THE PROCEDURE, PATH AND PARTNERS FOR ENERGY EFFICIENCY PROMOTION IN INDUSTRIES

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1. Introduction

Asian developing countries have been laggers in terms of setting up energy efficiency initiatives. When most industrialised nations were greatly concerned with energy demand management and security of national energy supply following the oil price shocks in the 70's, developing countries were not so much affected then due to their low energy demands associated with poor economic growth. Governments acted quickly to absorb the increases in international energy prices and subsidised the energy supply monopolies. In many centrally planned economies, inefficient public sector enterprises with poor track record in energy management were allowed to flourish under government protection. In view of the low energy prices in the domestic market, the end-users preferred to opt for inefficient equipment and appliances with low first-costs and suppliers of such products and services seldom emphasised the virtues of adopting energy efficiency.

In the latter part of the 80's, situation become quite different. The economy had picked up and many countries were facing a phenomenal rise in energy demand whose rate of growth was typically higher than that of the economy. With the improvements in living standards, many end-users were switching from traditional energies to commercial ones, thus putting an additional burden on the nation. The share of the annual national budget allocated for energy sector increased incessantly till it was no longer viable for the governments to absorb the price subsidies extended to the energy utilities and the end-users. Even the countries which were net exporters of oil products were affected as their foreign exchange earnings through the sale of oil started dwindling. These changes led the countries to look with renewed interest at energy demand management as an integral part of the national energy policy.

Initiatives were taken by the national authorities to develop policies of promoting energy management as an integral part of the overall efficiency drive and more recently, there is a genuine concern for environment protection. The industry sector particularly was looked upon as an ideal target because of its significant contribution to the rapid growth of the gross domestic products and it is recognised as an important user of energy and source of environmental pollution. The types of actions undertaken varied from country to country and they included information dissemination, training programmes, energy audits, subsidies for efficient appliances and processes, developing standards and labels, etc. However, more emphasis has been given on influencing the behaviour pattern of

the end-users. The task of instituting structural changes and convincing the end-users to choose more efficient appliances and processes in order to achieve long term benefits is more daunting now due to the relatively low international energy prices.

Looking at the situation in different Asian countries, one may conclude that the energy users in the industrial sector are fairly well aware of the importance of achieving greater energy efficiency for better competition in the domestic and international market. And yet in many cases, they are rather hesitant to make large investments and long term commitments. There seems to be something missing in the overall decision making process which is a combination of many factors such as uncertainty about future energy prices, absence of right partners for project implementation, lack of guarantee about the future prospects, unattractive returns on investments, etc.

One cannot obviously expect the market economy approach alone to resolve this as the outcomes not only affect the economy but also the quality of life and the environment. All energy inefficiencies have a cost which is often passed on to someone else (tenant of a poorly managed building, customer of a inefficiently produced commodity, etc.). The money spent for procuring energy which is wasted in unproductive manner could have been directed to productive investments or improving the quality of life. Therefore there is a need for defining an institutional framework, the path, procedure and players for promoting energy efficiency in the manufacturing sector.

2. The Decision Making Path

As far as energy efficiency in industry is concerned, industries themselves are the decision makers. The actions to be undertaken by them can be classified into two categories: one is a new way of looking at and dealing with the existing 'facilities' at the factory (i.e., energy, water, air, environment, etc.) which were not perceived as a burden earlier; and the other is the commitment to make investments which will provide long term benefits to the industry itself. The former is a pre-requisite for the success of the latter because there is no guarantee that investment alone can lead to substantial savings if no conscious efforts are made to operate and maintain the facilities in optimum conditions.

Before an industry decides to make any investment, the risks and the benefits associated with it are required to be assessed. The idea of 'energy efficiency investment' is still quite new in many circumstances and the use of standard methods or yardsticks may not suffice for various reasons. For instance, the user may not be aware of the pros and cons of implementing a specific energy efficiency measure or simply the market for energy efficient appliances or processes may not exist. In such a circumstance, there is a need for the national authorities to define and establish a coherent energy efficiency promotion policy which should assure active participation and co-operation of the different entities playing an important role for industrial promotion in a country.

The first task is to define a logical path which will gradually push the industry towards the energy efficiency goals (see Figure 1). Analysis of the

experiences gained by several countries shows that this path may typically be composed of five distinct stages or 'processes', pursued in a chronological manner.

