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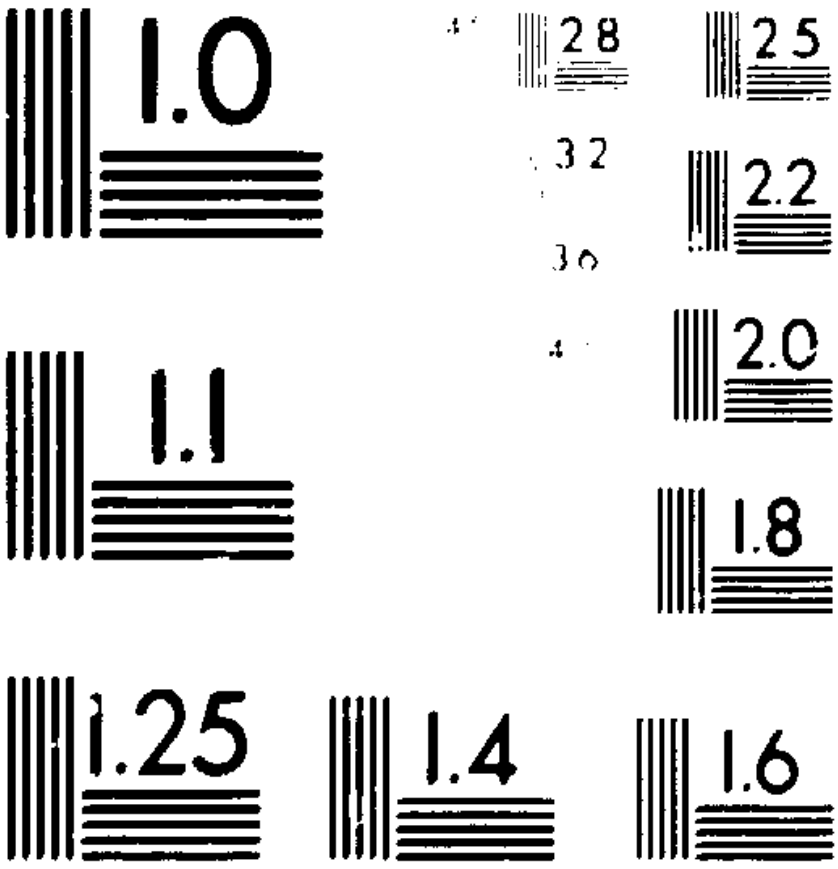

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ENERGY CONSERVATION IN INDONESIA*

by

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1.1. The Energy Situation in Indonesia

Indonesia currently meets 80 % its commercial energy requirements from indigenious oil. The country also has abundant reserves of gas and coal as well as an important geothermal and hydro-electeric potential, largely underdeveloped so far.

The economic development and population growth make demand for energy rising continuously and rapidly in the last two decades. As an idea, the commercial energy consumption in 1963 was 35 MBOE, 125 MBOE in 1978 and 176 MBOE in 1980, or about 5 folds.

The energy consumption growth is averaged at a rate of 13, 7 % from 1971 to 1980 and is dominated by the use of petroleum product. Energy consumption in Indonesia in 1981 amounts is 198 MBOE and is distributed as follows :

SECTOR	MBOE	%
1. Household sector	52	26
2. Transportation sector	52	26
3. Industrial sector	73	37
4. Electric Power sector	21	11
T o t a l	198	100,00

This energy consumption refers to commercial energy, primarily petroleum, natural gas, hydro power and to a small extent, coal. Most of energy consumed originates from petroleum which accounts for more than 80 % of the total consumption of commercial energy.

Being a petroleum exporter Indonesia gain most of her foreign exchange to finance the national development from exported oil, and still hope to be able to increase the oil export as well as to meet the domestic oil consumption.

In connection with energy demand management and conservation, it is realized that there was not enough attention being paid up to recent years. The reason why this happened was largely because of the abundance of energy resources and the need to accelerate economic and social development. Recently, however, the decision maker on energy issues became increasingly conscious of the very favorable impact which energy conservation can have on the economy.

