

INTERNATIONAL SEMINAR ON RATIONAL USE OF ENERGY IN INDUSTRY

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ENERGY CONSERVATION AND SAVINGS IN
COLOMBIA

*Ministry of Mines and Energy
Colombia*



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Planning Office

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Republic of Colombia

1. INTRODUCTION

The energy situation the world has been living in since the beginning of the 1970's has reassessed the criteria and bases of the national, regional and world energy scenarios.

During the present era, the energy policies outlined must undoubtedly include adjustment mechanisms as well as substantial variations in energy consumption structures based on resources that are depletable in the short and medium ranges.

From the standpoint of supply, an adequate pricing policy must be conceived - a policy that, by consulting socio-economic reality, would allow exploration and exploitation programs for traditional energy sources, as well as exploration of new technologies for the development of potential and alternative energy sources.

When dealing with demand, mechanisms allowing for rational use of widely-available energy sources must be designed within concrete policies, rational use taking into consideration regional and national resources and reserves and including conservation programs and energy savings, not only as a form of optimum utilization, but also as a new energy source.

Based on this concept, Colombia is moving forward with a program of such nature; and even after having taken only the first steps, they will have broadly favorable short-range repercussions, not only for national economy, but also, we believe, for the regional realm.

2. COLOMBIAN EXPERIENCE IN THE INDUSTRIAL SECTOR

The Colombian Energy Balance, compiled by the National Energy Study, determined a 1979 industrial sector consumption of 42,440 Tcal, which constituted 31% of the total national consumption. If vegetable fuels are not included, the consumption figure for the industrial sector is reduced to 39,530 Tcal.

Within the same sector, in-depth studies have been made concerning some branches of industry that account for more than 88% of energy consumption therein, indicating, as well, specific and important possibilities of conservation and substitution in each branch; these possibly reach figures of 9,000 Tcal, which, in economic terms, would represent U.S. \$ 197 million annually.

The branches studied were: the petrochemical industry; the cement industry; the iron and steel industry; the food industry; and the pulp, paper and textile industry, all within the National Energy Study. For its part, the Technological Research Institute has done studies in the areas of glass, liquor distillation and chemical products.

The CIDI has conducted specific studies, at the level of companies, which complement the above-mentioned studies. Among them are: The Antiochian Liquor Factory, Inextra Soap, Primical Lime, and The National Chocolate Company.

2.1 National Energy Study (ENE)

The National Energy Study (ENE) has already provided a framework for global, sectoral, integrated, and coherent analyses that aid in understanding the various and complicated inter-relationships of the Colombian energy system. With relation to international experience, it has analyzed the energy conservation potential in the six most important subsectors. Just for the moment, it has omitted studies on glass and brick subsectors. With reference to conventional energy consumption (including electricity), the industrial subsectors can be ordered as follows:

<u>Subsector</u>	<u>Participation</u>	<u>Consumption 1979*</u> <u>10⁵ Tcal</u>	<u>Savings</u> <u>Potential 1990</u>
1. Petrochemical Industry (refineries incl.)	34.3%	13.50	17%
2. Cement Industry	18.7%	7.40	10%
3. Food and Beverage Industry	12.0%	4.76	15%
4. Iron and Steel Industry	9.2%	3.65	10%
5. Textile Industry	7.4%	2.80	10%
6. Pulp and Paper Industry	5.9%	2.34	5%
	<u>87.5%</u>	<u>34.45</u>	

* Without vegetable fuels

The ENE proposes, for 1990, to achieve conservation and energy savings greater than 9,000 Tcal in the afore-mentioned sectors, depending on measures taken in that respect. These sectors must concentrate on general possibilities such as:

- Improvement of energy management
- Increase in present equipment efficiency
- Analysis of processes and energy improvement
- Analysis and implementation of new processes
- Installation of new equipment
- Energy recuperation within each process
- Implantation of other energy sources

2.2 Technological Research Institute (IIT)

2.2.1 Glass

With a sample of seven companies that cover close to 38% of the national glass production, the IIT, basically analyzing energy use in the adaptation of raw material and in the transformation and shaping of the final product, reached the conclusion that, compared to international technical parameters, this industrial branch could save more than 30% of its current consumption. The main areas determining inefficient consumption are: low combustion efficiency; age of furnaces and equipment; and fusion-furnace capacity.

