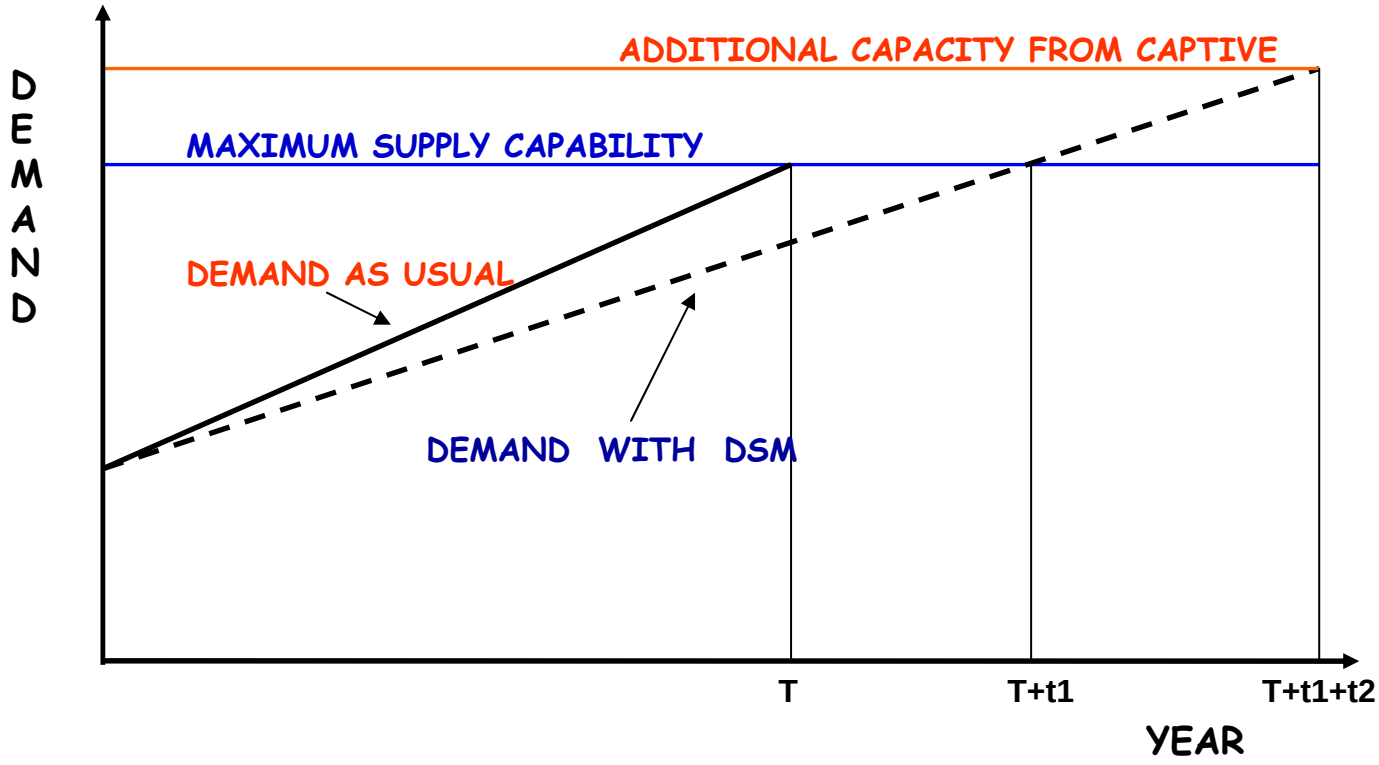
INTRODUCTION OF DEMAND SIDE MANAGEMENT PROGRAM

- CFL USES ON RESEDENTIAL SECTOR FOR CLIPPING THE PEAK DEMAND
- ENERGY AUDIT FOR INDUSTRIAL AND COMMERCIAL SECTOR FOR ENERGY CONSERVATION PROGRAM
- LABELING HOUSEHOLD ENERGY APPLIANCES
- INTERUPTABLE AND CURTAILABLE INCENTIVE

IMPLEMENTATION SUPPLY SIDE MANAGEMENT

- POWER PURCHASES DURING PEAK HOURS
- INCREASE THE POWER SUPPLY AVAIBILITY

Integrated Resource Planning (IRP)
PLN's Short term strategy for postpone the crisis



IMPLEMENTATION OF PLN's DSM PROGRAM 2002 - 2005

I. PRIORITY PROGRAM

1. POWER PURCHASE IN CRISIS AREA

   Purchasing energy on Peak Hours, have been transacted on :

   - Java, Kalimantan, Sumatera total power purchase 165 MW

2 HIGH EFFICIENCY LIGHTING RESIDENTIAL & STREET LIGHTING

   DSM Program" Terang and Peduli", CFL sold throughout PLN's payment point during 2002- 2003 is 1 057 142.