Therefore in Indonesia the approach of energy conservation is split into 2 stages. The first stage is to reduce the domestic petroleum consumption so that more oil can be exported to earn more foreign exchange and the second one is to increase the efficiency of the use of all kind of non renewable energy.

1.2. Energy Policy

Most countries in the world are generally trying to free them selves from dependence on petroleum as the source of energy.

The increase of energy demand form year to year obligated countries to use energy more effectively and efficiently, to reduce the import of energy, petroleum in particular and try to find and develop other domestic sources of energy, both conventional and non-conventional.

In Indonesia steps are steadily being taken not only to enable to meet the increase of domestic demand, but also to assure that oil exports can be maintained. These require the optimal utilization of petroleum energy sources in spite of the development alternative energy resources such as coal, biogas, solar energy etc.

In this connection the Government has than adopted a General Policy on energy, to substitute oil energy sources to non-oil ones where ever possible, and conserve oil as much as possible in order to maintain the oil exports.

The National Policy on energy is an integral part of the national development policy, because of the close link between economic growth and energy supply.

Summing up the objectives of the National Energy Policy, it will then be focused on key issues as follows:

a. To ensure the supply of energy for domestic purpose.

b. Tc continue the supply of energy for export purpose.

c. The economization of the use of petroleum as a fuel.

d. To develop all kind of other energy resources.

e. Environmental protection.

f. To Strenghten the national resilience.

In order to achieve the above mentioned objectives, the Government has pursued the following four basic programmes namely :

a. Intensification of the survey and the exploration of all energy resources in Indonesia in order to know the real energy resource reserve and potential.

b. Diversification of the energy source and use so that oil share to meet the energy demand.

c. Conservation of energy that is to rationalise the energy use for all purpose without harming the development.

d. Indexation, is to decide the most suitable energy for specific certain purposes.

All the first three of these four programmes are now being actuated simultaneously, and the energy policies will be adjusted following the finding in the progress of each program.

Among those programmes the energy conservation programmes can be executed immediately with an inexpensive manner, but whose impact can be achieved in a relatively short time.

This energy conservation policy is being conducted at present through the following programmes.

1. Public campaign and the dissemination of technical information, starting from the Government offices and state owned industries.
2. Technical guidance to intensive energy consuming entities, especially the big Companies which are supported by enough skilled operations, managers experts and funds.
3. Issuance of regulations, already proceded by the Presidential Instruction No. 9/1982.

Energy conservation in Indonesia is directed to achieve a decrease on the dependence of oil which at present contributes about 80 % of total commercial energy consumption. Experiences of some developed countries have proven thet regulatory policies aimed at improvement of the efficiency of energy use and adjustment in fuel prices could have a substantial effect on energy consumption and its growth.

Similar policies in other developing countries have led to saving of more than 10 %. That is why it is believed that proper implementation of energy conservation programmes may lead to significant energy savings.

With the current energy consumption, 3 - 5 % saving target (which normally not difficult to achieve) would amount to 7,000 - 11,000 KBOE.
At present oil price of $ 29 a barrel, it would yield target worth about $ 200 million to 300 million. Compared to the small financial requirement of $ 6 to 8 million probably needed to plan and implement the initial phase

of the energy conservation program, potential economic returns are undoubtedly among the highest than any nation can hope for.

As in other countries the energy conservation in Indonesia also falls into 3 phases or steps, the so called : good house keeping as the first which can be done without any additional budget such reducing material and energy losses. Followed by retrofitting as the second phase, with a minor investment, without any changes except some modification and additional instrumentation, for example is improvement of waste heat recovery system. And the third phase is major changes of process and replacement of machineries where necessary. This phase will lead to a big investment and a feasibility study is a must prior to decision making.