The starting step may be activities related to the creation of **'awareness'** in which the user is sensitised through various mass communication media about the virtues of energy efficiency at the micro and macro level. The typical examples shown can be related to behavioural changes such as switching off machines which are idling in a production chain. As an outcome, the manufacturer is expected to become aware of the advantages of improved energy efficiency at the factory (shown by 'A' in Figure 1).

Awareness in industry is best promoted through inter-professional exchanges of information such as conferences, seminars and workshops organised by trade or engineering associations. Wide publicity given to exemplary energy efficiency realisations in the media is also very effective to propagate awareness, especially when the spokesperson represents a manufacturing firm or enterprise.

Once the plant management becomes aware of the way energy is used in the factory and its economic and environmental consequences, many questions may arise as to how to practically implement energy efficiency measures or the technical, economical, financial and legal aspects associated with it. Therefore the next step is to provide **'advice'** through a credible and unbiased entity. In contrast to the mass media approach in the 'awareness' campaign, this advisory or counselling service is required to be more personalised and delivered at the proximity of the end user. Typical activities in this step may be to diagnose the existing energy problem in the factory, recommend

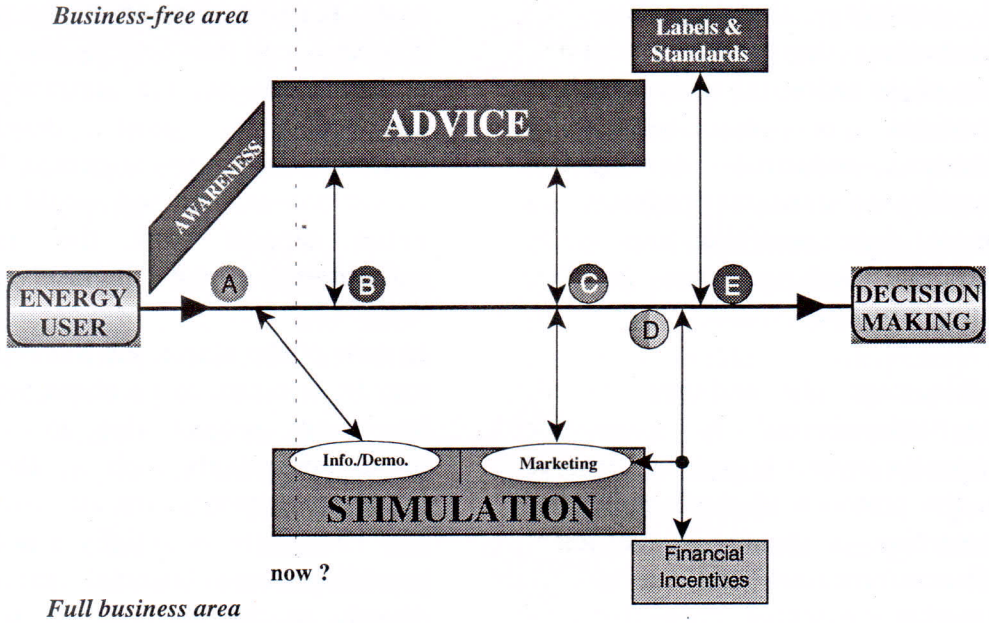

Figure 1. The decision making path

appropriate technical solution, roughly assess the economic benefit, and recommend reliable addresses where further assistance may be available for in-depth analysis and actual implementation. As a result, on the basis of qualified, credible and independent opinion free from vested interests, the manufacturer becomes capable of cross-checking the validity of information received from various channels regarding the action to undertake and the manner to implement it (shown by 'B' in Figure 1).

The advisory services would be best rendered by providing a one-stop window to the customers in terms of technical, economical, financial and managerial information related to energy efficiency. The various tasks could include assisting to conduct the so-called energy audits in the factories, organising training of personnel in-charge of energy management at the plant, providing a reliable list of suppliers of equipment and services, advising on the applicable regulations and assessing the relevance of implementing the proposed schemes. Many of the industrial entities such as federations or associations of industries, industrial development authorities or standards institutes can increase their portfolio and easily incorporate such activities in their existing structures.