   Total imported CFL in unit :

   2001 : 9 971 364 ; 2002 : 23 767 133 ; 2003 : 35 995 883;2004 : 48 129 751

3. CFL SALE FOR POOR CUSTOMER

   Program for selling CFL by installment on 10 location

IMPLEMENTATION OF PLN's DSM PROGRAM 2002 - 2005

II. ADVANCE PROGRAM

1. ENERGY AUDIT INDUSTRY & COMMERCIAL SECTOR

   Supporting the Government program of " alliance on energy conservation" have been audited

   5 Electricity intensity industries in 2004 and 3 industries in Makassar on 2005

   8 Multi stories commercial building and 6 more in 2005

2. LABELING HOUSEHOLDS ELECTRICAL APPLIANCES

   5 kinds household appliances have been energy performance test, such as CFL, refrigerator, AC, Fan and water pump

3. TOU & IC TARRIFS IMPLEMENTATION

   The PLN's have publish Board Circular for promoting Industry and big commercial customers using energy during off peak periods and disincentive on peak period

Evaluation of DSM Program

- Evaluation of DSM Program " Terang and Peduli " - the campaign of replacing Incandescent Lamps to Compact Fluorescent Lamps – the impacts to :

  - **1. Switching of lighting appliances for PLN's customer**
  - **2. Peak Load Reshaping for Jawa – Bali system**

1. Switching the appliances Incandescent lamp to CFL

The CFL Survey Result 2002

	>450 VA Customers	450 VA Customers
Penetration rate	78%	50-65%
CFL/house hold	2.6-6.6 unit	1.1-1.7 unit
CFL wattage	>12	7-9

Source of data: Price Water House & PLN Survey, March 2002

1. Switching the appliances, Incandescent lamp to CFL

- CFL IMPORTED

YEAR	UNIT	NOTE
2001	9 971 364	PLN's DSM Program not yet started
2002	23 767 133	DSM Program Terang and Peduli, launched
2003	35 995 883	DSM Program Terang and Peduli already implemented on all Unit of PLN
2004	48 129 751	DSM Program still continue

Sumber : BPS, import by commodity

The PLN's DSM Program has caused the significant import of CFL

2. Evaluation of DSM Program on Jawa-Bali Peak Load Reshaping

YEAR	PEAK LOAD (MW)	INCREASE (%)	ENERGY SALES (GWH)	INCREASE (%)
2001	12 577		67 928	
2002	13 374	6.3	69 960	3.0
2003	13 682	2.3	72 190	3.2
2004	14 323	4.6	79 793	10.5

Noted : Net peak load

The growth of peak load year 2003 and 2004 are smaller compare to the growth of energy sales , its caused improvement of load factor

RESUME

- 1. DSM PROGRAM“ TERANG AND PEDULI “ HAVE BEEN SUSCESSFULL FOR INTRODUCE THE USES OF CFL ON SOCIETY
- 2. THE USES OF CFL ON SOCIETY IS GROWING FAST DI MASYARAKAT, ITS REFLECTED ON IMPORT FIGURE OF CFL ; CFL IMPORTED ON 2002, 2.5 TIMES COMPARE TO 2001 AND ON THE YEAR 2004, 5 TIMES COMPARE TO 2001.
- 3. ESTIMATION FIGURE FOR PEAK LOAD REDUCTION ON JAWA BALI SITEM ON THE RANGE 192 MW TO 184 MW.

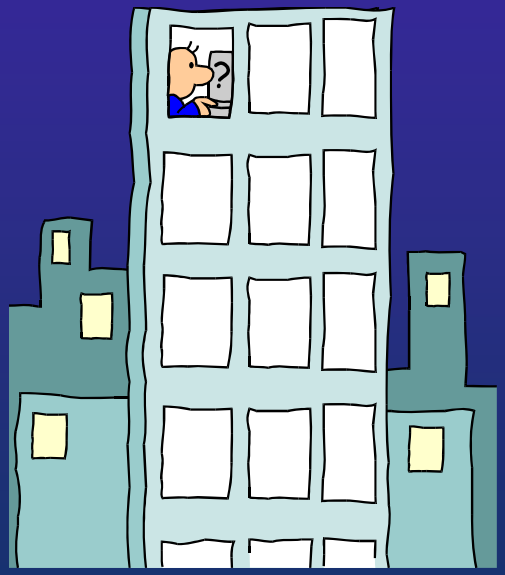
THE FUTURE PROGRAMS OF PLN'S DSM

1. INTRODUCING THE CFL AND TL 8 INCH ON LOW INCOME PLN CUSTOMER
2. SUPPORTING GOVERNMENT HOUSEHOLD LABELING PROGRAM
3. AWARENESS FOR ENERGY CONSERVATION PROGRAM TO BIG COMMERCIAL AND INDUSTRIAL CUSTOMERS
4. TARIFF INCENTIVES FOR RESHAPING THE LOAD

Energy Conservation Policy

Presented By :