2. SOME NOTES ON ENERGY CONSERVATION IN THE INDUSTRIAL SECTOR INDONESIA

The industrial sector is the largest consumer of energy (consuming 37 % included power sector in 1981), so that it has a great potential for conservation measures. It seems that in this sector, conservation measures could also relatively easy to implement since the location of industries are well defined and the number is relatively small compared to that consumers in the household and transportation sector.

The implementation of the energy conservation program in Indonesia is only in the early stage, and the program is still not compulsory.

The progress is going rather slow and most of industries especially the medium and small scale industries, consider that energy conservation is not urgent for them.

It can be noted that total energy consumed in small and medium industries is about 7 MBOE out of 198 MBOE as total energy consumed for all sectors which less than 10 % or energy consumption in Industries.

Besides that very small amount of energy consumption, in small and medium industries there is a wide range of types of plants, scattering in large areas of the island of Java as well as outer islands.

Measures taken in small and medium industries are still in the beginning. There are only little factories where

preliminary audits have been carried out and it seems difficult to appraise the energy conservation potential as a whole.

Although Indonesia is an oil exporter country, the Government is fully aware to the importance of the energy conservation and lay it down as one among the four basic program for the future, but the implementation program follows a pragmatic step by step approach, based on the trained personel and fund availability.

For the first step, the government already issued a Presidential Instruction No. 9, 1983, in which all government offices and state owned enterprices are instructed to conserve the energy use in their buildings and hicles.

Although there is no figure available, six nonths after the decree issued, a considerable decrease in electric energy consumption was indicated (5 - 6 %).

In line with the spirit of the Presidential Instruction, many energy intensive industries most of than are MNC's and big company actually already put the energy conservation in their efficiency program long before, but not reported to the government, among others : PT. Good Year (Tyre), PT. Semen Nusantara, PT. Semen Cibinong (cement), PT. Unilever Indonesia (food and house hold), PT. Teijin Indonesia Fiber Co., PT. Indonesia Toray Synthetics (mannade fiber), PT. Pupuk Sriwidjaja, PT. Petrokimia Gresik, PT. Pupuk Kujang (fertilizer), PT. Anker Beer (beverages), PT. Kertas Leces.

Many studies has been carried out by domestic as weel as foreign consultants concerning the energy conservation, and the report concluded that the potentials of energy conservation is big, and economically feasible but special notes is put to the medium and small scale industries as follows :

a. Most of the industries are not aware the energy conservation, due to :
   - lack of knowledge,
   - lack of enough skilled people,
   - they think that not much can be saved,
   - lack of knowledge about the national energy policy and international energy problems,
   - lack of sufficient fund,
   - the operation is so simple and traditional.

b. From the industry point, the energy cost element in the cost structure is relatively small, so that costwise there is no urgency for energy conservation.

c. The small scale industries actually are the most waste ful energy operations.

There is not available figures on the result from the energy conservation so far, except PT. Good Year.
The company has begun with the energy conservation programs since 1975, soon after the first world energy crisis. The record of the result of the energy conservation shows by the continuously lower fuel consumed to produce tyre from 1975, 1981, as in the following table :

	1975	1977	1978	1979	1980	1981
Fuel use (Kcal/Kg.Prod.)	11.956	9.279	7.733	6.598	5.630	5.268
% Reduction from previous year	-	8.79	16.66	14.67	14.67	6.43
% Reduction from the begining	-	22.39	35.33	44.81	52.91	55.94
Total production (Ton)	11.481	18.981	22.105	23.013	25.549	27.148

There are two remark that can be drawn from the table :

1. The fuel used per Kg. tyre fall dawn from 11.956 K.cal in 1975 to only 5.268 K.cal in 1981, or 55.95 % reduction.
2. The total tyre produced is increased from 11.480 ton in 1975 to 27.148 ton in 1981. That means the reduction of fuel consumption is shared by the increased of production capacity.

