

Energy Magazine

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Carlos Caballero

Minister of Mines and
Energy of Colombia



**"The central purpose
of an energy policy is
to meet the needs
of the population
efficiently, in a
diversified,
environmentally
sustainable, and
least-cost fashion"**

- Energy Efficiency in Sector Restructuring in Latin America and the Caribbean

- Modernization Process and Renewable Sources of Energy in Latin America and the Caribbean

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Editorial

Over the last few years, the energy sector has become a key factor for the socioeconomic development of Colombia. The transformation and modernization of this sector, involving as its principal elements the capacity building of energy planning institutions, support for infrastructure growth, the enlargement of service coverage to society, and opening up of the sector to private-sector participation in many sector development projects, have enabled oil to become the country's principal export product, among other achievements.

In view of the importance of the transformation process that Colombia's energy sector is currently undergoing, it is especially gratifying for the Permanent Secretariat of OLADE to include in the present issue of the *Energy Magazine* an article by Dr. Carlos Caballero-Argáez, Minister of Mines and Energy of Colombia, which analyzes the principal achievements in the framework of this process.

The present edition also includes two articles that are directly related to the upcoming Energy Conference and Exhibition of Europe, Latin America, and the Caribbean focusing on Energy Efficiency and Renewable Resources –

Eurolac 2000, taking place in Cartagena de Indias, Colombia, on June 19-20, 2000, as part of joint OLADE-European Commission efforts.

The first of these articles examines the topic of "Energy Efficiency in Sector Restructuring in Latin America and the Caribbean". It highlights efforts being made in this area and describes examples of actions that have been carried out for energy conservation and energy efficiency improvement in the region.

The second article focuses on the contribution of renewable sources of energy to the region's energy sector transformation and modernization processes and their prospects for the future.

The magazine also includes a summary of the address delivered by the undersigned when representing OLADE and Latin America and the Caribbean at the World Forum on Energy Regulation held in Montreal, Canada, on May 21-24, 2000.

Likewise, we are pleased to provide to the readers of the *Energy Magazine* energy sector development news from April to June 2000.

Dr. Julio Herrera
Executive Secretary

INTENSE SCHEDULE OF ACTIVITIES FOR THE EXECUTIVE SECRETARY

OLADE: ONSTAGE FOCUSING ON GLOBALIZATION



The Minister of Natural Resources of Quebec, Canada, Mr. Jacques Brassard, and the Executive Secretary of OLADE, Dr. Julio Herrera, discussed OLADE-Quebec cooperation issues and the possibility of hemispheric integration actions

Dr. Julio Herrera, Executive Secretary of the Latin American Energy Organization (OLADE), has been carrying out an intensive agenda so that OLADE can establish close ties with governments outside the region, international organizations, and cooperation agencies so as to build up the Organization's role on the international stage.

In this context, from May 19 to May 24, 2000, in Washington, D.C. and in Ottawa, Canada, Dr. Herrera held working meetings with the Secretary of Energy of the United States, Mr. Bill Richardson; with the Minister of Natural Resources of Quebec, Canada, Mr. Jacques Brassard; with the Secretary-General of the Organization of American States (OAS), Dr. César Gaviria; and with the Regional Director for Latin America and the Caribbean of the U.S. Trade Development Agency, Mr. Albert Angulo.

The Executive Secretary of OLADE and the above-mentioned top officials focused on hemispheric energy integration and cooperation and examined the possibility of joint actions to promote energy development in Latin America and the Caribbean.

These meetings took place in the framework of the new political and technical agenda of OLADE and its strategic reorganization, which will enable it to address the energy sector challenges of the region's countries in the twenty-first century.

The Organization, in addition to meeting its cooperation objectives, coordinating the policies

of its member countries, and promoting their integration, is making special efforts to respond to the needs of these countries and insert the region in a globalized world by undertaking actions to promote investments, transfer energy-efficient technologies, and ensuring partnerships for service delivery and the supply of capital goods.



Concurring viewpoints between the Energy Secretary of the United States, Mr. Bill Richardson (photo), and the Executive Secretary of OLADE, Dr. Julio Herrera, regarding hemispheric integration in the energy sector

PARTICIPATION IN THE STEERING COMMITTEE OF THE HEMISPHERIC ENERGY INITIATIVE

The Ninth Meeting of the Steering Committee of the Hemispheric Energy Initiative took place on May 18-19, 2000 in Ottawa, Canada, to evaluate compliance with the commitments made at the Meeting of Energy Ministers of the Hemisphere in August 1999 in New Orleans and to elaborate a plan to fulfill these commitments.