Ainul Wafa



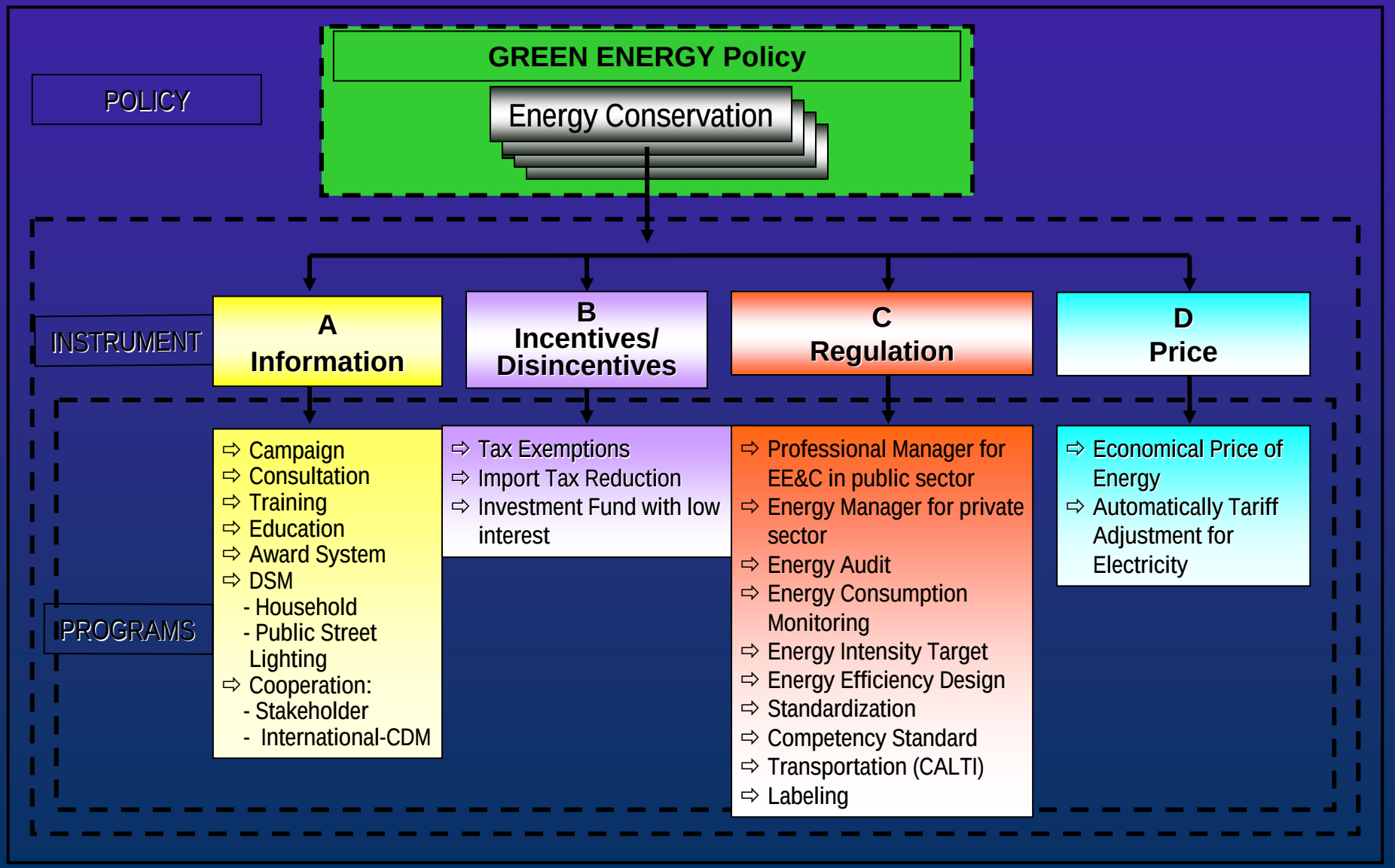
Seminar on Energy Efficiency Improvement

Assessment Analysis on Energy Efficiency Implementation in Buildings and Industries