As an illustration it is given results of a survey at a brewery plants, as follows;

. Name : Anker Bir (producing beer)

. Production 263.000 hl (1981)

. Production unit :

1. Brewing unit
2. Fermentation unit
3. Bolting up unit
4. Pasteurization unit

. Energy consumption

HSD : 1.098.100 liter 6.540 BOE (electricity production)
Residu : 2.900.680 liter 19.070 BOE (steam production)
Purchased electricity 6.700 BOE (3.225.181 Kwh).

. Energy specific

Heat : 0.073 BOE per hl of beer
Electricity 0.050 BOE per hl of beer

. Production Unit

1. Brewing unit
2. Fermentation unit
3. Bottling up unit
4. Pasteurization unit.

. Energy Saving
It can be achieve through

a. generating sets replacement;	saving	360	BOE
b. hot water production by recovery on chiller system and generating set;	saving	2.620	BOE
c. steam recompression in brewing;	saving	2.775	BOE
	Total	2.755	BOE

It is reported that the middle range target is to reduce the fuel consumption tc 5.000 K.cal/Kg. tyre produced.
It is a pity that break down of the energy saved by each step of the energy conservation pratice not available, so that could not be presented in this paper.

The success of hte Good Year Indonesia, supported by the good management, and especially energy management, re-peresented by energy officer in charge. The result is achieved from the total energy conservation effort, which can be summarized as follows :

1. To minimize the waste energy by improvement of insulation and leaking prevention.
2. Actuate and improve the preventive maintenance e.g. lubrication, repair, etc.
3. To provide training and supervision to improve the level of the know ledge and capability of the operator & staff in operation pratice, maintenance & staff.
4. To use the material, equipment or sparepart of good quality for de creas the posibility of operation shut downs due to the machine failure and broken down.
5. To intensity and extensify the campaign an energy conservation effort to all production level.
6. To maintain and "good housekeeping" in plant and building.

From the list, actually there is nothing new to what had been done so far, because it is all a standard actions for the energy conservation. The most important and decision factor is the committment of the management to the energy conservation, and consistenly stick to it.

3. METHODOLOGY FOR ENERGY AUDIT

Since energy audit is a new from of audit as generally known, there are possibility many different type of methodologies and approachs.

However the following steps are introduced that worth to be considered :

1) To create an auditors team with the company, and train them properly.
2) To set up the energy audit principles, criteria, system, target standard procedure etc.
3. To decide the energy audit form conform with the condition of the factory, and to install the measurement instrumentation in the correct parts as required by the auditors.
4) To conduct a preliminary survey and instroduction of the energy audit to the selected companies.
5) Try out of the energy audit for at least 6 months.
6) Review the result of the energy audit try out and improve and modify if necessary.
7) Implementation of the energy audit on selected company/ factory, for one year.
8) Review again, and put some adjustment if required to do so and approach the final energy audit form, method and system to be used national wide.
9) Enforce the energy audit as a tool for energy conservation national wide.
10) Establish a permanent board or institution to handle the energy conservation and audit in the government body.

This proposed methodology and approach could be changed in many circumstances, to suite the conditions arised during the preparations period and even later the implementation period.