OLADE was represented by its Executive Secretary, Dr. Julio Herrera. The Organization, along with the Department of Energy and the Ministry of Energy and Mines of Venezuela, is a member of the Coordination Secretariat of Hemispheric Energy Initiative.

Energy Efficiency in Sector Restructuring in Latin America and the Caribbean

The search for sustainable development implies actions that involve socioeconomic, environmental, and equity dimensions. In this context, the energy sector is playing an essential role and, in its development, it should incorporate lines of action to improve the efficiency of energy production, distribution, and use, as a contribution to ensuring sustainability.

On the basis of a conservative estimate by OLADE, it has been calculated that the implementation of sound energy efficiency programs in the region could well displace, by the year 2010, a total amount of 16 GW in electric power generation expansion, involving a reduction of US\$1.5 billion per year in expected investments. At the same time, by that year, emissions would decline by about 54 million tons of carbon dioxide and 0.3 million tons of nitrogen oxide and sulfur dioxide.

A rapid overview of the current situation of energy efficiency in the



region and actions carried out by OLADE on the subject provides us with a glimpse of the proposals that will enable energy efficiency to be installed as part of the actions for sustainable development, taking into account the reforms of the sector's structure in the region.

Current situation

There are many efforts being made in the energy sector of Latin America and the Caribbean to promote energy efficiency. Some examples of these actions carried out to conserve energy and improve energy efficiency in the region are quite noteworthy.

PROCEL of Brazil

The Program against Electric Power Waste (PROCEL) was set up by the Brazilian Government in December 1985 and is administered by an Executive Secretariat that is subordinated to ELETROBRAS, the state power generation utility. Its economic resources come from state

and federal funds set up on the basis of contributions from private enterprises, proportional to their investments. As a rule, it promotes actions aimed at improving efficiency in both energy supply and energy use, as long as the social cost is lower than producing the amount of energy saved.

According to data from the program, investments grew from US\$9.5 to US\$122 million during the period from 1994 to 1997, with savings amounting to 1,758 GWh per year and a peak reduction of 976 MW, with investments savings of US\$830 million.

Costa Rica's experience

The Law Regulating the Rational Use of Energy serves as the framework of reference for the efforts made by Costa Rican energy institutions, oriented by the Energy Sector Department of the Ministry of the Environment and Energy (MINAE) and members of the National Energy Conservation

Commission (CONACE), in which the power utilities and oil companies also participate.

In this context, in Costa Rica, over the last few years, technical and educational actions have been conducted, among which the following are noteworthy: the project to incorporate 750,000 compact fluorescent lamps for residential use, national energy saving contests, and the Fenería fair for the dissemination of energy saving and renewable energy technologies.

The work carried out by the Energy Conservation Program of the National Light and Power Company (CNFL) ranks second in the country. Its programs range from a pilot installation for distance load control via microwave to actions such as the modification of consumption bills to enable customers to follow up on their savings, the design and implementation of a program to educate children and young people with the establishment of a teaching center, the setting of a specific tariff for demand management, and efficient lighting programs in the residential and general sectors.

FIDE and CONAE in Mexico

Mexico's Trust Fund for Electric Power Saving (FIDE) is a private nonprofit institution created to support actions that induce and promote electric power savings. It is supported by the Federal Electricity Commission, the Centro Light and Power Utility, contractors, suppliers, service providers and the principal chambers of industry.

Its actions consist of providing project funds that can be recovered from the economic savings obtained from utilities or institutions as a result of the application

of measures to obtain electricity savings and reduce billing for this purpose.

The results obtained and quantified from FIDE's action up to 1998 amounts to 1,179 MW in displaced demand and 2,746 GWh in saved energy.

In addition, among Mexico's government institutions, the National Energy Saving Commission (CONAE) is carrying out important work in the efficient use of energy. It is the technical consultation agency for energy saving, a decentralized entity of the Energy Secretariat of Mexico, comprised of representatives of various Secretariats of State, but whose technical committee has representatives from the state oil company PEMEX, the Federal Electricity Commission, and the Centro Light and Power Utility. Its actions involve the elaboration and upgrading of official Mexican norms for energy efficiency, the promotion of renewable energy development in the country, and ongoing and recognized special-

ized human resource training in energy saving programs.