At this stage, the end-user requires some '**stimulation**' to make the decision to invest. In order to achieve this, the presence of the suppliers of commercial energy efficient appliances/processes and services in the market is essential. These firms are normally in a position to make attractive offers and services as a package to the factory as they are specialised in the specific area and earn their living from this activity. The suppliers of equipment and processes and engineering firms already existing in the market are capable of taking over this role with some initial assistance and incentives from the national authorities. The end-user has thus access to commercial entities offering energy efficient goods and services (shown by 'C' in Figure 1).

As investment decisions are rarely neutral, the stimulation phase would involve interacting in a full-business area with players having vested interests. The medium- or long-term goal here should be to establish an innovative 'energy efficiency' sector in the market which is in direct competition with the traditional 'energy supply' sector. This can be in the form of energy service companies which provide a range of energy services to the client, including the option of arranging finances, handling operation and maintenance as well as monitoring the actual performance of the equipment or process. In some cases, the remuneration to the service company can be tied to the actual performance or the improvements achieved. In most developing countries, these service companies are almost non-existent and would require initial support from the national authorities to establish themselves.

In spite of the above, the manufacturer may be reluctant to go ahead with the investment project due to various initial perceptions such as the high initial investment, lack of financing, etc. Thus there is initially a need for providing some financial '**incentive**' directly to the end-user or through indirect means to others who are involved in the energy efficiency project implementation (shown as 'D'

in Figure 1). Here, the objective should be clearly to assist in the initial promotion of commercial offers of products and services and not to introduce another subsidy and distort the market forces in play. The results and experiences gained by the manufacturers with the first actions undertaken should permit them to have higher confidence in energy efficiency and the necessary cash-flow generated from the savings should push them to undertake further initiatives.

Financial incentives are generally available in many countries to facilitate the development of industries, either to cope with the export market or for environmental protection. Similar incentives may be initially extended to projects requiring important investments and having not so attractive rates of return. These may take the form of tax exemption on imported equipment, higher depreciation rates or capital deduction allowances. Indirectly, leasing companies may be given access to cheaper borrowing rates for a selected list of energy efficiency equipment. This has been practised in some cases for promotion of renewable energy products in rural markets where individuals have limited access to the necessary capital.

Finally, it is necessary to complete the picture through a 'carrot and stick' approach. All promotional activities should be accompanied by legislative measures which compel those few who are unwilling or are lethargic to take any action in spite of all the assistances provided. Energy labels and '**standards**' set up may be more or less mandatory. The standards may apply to individual products sold in the market to assure a minimum energy efficiency qualification just the way quality assurance is guaranteed. Similarly, specific energy consumption standards may be set up corresponding to the most energy intensive industrial sub-sectors on the basis of a macro-analysis at the country level. Of course, the targets set must reflect the benchmarks which are achievable within the prevailing socio-economic context, leaving scope for revision and updating as a function of time. In order to meet the standard, the energy user may either carry out the task on his/her own based on the previous supports extended or choose to sub-contract to an energy service firm to implement the necessary measures (shown as 'E' in Figure 1).

Labels and standards are getting to be increasingly important for various reasons. A minimum guarantee may be obtained on the performance of equipment sold and quality products can be offered by the industries in the market. Moreover, with the globalisation of the economy, countries have to compete with the others to secure a share of the export market. Standards may be set and updated in a progressive manner so that the qualities of the industrial products could gradually become comparable to those of international standards. In order to provide effective results, the pace of implementation of the standards should be adequately set. Clear distinction has to be made between retrofits or new installations. A properly designed and implemented efficiency standard can greatly influence the overall energy demand pattern.