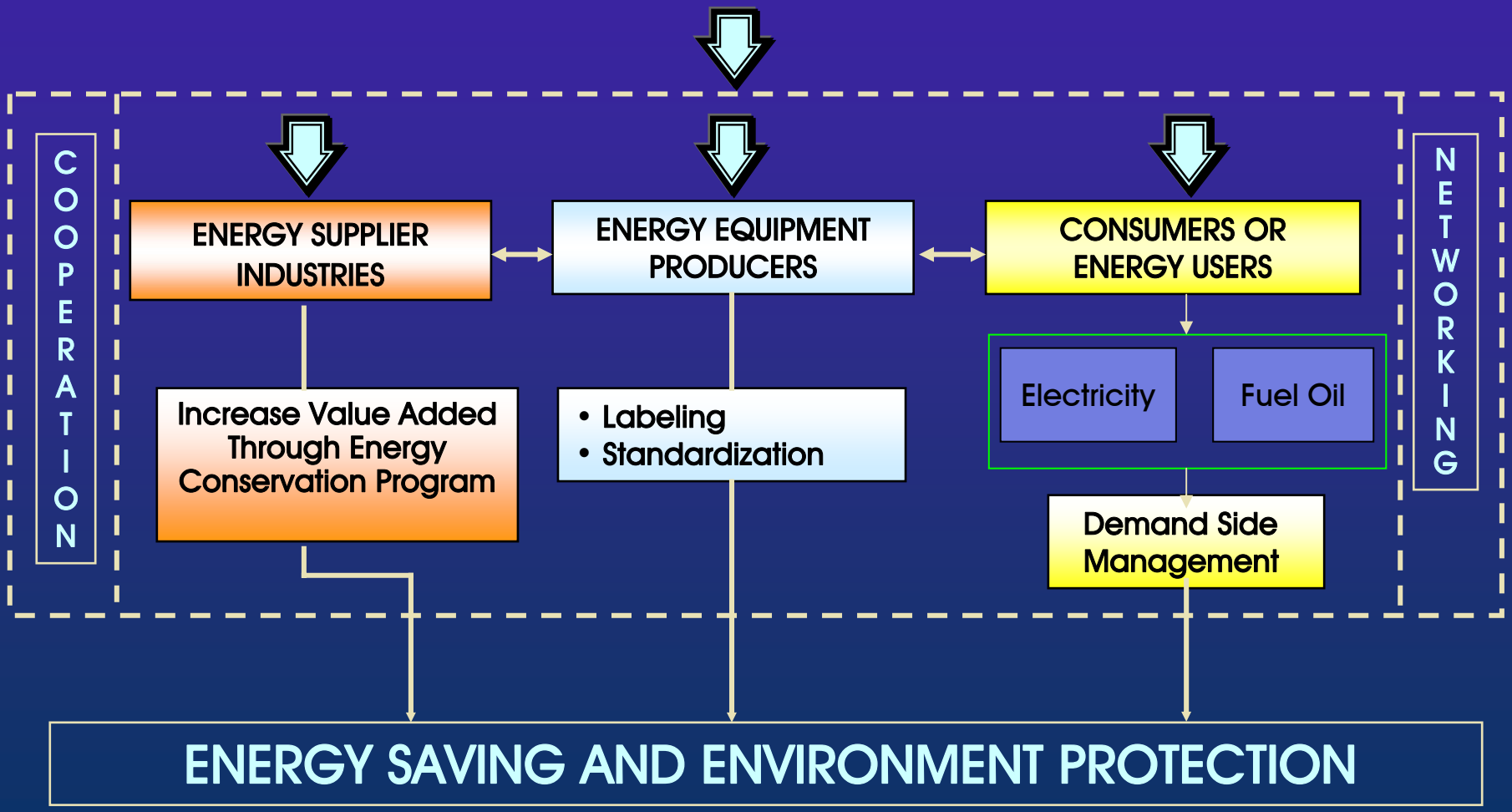
The Overview of Energy Policy

- GOI has completely formulated Blue Print on National Energy Management 2005-2025 that emphasizes on the utilization of energy in efficient, equitable and sustainable way and widening public accessibility for energy sufficiency with reasonable price.
- On the other hand, energy diversification is pursued by exploring new renewable energy sources and alternative energy to reduce dependency on fossil fuel.
- Blue Print constitutes the main guidelines for managing energy in national level.
- Presidential Instruction No 10 Year 2005 concerning Energy Efficiency, issued on 10 July 2005

Framework of Energy Conservation Policy and Measures in Indonesia

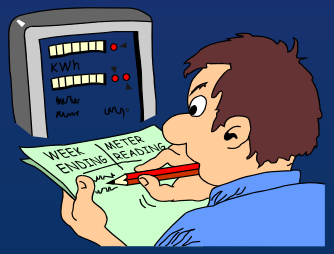


ENERGY CONSERVATION STRATEGY



Energy Management System

- No specific regulation for companies' to have energy manager (mandatory basis). In fact, energy manager has functionally existed in both industries and buildings.
- Under the new energy law (under discussion with parliament), energy management system will be covered in.



continued...

- Energy manager accreditation scheme is being developed both for private company and government employees.
- The separation of them should be made by concerning the difference of energy use and system’s complexity in each section (private and government). Private company usually consumes larger amount of energy than government office does.

continued...

Energy Efficiency Labeling

- Energy Label for household appliances SNI 04-6958-2003.
- DGEEU Decree No. 238-12/47/600.5/2003 on The Procedure of Energy Efficiency Label Attachment.
- The preparation of DGEEU Decree concerning Procedures and Requirements of Lembaga Sertifikasi Produk (LSPRO) Appointment.

continued...

RECENT STATUS...

Energy Audit

- Energy audit in industries and commercial buildings is continually conducted with aiming at assisting companies to improve their energy efficiency performance by average of 20%.
- In 2003 and 2004, there are 10 (ten) industries and 14 (fourteen) buildings had been audited. Energy saving potential achieved by industries varied from 5% to 23 % while buildings achieved 0.5% to 12%.

continued...

RECENT STATUS...

Energy Efficiency Benchmarking

- In 2004, Energy efficiency benchmarking system was developed by conducting survey on 65 buildings of 120 questionnaires submitted consist of shopping mall (12), hospital (13), hotel (15) and office (25) buildings.

- EEI Hotel : 198.2 KWh/y.m2
- EEI Office : 203.4 KWh/y.m2
- EEI Shopping Mall : 228.9 KWh/y.m2
- EEI Hospital : 249.9 KWh/y.m2
- Total Buildings : 216.2 KWh/y.m2

continued...

Next Program

- Conducting energy audit in energy intensive industries as mandated in Presidential Instruction.
- Reviewing policy and regulation on EE&C in order to adapt the changes happened on governance aspects in the autonomy era.
- EE&C programs as an integral part of energy law.
- Developing the energy efficiency reporting system (on-line system) for buildings and industries.

Thank You

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The World Bank's Energy Efficiency Project Experience in East Asia

Leiping Wang and Eka Zarman Putra

Energy and Mining Sector Unit
East Asia and Pacific Region
The World Bank

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Agenda

- Regional context
- The World Bank's commitment, strategy and supports
- The World Bank's typical EE project in East Asia
  - ***Promoting End-use Energy Efficiency by Introducing Market Based Mechanism – Energy Service Company (ESCO)***
  - ***Promoting End-use Energy Efficiency by Implementing Demand Side Management Program (DSM) through Power Utilities***
  - ***Credit Enhancement to Promote Energy Efficiency Financing***
  - ***Promoting Energy Efficiency through Pricing Reform and Capacity Building***
- ***What can we do in Indonesia?***