PAE and CENERGIA in Peru

The Energy Saving Project (PAE) is a project of the Ministry of Energy and Mines that was set up to avoid rationing in the Centro Norte Interconnected System; to achieve its objective, it promoted energy saving when reserve margins were insufficient to handle the growth of electrification coverage during the country's economic recovery. After the success of this program, in 1998 another emergency arose when there was a 25% outage of energy supply in the southern part of the country. As a result, PAE assumed responsibility for a campaign in this region to avoid rationing, and this was also achieved. It is estimated that, in 1998, the actions of the PAE led to a 202 MW reduction in peak demand nationwide.

As for the Energy and Environmental Conservation Center (CENERGIA), its principal mission is to achieve sustainable development in the energy sector through training,



promotion, and studies. At present, CENERGIA has reoriented its structure, and its activities are those of an energy service company (ESCO) adapted to the new structure of the Peruvian energy sector.

Both the PAE and CENERGIA are predecessors and supporters of the Market-Based Energy Service Program, which is being implemented with funding from the Inter-American Development Bank, in order to consolidate the supply of energy services on the local market. It is comprised of two projects. The first, implemented by the Ministry of Energy and Mines is referred to as Consolidation of the Institutional and Regulatory Framework for Sustainable Energy Efficient Use and Production Services. The second is aimed at the private sector and is called the Development of an Energy Efficient Use and Production Services Market in the Industrial Sector.

OLADE's experience

By implementing concrete energy efficiency projects, OLADE has demonstrated the economic advisability of demand management and energy conservation actions for all players involved in these projects. Thus, it is complying with the institutional objective of conserving the region's energy resources, while keeping its role as a forum for the exchange and dissemination of experiences on this subject in the region.

OLADE's most recent efforts in the area of energy efficiency are described below:

OLADE/European Commission Project: Demand Management in the Central American Isthmus (Central American PIER)

The project is being implemented since 1992 in cities of all the Central American countries; activities have concluded in San José de Costa Rica, Managua en Nicaragua, and San Salvador in El Salvador. At present, actions are being carried out in San Pedro Sula, Honduras, Guatemala City and Panama City.

The project's fundamental objective focuses on the elaboration of a plan of action for each city, based on the detailed study of the electric power supply and use system by means of metering and surveys. This plan of action receives initial support from the project with the funding of low-cost activities and the elaboration of feasibility studies for those actions that require higher investments.

The elaboration of the plan of action in each one of the cities is based on a load characterization study, whose objective is to determine the share of end-uses in energy consumption and in the system's load curve. The proposals for measures based on this study are examined from the economic viewpoint, and on the basis of the balance of benefits for each one of the players and their ease of implementation these measures are selected and prioritized.

The most important conclusions of this study focus on the need to analyze the evolution of end-uses in each one of the countries, owing to the differences there are in customs and climates, which are naturally reflected in the performance of the electric power load and owing to the indispensable requirement of creating a suitable environment for efficiency, with actions in the environment taking into account, at least, laws and regulations, information and dissemination, education and training, integration of

equipment suppliers, technical and financial assistance.

OLADE/European Commission Project: Demand-Side Management in the Andean Countries (Andean PIER)

The success of the project in the Central American Isthmus enabled the European Commission to approve funding for a similar project for the Andean countries. In June 1999, an agreement was signed for the two institutions to implement an energy efficiency project in the electric power sector of three Andean Group countries. At present, the project in the European Commission is in the process of selecting and hiring the European consulting firm to complement Latin American technical assistance for the implementation of planned activities.

Promotion of ESCOs in Latin America

Energy service companies (ESCOs) are involved in the development, installation, and funding of projects that are designed to improve energy efficiency among energy company customers and help them assume the technical and financial risks on the basis of their know-how and experience. These services are part of the project's costs and are recovered as a result of savings generated in the projects. The objectives of these companies convert them into a driving force for energy efficiency and, as a result, behind the interest in developing efficiency.

The launching of ESCOs in Latin America has been especially difficult and, because of this, OLADE submitted to the European Commission a project to promote the establishment and support the operation of energy service companies.

The Commission welcomed the idea and started the first stage of the project, in which OLADE in association with two European consulting firms is analyzing experiences and selecting some countries of the region for the following phase, which involves promoting the association of Latin American companies with European ESCOs to start activities.