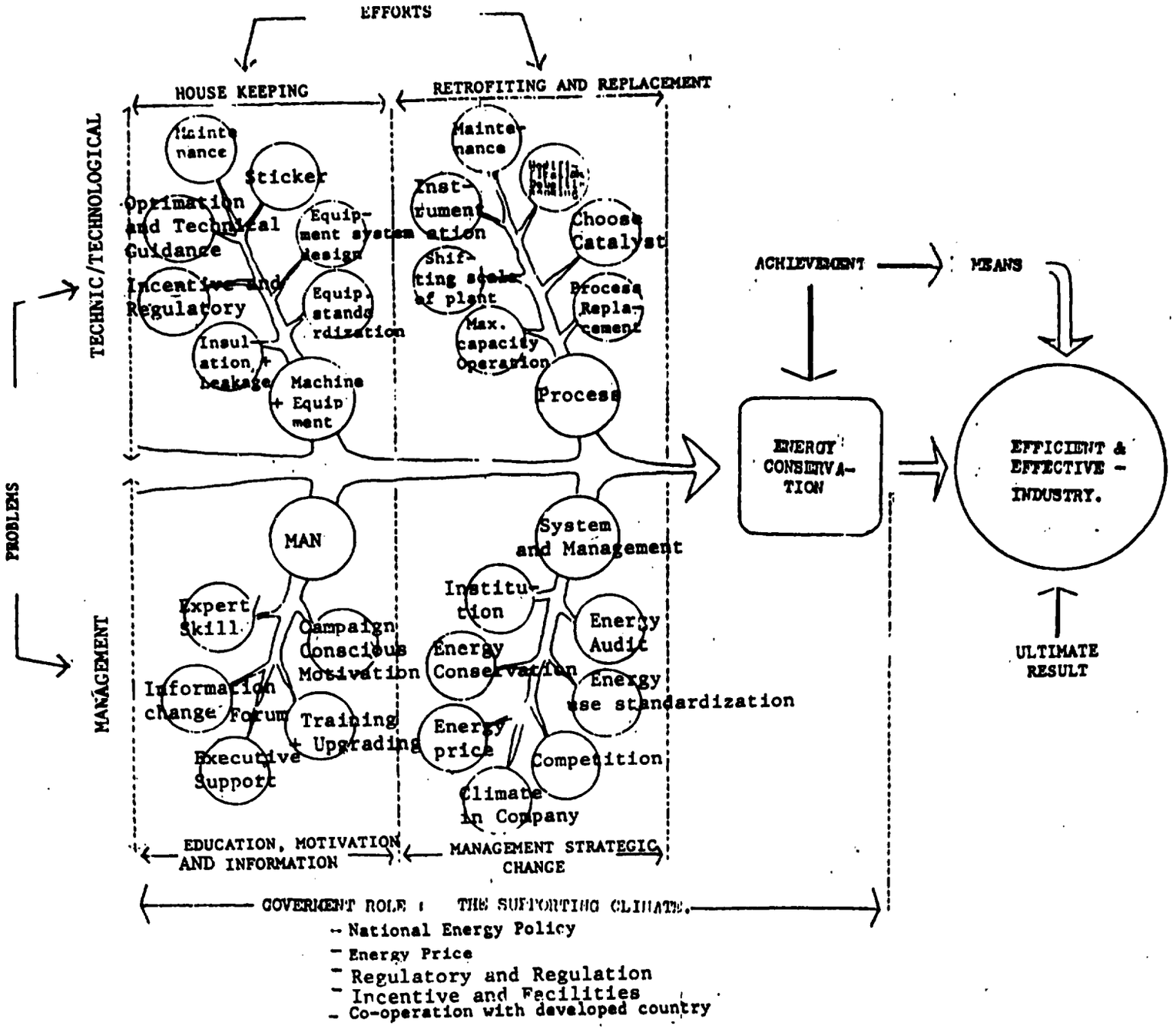
4. MAJOR PROBLEM IN THE IMPLEMENTATION OF ENERGY CONSERVATION PROGRAMMES AND PROJECT

There are many problem in the implementation of the energy conservation an all industry in general, but the most dominant ones which and become major problem among others are :

a. In-efficient and ineffective operations and maintenance.
b. Lack of energy conciousness and trained man power.
c. Lack of concept of energy savings.
d. Old machineries and equipment as well as process.
e. Small scale with simple and inefficient operations.
f. Lack of financial support.
g. Lack of informations, education and technology.
h. Small scale of generating power set due to unavailable purchased power.
i. Attitude and response of the managers and executive to the energy policy.

Moreover is the scattering of small industries within the island of Java as well as outer islands.
As consequence it is difficult to get periodical report, from which it is expected the consumption flactuation and trend of the plants can be monitored and compared to the energy consumption of other plant using the same process. Refering to the specific energy consumption for each type of process which can be achieved by energy conservation measures, the specific energy consumption for each type of process in small and medium industries can be specified.