2.2.2 Chemical Products

As in the previous case, the IIT, with a sample of seven companies that consume approximately half a million gallons of fuel oil equivalent, reached the conclusion that these companies would be capable of saving more than 40% of their current consumption. Here, it is important to consider the possible utilization of residual heat recovery as a result of certain

chemical reactions not taken advantage of for energy purposes. Here, measures could be taken in the areas of feedwater, process control, condensate return, and the maximum utilization of available capacity.

This industrial branch demonstrates the inconvenience of the fact that each one of the companies and plants has its own particular processes.

2.2.3 Liquor Distillation

The IIT used a sample of five companies in this group, which surpasses 40% of the production. The savings potential would be close to 1.2 million gallons of fuel oil equivalent, this constituting 18% of current consumption. Such savings would be possible through the following measures: preheating of combustion air; installation of preheaters; repairing of defective insulation; thermal insulation of the distilling column system; as well as measures for the operation itself and for residual heat exploitation.

2.3 Research Center for Integral Development (CIDI)

The CIDI has performed the following audits, on an experimental basis:

THE ANTIOCHIAN LIQUOR FACTORY - Duration four months. Evaluation of the fuel-steam system: a savings of 8% was obtained. Evaluation of the electric power system: a savings of 1.8% was obtained.

INEXTRA SOAP - Duration six months. Evaluation of electrical steam-fuel system: initially, a savings of 8% was obtained, and after certain implementations, savings of from 12% to 15% were reached.

PROMICAL LIME - Duration three months. Energy savings in the lime furnaces approximately 10%.

NATIONAL CHOCOLATE COMPANY - Duration two and a half months. Study of six cacao-toasting machines: a savings of 4% was achieved without any implementations except for operational changes.

2.4 Campaigns and Publicity

In this area, actions taken in Colombia are few; and those with any continuity at all are oriented towards the residential or transportation sector. In these last-mentioned areas, it is worth noting the campaigns being carried out by Ecopetrol, which, by using different means, seeks to rationalize gasoline consumption. There is also the campaign formed by ISA-Bank of Colombia, which attempts to save on residential electricity consumption in response to the recent crisis, which has hit the industrial sector hard.

In relation to industry, the most consistent action taken has been that of ANDI, which has put into circulation a manual on energy conservation and savings.

3. PROGRAM PRIORITIES

3.1 Placement of Program in Time

For the purposes of placing the program in time, not just from a chronological standpoint, but also so as to facilitate its smooth and oportune development, it is based on two conceptual pillars: general objectives and measures to be taken.

CONCEPTUAL SCHEME OF THE PROGRAM IN TIME

<u>RANGE</u>	<u>OBJECTIVES</u>	<u>MEASURES</u>
Short and Medium Range	To avoid squandering	Voluntary Persuasive Coercive

<u>RANGE</u>	<u>OBJECTIVES</u>	<u>MEASURES</u>
Long Range	To change habits and structures of consumption	Voluntary Persuasive Coercive

3.2 Program Bases

3.2.1 Diagnosis

To compile a detailed inventory of the processes, equipment and consumption in each sector, as well as possibilities for conservation and energy savings.

To further explore this sector, progress is currently being made to institutionalize and implant a system of energy information (SIE), which, although having as its fundamental objective the supply of input for energy models, will constantly and systematically report valuable information for the conservation and energy-savings program.