Promoting Rational-Use-of-Energy Projects in Latin America and the Caribbean

With support from the German Technical Cooperation Agency (GTZ) and OLADE, six countries of Latin America have defined energy efficiency projects that are of special interest to them. The objective is to contribute to the establishment or consolidation of a suitable environment for the full development of an energy efficiency service and technology market, as a valid alternative to improve the competitiveness of a country in an international context.

Proposals for concrete actions

The new regulations that have been promoting open markets for the energy sector in the countries of Latin America and the Caribbean have determined that some of the barriers that were hampering the dissemination of energy efficiency should be dismantled. Therefore, low prices, which have been highlighted as one of the causes preventing investments in efficiency measures, have been replaced by market prices, and thus measures that were previously unattractive have become so.

Nevertheless, competitive open market schemes have made companies view energy efficiency as a risk that would entail a reduction in

their income. A noteworthy example of this occurs in the power distribution utilities.

There are those who view restructuring and market regulations as a severe threat to energy efficiency, whereas other experts believe that, when markets are consolidated, especially the electric power market, discussions should focus on how to stimulate the promotion of energy efficiency.

Energy efficiency actions have been affected, especially in electric power markets, by the lack of information on the benefits that these actions could bring to each one of the players on these markets.

In addition, there is a consensus that sector or subsector regulatory entities should be the suitable mechanism to channel actions aimed at putting into practice the energy policies proposed by the countries. In the present case, energy conservation policies, which in many cases have been expressly mentioned in new sector laws without defining how they can be enforced in reality, should find a way to become viable without altering market rules now largely prevailing in all the countries of the region.

It is noteworthy that the majority of the countries of Latin America and the Caribbean were beginning to make efforts to start up efficiency programs when the rules of the game changed as a result of energy sector transformation and modernization. Now it is necessary to redirect the actions that have already begun. Creative solutions are needed to promote a suitable environment so that efficiency programs will not dwindle but rather will be further consolidated.

For Latin America and the Caribbean, energy efficiency is decisive in order to reduce investments needed in the power sector, which in turn will benefit society as a whole and will contribute to reducing emissions that produce benefits for the global environment

The case of CENERGIA in Peru is of special interest because its budget was funded by contributions from state power utilities. After the privatization of these utilities and without these contributions, however, it continued to function thanks to the energy services that it could provide on the basis of the experience that it had acquired in the past.

There are cases such as the State of California or Norway where regulations require electric power distribution utilities to invest in efficiency programs. There is also the State of Oregon, where a rate was created to obtain funds to implement efficiency programs.

Among the most interesting and creative approaches to energy efficiency, there are demand-management programs on the open market; in other words, the market accepts as part of its supply components a negative generation, called negawatts (megawatts saved).

In England and Wales, several large customers actively participate in the electric power exchange as demand management suppliers. They submit bids where they specify the price at which they are willing to reduce their demand and they participate in the market by being involved in the closing price.

In Australia, the customers all submit demand management bids but they have to install the equipment to adjust their demand automatically. In New Zealand, a similar procedure is used.

In Scandinavia and California, supply and demand management are

dealt with equally, and they are included in the supply and demand curves to determine closing prices.

Among the actions that are needed, education and training merit special attention, since there is no doubt that their involvement is of the utmost importance for consolidating and supporting actions to implement the energy efficiency policies that are proposed. The training method that in OLADE has turned out to be the most effective consists of striking a balance between academic training and involvement in demonstrative projects that provide professionals with effective experience in the preparation of programs and their application.


Conclusions

For Latin America and the Caribbean, energy efficiency is decisive in order to reduce investments needed in the power sector, which in turn will benefit society as a whole and will contribute to reducing emissions that produce global benefits. The interest in developing energy efficiency, therefore, extends beyond the region and requires international assistance. In particular, the industrialized countries must find the most effective and timely way to collaborate so that the efforts that have already been made can gather momentum in the new framework that has been established by the structural reforms in the energy sector.

It is advisable to coordinate efforts to establish education programs for children and young people suitably linking energy efficiency issues to

knowledge about renewable sources of energy and the incidence of rational energy use and management on the environment. A concrete possibility is to insert all the above-mentioned issues throughout the current curriculum, by considering biodiversity in biology, the analysis of economic advantages of using efficient equipment in mathematics, the evolution of pollution over time and its impacts in history, among others.