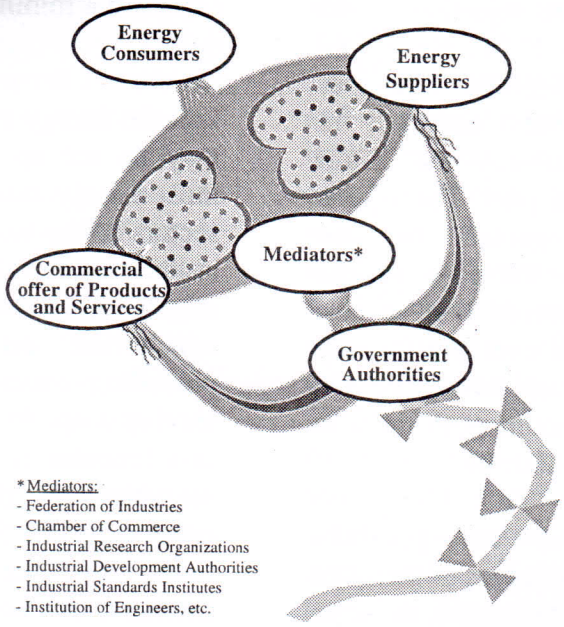

Figure 2. The players involved in promoting energy efficiency

3. Partners/Players To Promote Energy Efficiency

Successful implementation of energy efficiency requires that it becomes an integral part of the national energy policy and involves the participation of already existing players in the field. The concept therefore has to be built using the existing institutions and should provide a comprehensive view of the role of each player and define the relationship among each other, thus allowing to develop a co-operative win-win strategy. Priority should therefore be given to the private sector to take the lead while the public authorities only deal with generic issues.

The different players involved in this endeavour can be classified into five categories: energy end-users, energy suppliers, providers of commercial products and services, various mediators and public authorities (see Figure 2).

The manufacturing sector as the **energy end-user** is reasonably aware of the importance of energy management for better competition in the market. Yet there seems to be a lack of urgency to carry out any improvement, often because there is no accountability of how energy is used or because there is no benchmark with which the present performance can be compared with. Moreover, most enterprises are averse to the idea of some outsider intervening in the factory activities. They would prefer that the in-house personnel be trained to conduct energy efficiency activities in the factory. Most often, priority is given to the production chain and as there is an inadequacy of qualified personnel, the energy efficiency issues are neglected. Therefore, understanding the concept and commitment of the management at the highest level is extremely important. Once the top management is convinced, it is relatively easy to bring in external expertise to look at the

plant energy performance just the same way external auditors are appointed to assess the financial position of an enterprise.

The **energy suppliers** are undergoing drastic changes in the region. In the past, most of them have been allowed to flourish as public sector enterprises with the patronage of the state. With the rapid surge in energy demand associated with the economic development, state is finding it practically impossible to support these entities in the same manner. As a result, private investment is being solicited and energy price revision has become a priority item in many agenda. Due to greater competition for survival, many energy suppliers are discovering areas where energy conservation has a greater economic merit than energy supply. Learning from the experiences of industrialised countries, some energy suppliers are seriously toying with the idea of providing incentives to the end-users and equipment manufacturers for their voluntary contributions towards energy demand management. This is expected to allow these energy suppliers to defer investment required for capacity expansion, to reduce the overall cost of energy supply and thus become more competitive in the market. Even though the energy suppliers are more familiar with the techniques of energy supply than those related to the end-use, they can in this manner play an important role to promote the cause of energy efficiency.

Most **providers of commercial products and services** believe the market is not yet ready for energy efficiency and there is limited opportunity for business. Two main reasons for this are the distortion in energy prices and the buyer's major concern to minimise the initial investment. In view of the impending revisions in energy prices and stricter environmental regulations, energy efficiency is likely to create new market for products and services if it is accompanied by innovative financing schemes, leasing facilities and well-tailored service packages. Commercial banks and financial institutions can participate in this scheme positively by providing moderate lending rates in the initial take-off phase. As most end-users are averse to the idea of being the 'first' to implement a new idea into practice, public authorities may assist the providers of commercial products and services to launch selected 'demonstration projects' and disseminate the results to the others through information campaigns and industrial gatherings.

The **mediators** act as a very important link as they tend to operate in business-free areas and provide unbiased opinion/judgement. These mediators may be composed of a wide and diversified group of actors, representing public as well as non-governmental organisations, and assuring distinct roles. These are federations of industries, industrial development authorities, standards institutes, scientific and industrial research organisations, educational establishments and various associations. Some of these directly defend the interests of the industries whereas others assist the industries in assuring greater competition in the domestic and international markets. Their activities may encompass information dissemination, advisory services, feasibility studies, monitoring of performance, development of standards, transfer of technology, etc. Greater understanding and close interaction between the mediators and

the industries as well as the other actors is essential for successful promotion of energy efficiency.

Lastly, the **public authorities** have a delicate role of assisting in the promotion process. Depending on the situation and the need, these may represent national, regional or local authorities. They are required to assure the role of a catalyst without appearing to be interfering in the private sector activities. It is comparable to the role of a conductor of an orchestra who makes sure that there is a perfect harmony among the musicians playing various instruments in the manner clearly assigned to them. The way in which a piece of music is to be played and the time at which a specific instrument is to be played are already decided by the composer and the conductor is only there to support and encourage the artists to express themselves through their musical instruments without marching on the toes of fellow artists. The conductor cannot be substituted for anybody in the orchestra. Similarly, the role of public authorities is not to take over the responsibility of the other players but to encourage and support them to fulfil their pre-defined tasks in the best possible manner.