Furthermore, other complementary work is being done; though currently being centered on the industrial sector, it will extend to others during the second half of 1984. It is as follows:

The Ministry of Mines and Energy has, with the help of the National Administrative Department of Statistics (DANE), contracted the gathering of information dealing with energy consumption in the processes of the industrial sector; the objective being to provide and update ENE's frame of reference. This survey, along with the information on total electricity consumption, will also make it possible to select representative plants for other energy audits.

The ENE will be surveying industrial energy use, at the plant level, with the objective of learning about company processes and equipment.

This inquiry will cover 515 companies, each employing more than 200 workers. It will take place beginning in May and will have the collaboration of the National Association of Industrialists (ANDI).

As for the transportation sector (which, although it is not a topic of the seminar, merits attention), with sponsorship from the OAS, a program is being carried out on energy consumption, substitution and conservation. This study has already outlined the consumption for each mode of transportation, energy efficiency, type of service and form of energy, as well as critical areas for conservation and energy savings.

3.2.2 Manpower Training

One of the fundamentals for program success is on-going sectoral job training. For this purpose, two clear actions are proposed.

3.2.2.1 Technological and Methodological Assimilation

At this point, we will take a look at the experiences of other countries in reference to conservation and energy savings.

The Ministry of Mines and Energy has sent officials to Brazil in order to study the Brazilian program completely; also, through a Technical Assistance Agreement with the French Government, they have received training.

The CIDI of the Bolivarian University in Medellin, through an agreement between the Colombian Government and the UNDP, also incorporates within its activities human resource training, and involves the transfer of expertise that certain companies have in program development to university students.

The IIT of Colombia, through an agreement signed with the IPT of Sao Paulo, Brazil, as well as through visits to Spain and Brazil, has analyzed

the methods and consistency of the structured model in Spain and the manner in which the IPT provides technical assistance to industry.

The IIT has likewise committed itself to analyzing the diagnosis and to studying engineering solutions having to do with industrial energy savings.

3.2.2.2 National Training Efforts

In search of a constant flow of trained personnel for the medium and long term, the program has the following plan.

The Pontifical Bolivarian University of Medellin has introduced subjects directly related to the Program of Energy Conservation and Savings as an elective within the academic program of certain careers.

For next year, the Ministry will incorporate personnel training in the field of energy into its agreements with the education sector. This makes up part of a general training program for the Mining and Energy Sector, which will cover the current deficit at an approximate cost of U.S. \$45 million over the next ten years.

The bases for national training will be provided by methodological and technological assimilation, as well as by Technical Assistance Agreements.

3.3 Program Mechanisms

3.3.1 Energy Audits

After obtaining a clear diagnosis of energy use and the set-up that determines current consumption, further energy audits will be carried out to evaluate, in a more specific manner, the possibilities of conservation

and energy savings, and to allow for the development of the program's conceptual design.

In reference to this, it is worth noting that some energy audits have already taken place; at an individual level, these have determined a savings potential, with minimal investments of around 10-15%, while with easy-return investments, of no more than 24 months, a savings of close to 30% could be obtained. During this year, said mechanism will cover approximately 100 companies, previously selected according to the results of studies on consumption diagnosis, energy use and set-up. This work will be coordinated by the Ministry of Mines and Energy, and will be carried out by all participating entities.

The completed audits, and those to be made in the short term, are geared to accomplishing the following specific objectives:

- To create a diagnostic and technical assistance service for industry in such a way that it could identify and put previously recommended measures into practice.
- To create the necessary conditions for improving industrial energy efficiency, concentrating as much on quantity as on quality of consumed energy.
- To evaluate substitution possibilities, using as a basis the resources that are widely available within the country.
- To facilitate access to, and means of, adequate financing which would allow the preparation of optimum outfitting.

3.3.2 Energy Conservation Center

On a long-term basis, studies are underway on creating an energy conservation center within an institutional framework that would provide technical, financial and training assistance for the program of conservation, savings and even substitution of energy.