OLADE is currently working on the training of professionals from the region through its Master's Degree Program in Energy and Environment, which benefits from the initial financial support of the Canadian International Development Agency (CIDA).

The industrialized countries should consider the following proposals: collaboration to prevent low-efficiency equipment from being sold to developing countries simply because it involves low initial investments; assistance to promote energy efficiency labeling for appliances aimed at developing country markets, with suitable information for possible buyers; technical and economic assistance to disseminate information on efficient equipment and the techniques available at present for the public of developing countries; assistance for the training of technical experts who design and build facilities and buildings. OLADE, owing to its experience and objectives, is the best partner in the region to channel aid and cooperation for promoting and consolidating energy efficiency. 

The Energy Sector: Key Element for the Social and Economic Development of Colombia



*Dr. Carlos Caballero-Argáez,
Minister of Mines and Energy
of Colombia*

The Mining and Energy Sectors and the Economy

The mining and energy sector, in real terms, has been accounting for an increasingly large share of the Colombian economy in terms of contribution to the production of goods and services, exports, and generation of national and local public revenues. One of the challenges of the government's policy is to maintain and improve these indices of buoyancy.

The share of the oil, gas, and mineral subsectors in GDP over the last five years amounted to 4.1% on average, with a share of 4.4% in 1998 and a share of 4.7% in 1999. If the value added of the electric power and natural gas services subsector is added, the share of the mining and energy sector in the economy during this period amounted, on average, to 7.3% per year (7.5% in 1998 and 7.9% in 1999).

From the start of the nineties, oil displaced coffee as the principal export product, and among export products coal now ranks third. Despite efforts to increase the exports of so-called traditional products and manufactured goods, the heavy dependence on the export of raw materials, especially

nonrenewable natural resources, is noteworthy. The contribution of the oil, gas, and mining sectors to the trade balance is still very high, with a rate of 44% at present, compared to 34% in 1991.

Public and private investment in the sector during 1996-1997 was equivalent to 5.7% of GDP; in 1998, however, when there was a slowdown, it amounted to only 3.8% of gross domestic product.

The energy and mining sector also plays an active role in regional development, not only as a promoter of economic and social progress, but also as a source of income for territorial entities whether or not they produce energy products and minerals. The royalties stemming from the production of oil, gas, coal, and other minerals have been rising, and in 1999 they amounted to US\$800 million.

Over the last three years, the sector as a generator of employment, accounted for more than 1.3% of the jobs of the country's economy.

Electricity coverage service for the population at present amounts to 81%. In urban centers, the rate is over 93%, whereas in rural areas it amounts to only 51%. In the rural

sector, it is estimated that coverage amounts to 61% in interconnected areas and hardly 14% in areas that are not interconnected.

As a result of the enlargement of capacity for producing the different resources available in the country, it has been possible to achieve more diversified and efficient energy supply; this helps to ensure better conditions to tackle eventual supply difficulties, such as when there was the El Niño Phenomenon, which affected the electric power sector.

The central purpose of a comprehensive mining and energy policy, such as the one that is being promoted in Colombia, consists of undertaking actions that enable the country not only to use its available resources rationally but also to meet the needs of the population efficiently, in a diversified, environmentally sustainable and least-cost fashion.

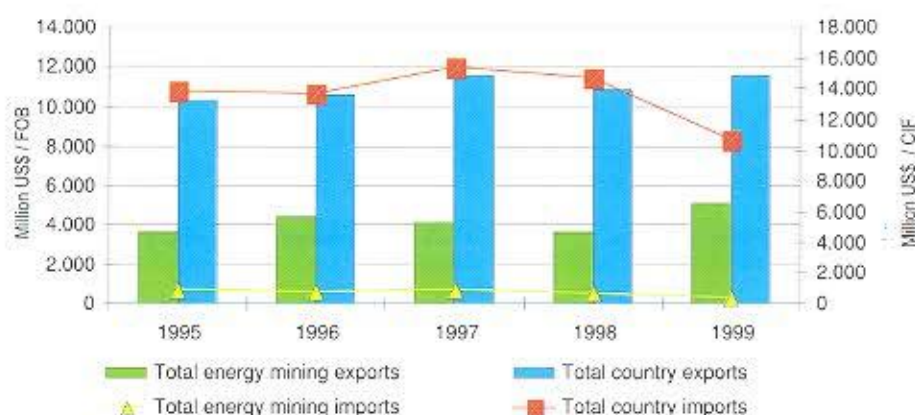
On the basis of the potential of available resources, Colombia has been developing a well-defined strategy for diversified domestic energy demand supply. The recent development of this strategy involves above all the intensification of the use of natural gas in the different sectors of consumption, as a substitute for other fuels that are relatively scarce or more costly. In addition to evident impacts on the diversification of energy mix options for the end-user, this strategy also contributes greatly to mitigating environmental impacts stemming from the use of energy.