The solution of the problems are not simple, but quite complicated as shown in the following chart. In this chart shown the inter relation, between grouping of the problem, efforts that have to be carried out and the design of government support at national level to stimulate and accelerate solution of the problem faced by the energy conservation program in the country.


EFFORTS
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TECHNIC/TECHNOLOGICAL
PROBLEMS
MANAGEMENT
Maintenance
Sticker
Optimation and Technical Guidance
Equipment system design
Incentive and Regulatory
Equip. standardization
Insulation + leakage
Machine + Equipment
Maintenance
Instrument
Choose Catalyst
Shifting scale of plant
Process Replacement
Max. capacity Operation
Process
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MEANS
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EFFICIENT & EFFECTIVE - INDUSTRY.
ULTIMATE RESULT
MAN
System and Management
Expert Skill
Campaign Conscious Motivation
Information change Forum
Training + Upgrading
Executive Support
Institution
Energy Audit
Energy Conservation
Energy use standardization
Energy price
Competition
Climate in Company
EDUCATION, MOTIVATION AND INFORMATION
MANAGEMENT STRATEGIC CHANGE
GOVERNMENT ROLE : THE SUPPORTING CLIMATE.
- National Energy Policy
- Energy Price
- Regulatory and Regulation
- Incentive and Facilities
- Co-operation with developed country

The most dominant factor is of course the management response and attitude to the energy conservation, since all policy in the company started from the management board. The resistant from the management to the energy conservation is mostly to lack of under-standing of the mission involved within the energy conservation as one four basic programmes of the government for the long term objective.

Most of the managements are more interested in their short term program based on profit and loss point of view.

As shown in the chart, in a longer term the ultimate result of the success of the energy conservation program is actually is a better efficiency and effectiveness of the operation at the industry.

Government Support :

In this connection, it is believed that government plays an important role on determining the success of the energy conservation program.

The desired forms of government support at national level, among others :

a. To establish an advisory bodies and information centre to assist and guide the industry to adopt energy saving technologies.

b. To provide the provision of tax and other incentives as well as soft financing for buying/importing.

c. To promote Government policies to encourage users to suite local conditions (trough exports) and to discourage energy wise in-efficient units.

d. Formations of technical bodies to deal with technology, energy conservation and optimization.

e. To lay down the energy consumptions standard for auditing and self auditing purpose.

f. Training of supervisory staff for energy saving in developed countries with good in energy conservation.

g. Due to the attention an energy conservation must be carried out in the house as well as the national training programmes for skilled workers and operators.

h. To enforce law and regulation concerning the national use of energy (energy conservation law) as soon as posible.

It is realized that there are many constraints facing by the energy conservation program and the solutions could not be done in a short time. But it is understood that energy conservation is a must that has to be carried out, so that while the government prepare all people concerned should start from their position and environment. Actually we loss nothing by the implementation of energy conservation in the industry, except may be some of our conviniency and previlige, but it will lead to a higher efficiency and a better effectiveness of the operation and in turn will improve the competetiveness of the industry.

In national we already participate to solve the national energy problems, and in more broad view, we participate to save the future from the shortage of energy.

5. HOW TO STRENGTHEN ASEAN CO-OPERATION ON ENERGY CONSERVATION

To strengthen ASEAN Co-operation on energy conservation for small and medium industries, the following actions are suggested :

1. Exchange of information and experience among ASEAN member countries, including monitoring and controlling energy conservation programmes.
2. Promote joint energy conservation project and program including :
   - training,
   - auditing,
   - implementing,
   - studi tour,
   - seminar and symposium.

In this connection it is also proposed to conduct those actions through a technical assistance from country (ies) having more experiences in energy conservation for small and medium industries.

THE LINGKAGES BETWEEN AN ENERGY CONSERVATION AND NATIONAL ENERGY PROBLEM AND POLICY