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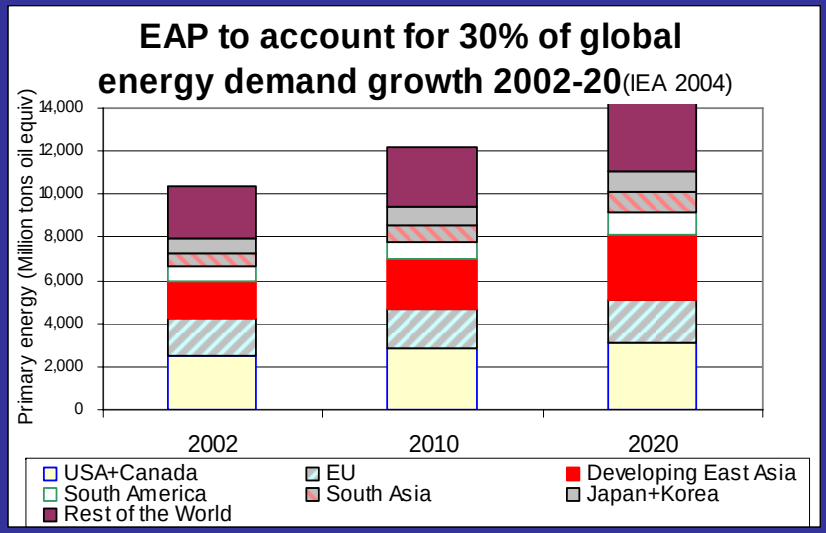
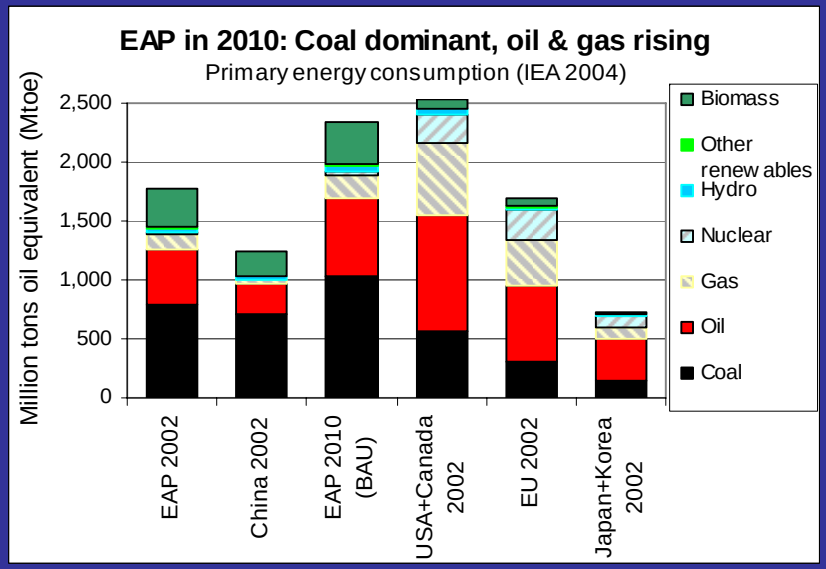
Regional Context

- Fastest energy demand growth among all regions in the world;
- Coal to account for nearly half of primary energy → environmental impacts
- Oil imports to rise rapidly→ security concerns
- Gas low – aggressive promotion needed
- Low energy efficiency.





The World Bank's Commitment, Strategy and Supports

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- The World Bank Group (WBG) has committed to supports its member developing countries for energy efficiency improvements
  - **the WBG is one of the largest financiers of Energy Efficiency (EE) in developing countries**
  - **Over US$ 2.1 billion grants and loans since 1990 – 35% in East Asia**
- At the International Conference on Renewable Energies in Bonn in 2004, the World Bank Group committed to a Renewable Energy and Energy Efficiency Action Plan with the aim of accelerating such activities in developing countries - 20% increase of financing commitments every year over the next five years
- **The focus will be on developing strategic partnerships in the major countries, including Indonesia, for energy efficiency interventions with**
  - **GEF support (grants) and/or**
  - **IBRD loans, as well as**
  - **carbon financing.**

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The World Bank's Typical EE Projects in East Asia

- Promoting End-use Energy Efficiency by Introducing Market Based Mechanism – Energy Service Company (ESCO)
  - In 1990s, the World Bank started to introduce a market based energy conservation project financing and implementation mechanism called **energy performance contracting**
  - Energy performance contracting is an energy conservation project financing and implementation method which has been successfully employed in North America and Western Europe since the late 1970s. It involves joint implementation of an energy conservation project by an Energy Service Company (ESCO) – together with a "host enterprise," according to an "energy performance contract."
  - The ESCO undertakes project design, arranges financing, and installs and usually maintains the key equipment in the host enterprise. In exchange for these services and shouldering most of the project risk, the EMC is compensated from a portion of the money saved by the host enterprise on its energy bills

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The World Bank's Typical EE Projects in East Asia

- ***China Energy Efficiency Project***
  - Financing: GEF Grant of US$ 22 million and IBRD Loan of US$ 63 million
  - The Objective of the project:
    - introducing, demonstrating and disseminating new project financing concepts and market-oriented institutions to promote and implement energy efficiency measures in China, and
    - developing a more efficient national energy conservation information dissemination program
  - Energy Management Company Demonstration;
  - Information Dissemination Component;
  - Program Management and Monitoring Component

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The World Bank's Typical EE Projects in East Asia

- Promoting End-use Energy Efficiency by Implementing Demand Side Management Program (DSM) through Power Utilities
  - DSM is an energy service that encourages electricity consumers to utilize energy more efficiently through a variety of measures, including time-of-use (TOU) tariff adjustments, power factor correction measures, energy audits and follow-up retrofits, load research and management, information campaigns, incentive mechanisms to encourage adoption of energy-efficient equipment and specific DSM programs aimed at industrial, commercial and residential sector end-uses.
  - The World Bank, with the support of GEF, has financed several DSM programs in the past. A recent example is in Vietnam

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The World Bank's Typical EE Projects in East Asia

- ***Vietnam: Demand Side Management and Energy Efficiency Project***
- **Financing**: GEF Grant of US$ 5.5 million and IDA of US$ 5.2 million
- The objectives of this project are to :
  - develop and expand demand-side management (DSM) business programs and test new market transformation efforts within the national electric utility, Electricity of Vietnam (EVN); and
  - develop sustainable business models and mechanisms to support energy efficiency (EE) retrofit investments in commercial and industrial facilities.
- **Component 1 - DSM Program under EVN**
- **Component 2: Pilot Commercial EE Program**

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The World Bank's Typical EE Projects in East Asia

- **Credit Enhancement to Promote Energy Efficiency Financing**
  - The shortage of energy efficiency (EE) investments has been a big barrier to improve energy efficiency in many developing countries;
  - The World Bank has financed several projects to reduce financing barriers for EE project in the past few years.