Sector figures

Coal

The growth of the mining sector has been one of the outstanding factors of the country's economy.

ENERGY MINING EXPORTS AND IMPORTS
1995 - 1999



Coal reserves updated to December 1999 amount to about 6,692,000,000 tons. The reserves-production ratio is 204 years.

During 1999, total coal production amounted to 32.8 million tons. In 1998, it was 33.8 million tons, that is, there was a 2.8% fall owing to the decline in demand for electric power generation.

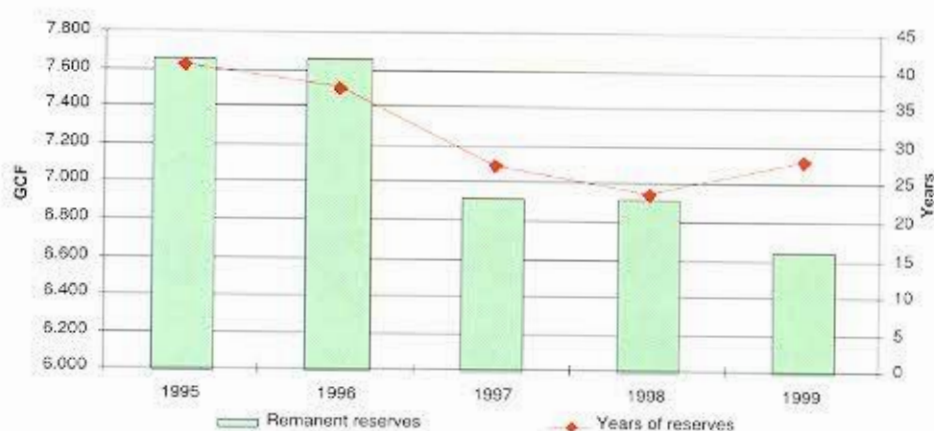
Over the last two years, coal exports have remained at about 30 million tons. In 1999, overall mineral exports involved US\$1,042,000,000, equivalent to 11.3% of all the country's exports.

Oil and products

At December 31, 1999, remanent oil reserves amounted to 2,287,000,000 barrels.

Oil production has been rising: in 1996, it amounted to 625,000 barrels per calendar day (BCD), whereas by 1999 it had reached 815,000 BCD. The reserves-production ratio, however, fell from 9.2 years at the end of 1998 to 7.7 years in December 1999. Nevertheless, the country continues to be self-sufficient in terms of oil.

**GAS RESERVES-PRODUCTION RATIO
1995 - 1999**



The export of crude oil and products managed to reach a figure of US\$2,918,000,000 in 1999, equivalent to 32% of the country's exports, that is, 10 points higher than the preceding year.

The country's refining capacity amounts to 278,000 barrels per day, which in 1999 enabled the country to meet 100% of its domestic gasoline needs, owing to a 13% drop in consumption compared to the previous year.