4. Procedure To Implement An Energy Efficiency Policy

Once the global energy efficiency potentials have been assessed and an agreement has been reached among the different players within a conceptual framework with the leadership of the national authorities, it is necessary to define the procedure or the manner in which the five distinct functions or processes elaborated above can be gradually implemented. These functions should be defined such that starting with behavioural changes, the end-user gradually shifts towards longer term benefits associated with investments in new and efficient equipment and processes in a phased manner. Therefore, for each of the functions defined, it is necessary to elaborate the implementation procedure by including the required tools, involvement of organisations, allocation of human and financial resources, definition of targets and partners, and most important, monitoring and evaluation (see Figure 3).

As an example, let us consider the steps related to sensitisation. The tools required are establishment of specific technical information centres closer to the industrial estates, provision of information through telephone or other innovative media such as Internet, setting up of training centres with adequate facilities, creation of database of equipment and processes, their costs and benefits as well as the list of suppliers, etc.

When it comes to defining the organisational involvement, one should include the national, regional and local authorities. The energy supply sector can be mobilised to sensitise the customers about how they can improve energy efficiency and reduce their energy bills. Another effective way is to approach the organisations affiliated to specific industrial sub-sectors (associations of steel, cement, paper mills, etc.) who would be more than happy to render value-added service to their members.

More than the financial resources, what is important at this stage is the human resources in the form of highly skilled engineers and economists who are able to convince the enterprises about the

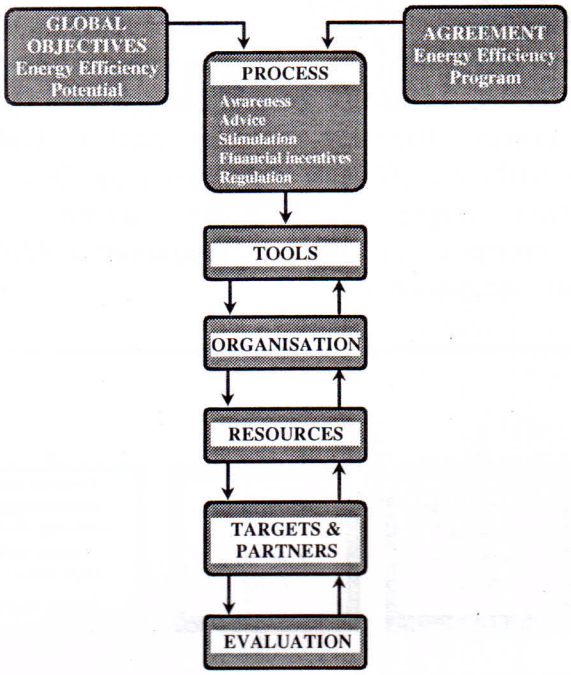

Figure 3. Implementation of an energy efficiency policy

technicality of the proposed modifications and the economic and financial viabilities of their implementation. These qualified personnel should be sufficiently familiar with the operational strategies of the industries and should have undergone adequate training on energy management practices.

To start with, only large and energy intensive industries may be targeted in order to achieve tangible results and to highlight the achievements to the others. It is equally important to establish partnership with consultants and providers of equipment and services who are likely to provide valuable information necessary to convince the end-user and who would play a more active role in the subsequent stimulation stage.

Monitoring and evaluation are very important as they allow to have a feed-back mechanism and to assess if the targets set have been achieved or if changes are required in the process to adapt to the prevailing conditions. The programming may be short-term and method of evaluation may be kept simple at the initial stages of advising and sensitisation in order to obtain a quick feed-back and to rectify any anomalies encountered before proceeding to the next stages of activity.

5. Cyclic Process Of Energy Efficiency Promotion

It may be concluded by pointing out that promotion of an effective energy management policy is a cyclic process which needs to evolve with time. It requires periodic updating of databases and action plans both at the macro and micro level, refining of the tools to adapt to the complexity of the situation (see Figure 4). Equally important is a perfect co-ordination among the

various actors playing important roles in the decision making process. Only then can such a conceptual framework be conducive to the effective implementation of energy efficiency policies of a country without requiring to set up unrealistic targets, to implement radical changes, or to sacrifice the national socio-economic objectives..