The World Bank's Typical EE Projects in East Asia

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- **China Second Energy Efficiency Project**
  - **Financing**: GEF Grant of US$ 26 million.
  - Objective:
    - To introduce the participation of China's domestic banks in the business, as the primary source of credit.
    - To massively disseminate the concept and experiences achieved, supported also with practical technical assistance and operationally-focused training for emerging new energy service companies (EMCs).
  - Components:
    - an EMC Service Component, designed primarily to provide in-depth, practical technical assistance to new and emerging EMCs on setting up and developing their businesses;
    - a Project Monitoring, Reporting and Evaluation Component to support the coordination and evaluation work of SETC's PMO; and
    - an EMC Loan Guarantee Program, designed to provide new and emerging EMCs with enhanced opportunities to receive loans from domestic banks, and to engage the banks in the development of a sustainable EMC industry.

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The World Bank's Typical EE Projects in East Asia

- **Philippines Electric Cooperative Loss Reduction Project**
- **Financing Support**: GEF Grant of US$ 12 million
- Components:
  - Partial Credit Guarantee Program: In light of the potential high risk exposure of investor under the Investment Management Contract model and the marginal creditworthiness of many Electric Cooperatives (ECs), a partial credit guarantee program for commercial loans is established under this Project. The government has selected LGU Guarantee Corporation (LGUGC) to be the Guarantee Program Manager to manage and operate two windows, one for loans to Non-ECs (Le. the pilot IMCs) and the other for loans to qualified ECs.
  - Capacity Building and Implementation Support

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The World Bank's Typical EE Projects in East Asia

- ***Promoting Energy Efficiency through Pricing Reform and Capacity Building***
  - ***China: Heat Reform and Building Energy Efficiency Project.***
  - The objective of the proposed project is
    - to achieve substantial, sustained and growing increases in energy efficiency in urban residential buildings and central heating systems in China's cold climate regions
    - To leverage corporate resources and work in close collaboration with the Government to reduce energy waste in space heating;
  - Project components:
    - improvement of the thermal integrity of buildings, through improved enforcement of building energy efficiency standards, improved design, and use of improved insulation and other energy efficiency measures
    - reform of heat pricing and billing, through implementation of heat metering, cost-based pricing and consumption-based billing; and
    - modernization of heat supply systems to enable end user control and demand-driven operation

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How Can the World Bank Help?

YOU TELL ME!

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Thank You !

APPENDIX B - POTENTIAL EE TECHNOLOGIES FOR INDONESIA

The following EE technologies are extracted from the audits performed during the mandate. They are not intended to be complete nor self-sufficient. The purpose of including them is to demonstrate through these examples few EE technologies that can be replicable on larger scale through the coming energy audits that PLN and DGEEU will launch under the auditing program.

1- General

Future auditors will have to perform energy audits along with Koneba, UoI, or PLN. The methodology and procedure applicable to these audits will be similar to as the one used in the three audits executed with Koneba and the World Bank team. The three audits were done on the following company premises:

- Textile: Chitatex Peni, Kerawang;
- Building: PLN office building No 1;
- Steel: ABA.

Figure B-1: PLN Building No. 1

PLN building No 1 was selected as this category of administrative buildings is among the largest ones in Indonesia and to convince others of the benefit of doing audits. PLN must show by example that they implement what they recommend to others.

The two other sampling customers were recommended by KONEBA and approved by PLN team. They represent the industrial sector. The auditing team could perform a preliminary audit in Chitatex with a specific list of energy efficiency measures that are described herein. While the auditing team could perform a detailed energy audit for ABA, steel industry.

2- Large Spectrum EE Technologies

Best practices for the realization of energy audits must include simulation of energy savings and payback calculation that can be achieved through each EE measure and for the entire project. The following technologies are recommended as they are repetitive for all end-user categories such as:

- Efficient pumps and fans.
- Boiler efficiency improvement.
- High efficient motors.
- Variable frequency drives.
- Efficient lighting.

Payback analysis can be presented as they were done for Chitatex walkthrough audit, by synthesizing the savings and costs for the calculation:

Table B-1: Chitatex Payback Analysis

	TYPE OF MEASURES	Tot. Financial Saving (Mill.Rp/Year)	Total Cost (Mill.Rp)	Simple Payback (Months)
EEM1	Natural Lighting	18,58	9,90	6
EEM2	Lighting Zoning Switches	18,58	41,40	27
EEM3	Compressed Air Leakage Reduction	164,37	8,00	1
EEM4	Replacement of T8+Magnetic Ballast by T5+Electronic Ballast	37,15	80,83	26
EEM5	Variable Speed Drives for Motors	102,32	106,50	12
EEM6	Steam leakage reduction programme	319,60	9,00	0,3
EEM7	Thermal insulation for Boiler	95,88	81,00	10

The ABA audit concluded to the following project:

Table B-2: ABA Payback Analysis

	TYPE OF MEASURES	Tot. Financial Saving (Mill.Rp/Year)	Total Cost (Mill.Rp)	Simple Payback (Months)
EEM1	Ventilation optimization with use of natural fluxes	20,55	1,00	1
EEM2	Reduction campaign of Compressed Air Leaks	45,44	9,00	2
EEM3	Fluorescent lighting: installation of T5+Electronic Ballast	85,43	188,50	26
EEM4	Installation of Variable Frequency Drives on process Motors	55,61	213,00	46
EEM5	Reduction programme of steam leaks	38,75	13,00	4
EEM6	LPG boiler & pipes thermal insulation	11,07	41,00	44

The PLN building No 1 was the opportunity to assess the feasibility of the following technologies:

Table B-3: PLN building payback analysis

	TYPE OF MEASURES	Tot. Financial Saving (Mill.Rp/Year)	Total Cost (Mill.Rp)	Simple Payback (Year)
EEM1	Replacement of T8+Magnetic Ballast by T5+Electronic Ballast	35,08	231,81	6,6
EEM2	Capacitor Bank (Average Cost)	19,74	54,41	2,8
EEM3	Switches on the windows	14,49	27,70	1,9
EEM4	Shadowing the A/C condensers	7,25	27,70	3,8
EEM5	Recovery from extracted cooled air	43,47	230,85	5,3
EEM6	Dampers for the balancing of the systems	28,98	41,55	1,4
EEM7	Programmable control units of the overall systems	20,16	73,44	3,6

3- Recovery Systems on Chillers

Usage of recovery systems can be installed on centralized chillers for pre-heating water or any other heating usage. The centralized chillers loose their efficiency as the condensers become dirty and old. It is proposed to install an energy recovery exchanger before the condensers (refrigerant at the chiller level) to preheat fresh water going into the boiler room. A double skin tube exchanger is normally recommended. The impact is at two levels:

- Improvement of the chiller efficiency.

- Recovery of energy to replace the heat requirements for fresh new water feeding the condensate water tank.

4- Steam Recovery: Increase of Ratio of Condensate Return

The ratio of condensate steam will depend on how the steam is used at the equipment level. In many cases the heating process can be modified by containing the steam in close circuits. This may imply new types of heat exchangers, different calendars and/or machine capping. It depends on the detailed assessment of the existing situation of the department/equipment.

The technical energy recovery system consists in optimizing the collection ratio of clean steam.

The savings are generated at different levels including:

- Savings on heat requirement to bring the temperature of the feeding city water to the condensate tank temperature.
- Savings on heating steam of the feeding water tank of the boilers.
- Savings on water consumption including the consumables and energy of the water treatment units for steam production.

This measure can be combined with blow down reduction. Usually, chemical companies recommend that the TDS level be maintained at a certain upper limit by doing blow down. Ex: 3,000-5,000 TDS level. In several installations, the THD level proposed by chemical companies is good only for chemical product vendors as excessive blow down results in increased consumption of chemical products. The real lower limit for TDH is when the level is high enough to have solids that combine with the steam in the distribution line and go back to the condensate water tank. Then it has the maximum practical limit and should bring down the TDH level at a limit slightly lower for safety purposes. Following this procedure can result in reduction in both energy and chemical product consumption.

5- Boilers Recovery

The recovery systems installed on the chimney allow recovering the energy from the fumes. Usually the fumes may have a temperature going up to 500 degree C. The system will then reduce the temperature of the fumes to the temperature avoiding water condensing in the chimney (around 120 degree C). The energy recovered can be used for pre-heating purposes of any fluid and/or process usage.

The system showed good economical results especially for natural gas primary fuel boilers. Many applications are also done for fuel-oil boilers. However, it is not recommended for heavy fuel-oil boilers.

6- Wasted water or Air Recovery Systems

In the close air conditioned buildings, new fresh air is brought to maintain a good quality for the ambient inside air of the buildings. As this fresh air is introduced, wasted air is extracted from the building. Several manufactures developed systems to recover energy from extracted air. Economical assessment showed particular interest for several applications in Canada and around the world. As air

conditioning is among the large usage in Indonesia, this system can be used for improving overall efficiency of the systems.

7- DSM Peak Shaving Technologies

Peak shaving is also named peak clipping. It aims at cutting the peak demand of a customer, an end use or an economical sector. Peak clipping is illustrated here by a comparison with other types of DSM impacts expected from other EE technologies:

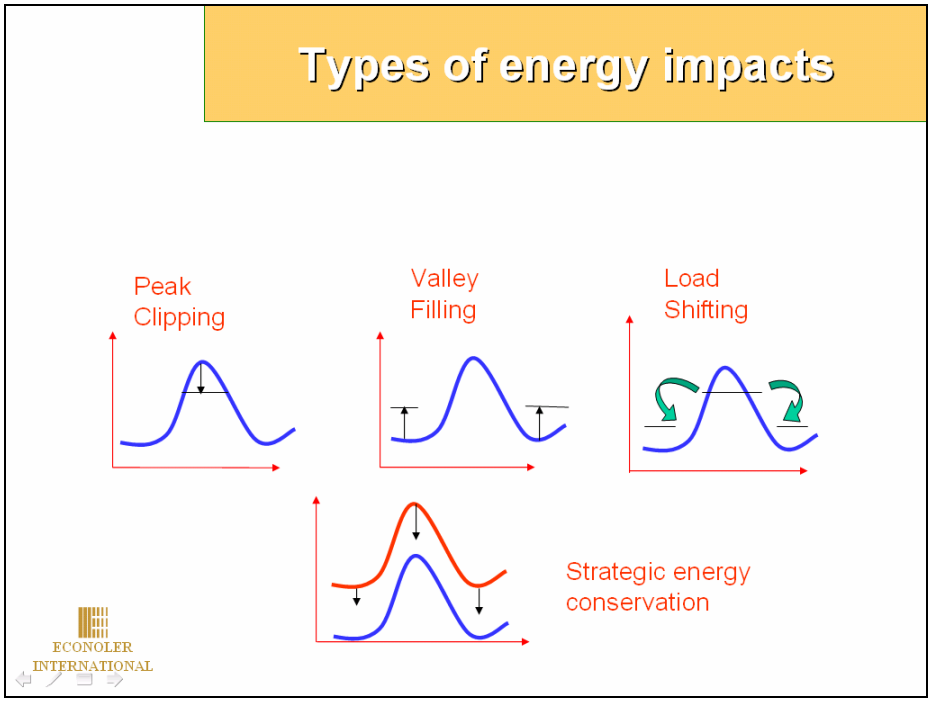

Figure B-2: Peak Clipping (or Shifting) Impact on Load Curve

Peak shaving technologies mainly consist of two options: alternative energy for heating process and load management systems (industries, etc.).

As an illustrative example, hotels and industries requiring electric water heating may use the peak shaving option consisting in changing the use of electricity for water heating during peak hours by another source of primary energy. This energy can be provided by coal, gas or sun for the production of hot water.

Figure B-3: Load Management System – Demand Regulator

Load management systems consist in regulators that limit the maximum demand of a customer. These demand regulators prioritize the end use that must run before others can be turned on. It allows the industry or commercial building to flatten its load curve.

8- DSM Peak Shifting Technologies

EE technologies, which can contribute to peak shifting in Indonesia, primarily concern air conditioning technological options. Efficient technologies may be a combination of one or more among the following elements:

- Splitting the HVAC system into zones adjusted to solar and other variable loads.
- Usage of primary, secondary and tertiary pump systems with plate type heat exchangers.
- Usage of pre-insulated material rather than conventional ducting.
- Usage of high efficiency recovery wheels in the air handling units for electricity recovery from outlet air.
- Installation of dehumidifier, as required.
- Installation and adjustment of oxygen (new fresh air) in places such as crowded rooms or those containing high levels of carbon dioxide.
- New high-tech equipment for air conditioning including a new ionizing filter, a new design for its coils in window and mini-split systems, as well as a new scroll technology for its medium-sized refrigeration plants.
- Use of lighting lamps with minimum electricity dissipation in the air.
- Ice storage systems to shift the air conditioning consumptions from peak to off-peak period.

As presented during the World Bank workshop organized on June 2005, ice storage can have a very effective impact on the peak demand for Indonesia:

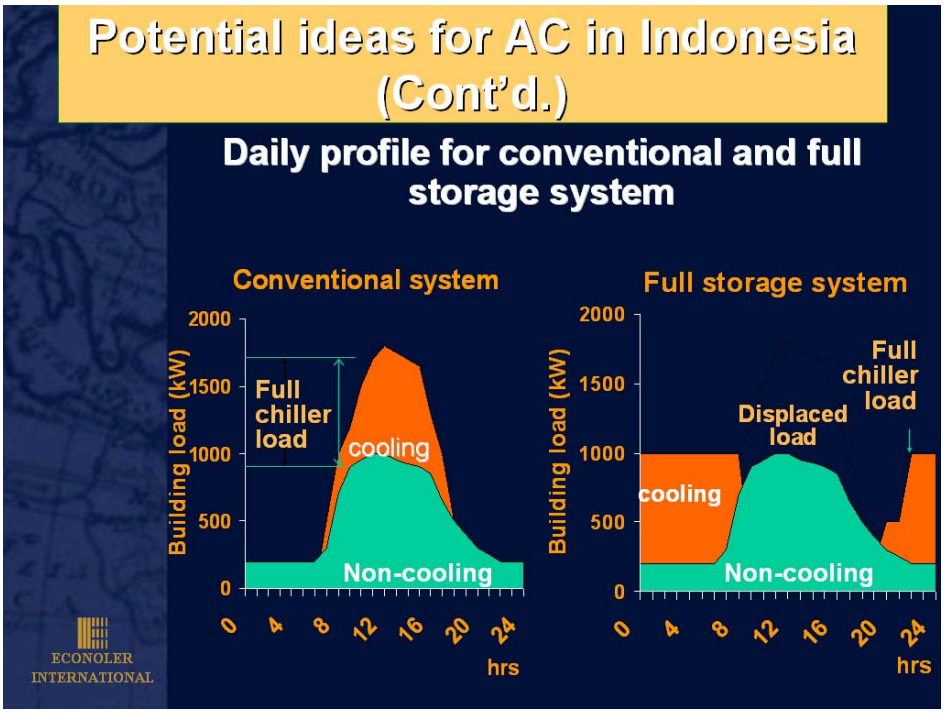

Figure B-4: EE Technologies for Peak Shifting: Ice Storage

9- Cogeneration

Cogeneration is an energy efficient technology that can provide meaningful contribution towards efforts in efficiency improvement in the industrial sector. In the future this technology is expected to become a main choice for energy efficiency application. To encourage the use of cogeneration and to improve the commercial-based capacity of cogeneration both small-scale as well as large-scale, development of such new technologies is needed in order to make it competitive.

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160, rue Saint-Paul, bureau 200, Québec (Québec) G1K 3W1 Canada Tél. : +1 (418) 692.2592 Fax : +1 (418) 692.4899
www.econolerint.com