Gas fuel

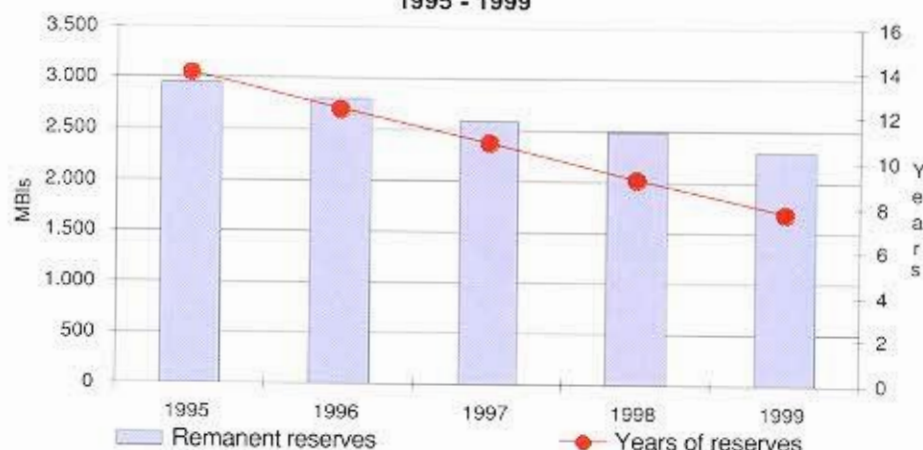
The country now has proven natural gas reserves amounting to 6,641 giga cubic feet (GCF). The principal reserves are located in Guajira (2,975 GCF), Cusiana-Cupiagua (2,984 GCF) and Piedemonte (380 GCF).

Net production of natural gas in 1999 amounted to 181,546,000,000 cubic feet per day (CFD), 17% less than the preceding year, owing to the decline in demand for electric power generation. The reserves-production ratio is about 36 years.

Natural gas consumption in the residential sector rose during 1999 by 21% compared to the preceding year and amounted to 71 million cubic feet per day. The other sectors also increased their demand, except for the thermoelectric sector that needed 40% less than in 1998.

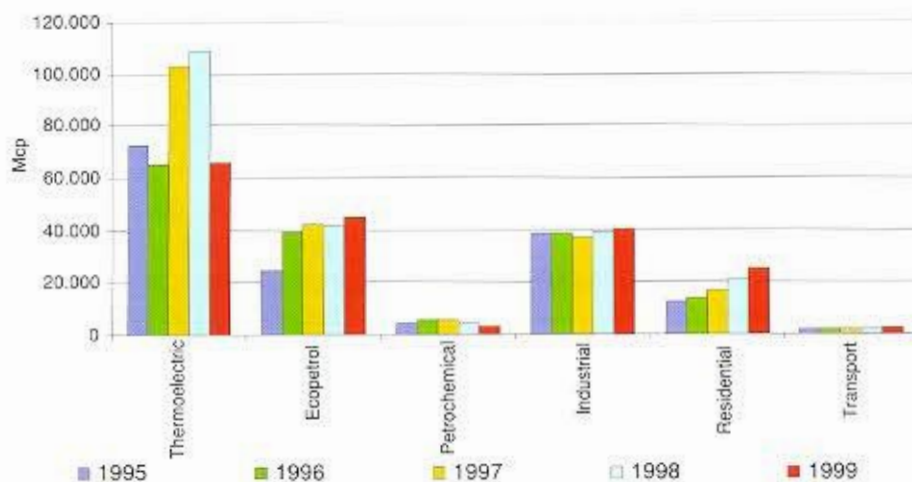
The number of users connected to the national natural gas network amounted to 1,899,000 users, 280,000 more than in 1998.

**OIL RESERVES-PRODUCTION RATIO
1995 - 1999**



NATURAL GAS CONSUMPTION BY SECTOR

1995 - 1999

**Electric power**

The gross effective capacity of the system in 1999 amounted to 11,595 MW, of which 68% is from hydropower units and 32% from thermoelectric units, that is, a structure similar to that of 1998.

During 1999, the net effective capacity of the interconnected system (SIN) declined by 130 MW: 481 new MW were installed and 610 MW were shut down/decommissioned.

Electric power generation only declined by 4% and amounted to 42,181 GWh in 1999, of which 79.5% corresponded to hydropower plants and the remaining 20.5% to thermoelectric plants, a structure that in 1998 was 70% and 30%, respectively.

Energy demand declined by 4.6%, compared to 1998, as a result of the economic recession that hit the country.

The number of electricity subscribers rose by 366,000, amount-

ing to a total of 7,440,170 end-users.