Acknowledgements: *The ideas presented in this paper are an outcome of various discussions and interactions the author had with Mr. Michel Labrousse, Director of EXPLICIT and Mr. Bernard Devin, a senior consultant at ADEME.*

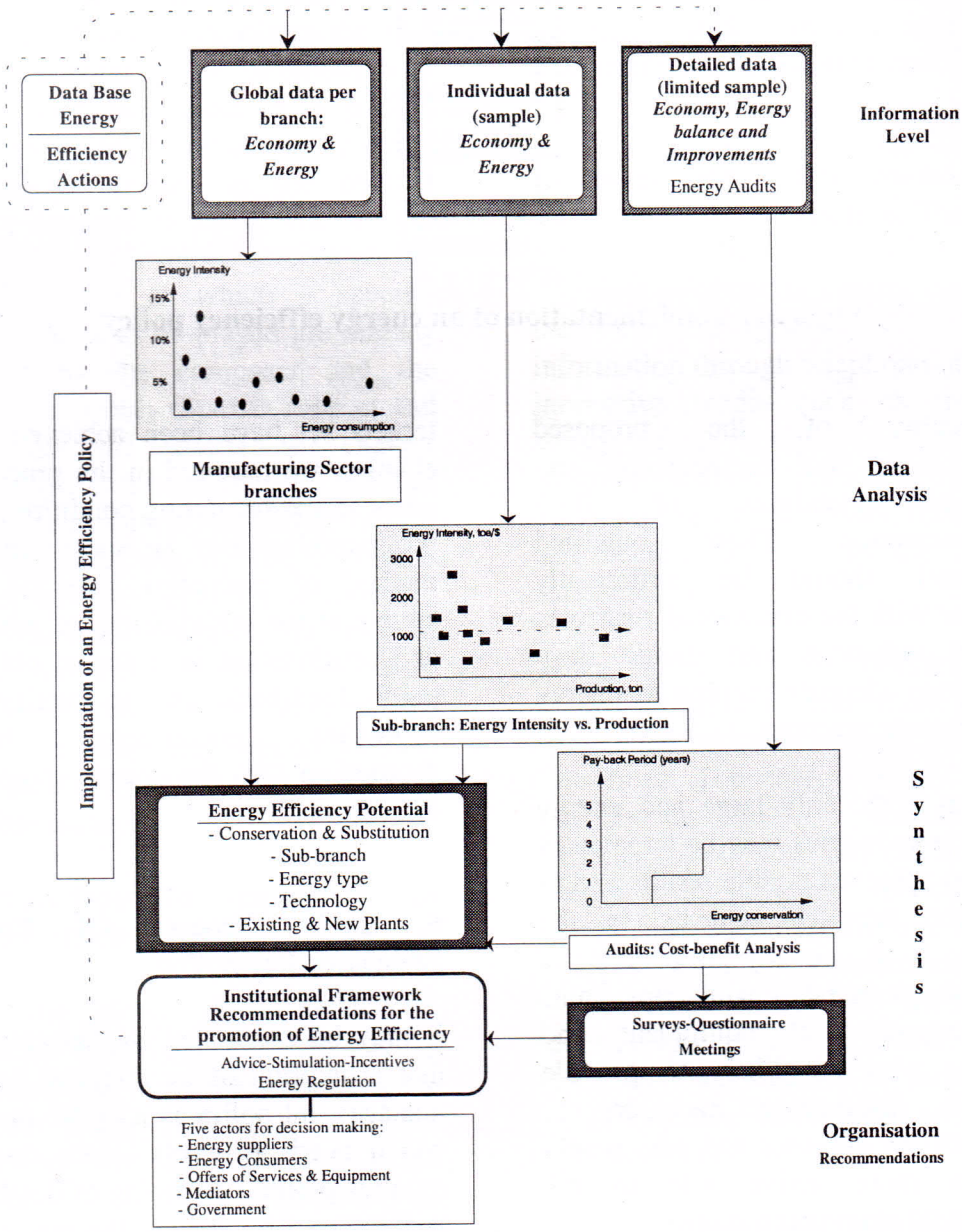

Figure 4. Cyclic process for the promotion of energy efficiency in industry