Foreign Investment and Linkage with Private Capital**Foreign investment**

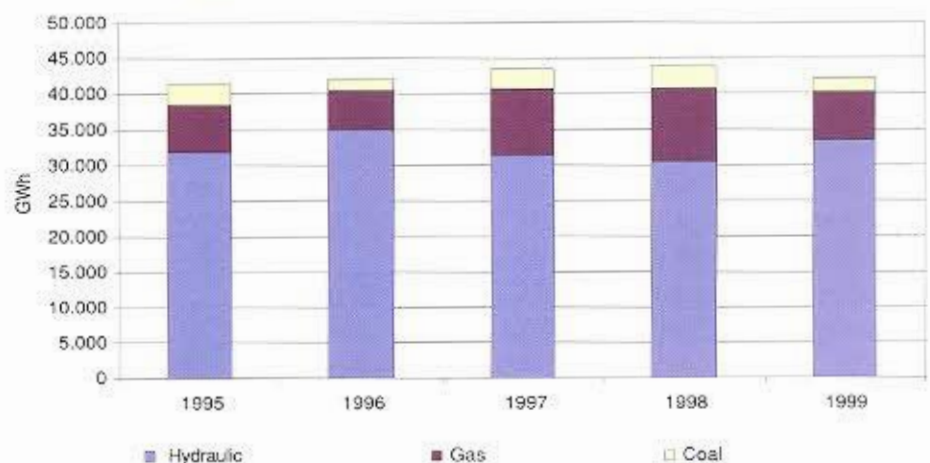
Foreign investment in the sector during 1998 amounted to US\$1,752,000,000, broken down as follows: US\$1,092,000,000 for the development of new projects and US\$661 million for the capitalization of existing projects. As a

whole, the sector received 33% of all foreign investment.

In the hydrocarbons subsector, foreign investment for the development of new projects was also stable during the years 1996 and 1997, during which time the amounts that were recorded were US\$1,067,000,000 and US\$1,119,000,000, respectively. In 1998, there was a downward trend, and foreign investment amounted to US\$841.4 million, all of which were for investments in oil and gas exploration and production, essentially the development of the oil production fields of Casanare and their associated facilities. The share of the subsector in total foreign investment for new projects in the country during the period 1996-1998 was 19%, whereas total investments for capitalization amounted to 5%, equivalent to US\$245 million.

Foreign investment in the development of new projects of the electric power subsector recorded major growth during the period 1996-1998, especially in 1997 when it reached US\$203.5 million. In 1996 and 1998, investment amounted to US\$82.7 million and US\$70.3 million, respectively.

ELECTRIC POWER GENERATION BY TYPE OF FUEL



At the beginning of the nineties, oil displaced coffee as the principal export product, and among export products coal now ranks third

During the same period, the amounts of foreign investment in the capitalization of existing projects displayed a similar trend, with a figure of US\$3.75 billion in 1997, whereas in 1996 and 1998 the figures were US\$456 million and US\$660.5 million, respectively, equivalent to 92% of total investments for capitalization.

Involvement of private-sector capital in the electric power sector

One of the actions to improve the competitiveness of the electric power sector is to enlarge private-sector participation in power generation, transmission, and distribution activities that are controlled by the central government.

The following objectives are being sought from involving private-sector capital:

First of all, it is aimed at addressing the dual role of the Government, as a regulatory or monitoring agent and as a regulated or monitored entity. The access to private-sector capital enables the government's role to be defined; as in the first case it will act to ensure the future sustainability of the regulatory framework and to build up its capacity to impose quality and coverage criteria and to penalize those who do not comply with them.

Second, it will free resources that the State now has invested in the sector and enable the State to use these resources to expand electric power service in areas where it is not economically viable to do so, thus fulfilling the government's social duty. In addition, these resources, will not be generating a crowding-out effect on the economy and thus will not affect growth in other areas of the economy. As a result of the above, the need for further indebtedness is obviated, thus contributing to reducing the public deficit.

Third, the flow of money between end-users and the different links of the chain (generator, transmitter, distributor, and trader) will be improved. At present, the distribution utilities controlled by the Government have a high outstanding debt that it owes to the administrator of commercial exchanges, which prevents resources to be channeled to the power generation and transmission utilities. Thus, it guarantees the expansion of this service on a financially sound basis.

At present, 58.4% of the country's net effective capacity is private and the remaining 41.6% is public, compared to almost 100% in mid-1995.

This year (year 2000), it is expected that the sale of ISA and ISAGEN, as well as that of the 14 inland dis-

**NET EFFECTIVE CAPACITY IN 1999:
SHARE BY TYPE OF OWNERSHIP**

ENERGY SOURCE	NET EFFECTIVE CAPACITY OF THE NATIONAL INTERCONNECTED SYSTEM					
	PRIVATE		PUBLIC		TOTAL	
	MW	%	MW	%	MW	%
Coal	554.00	4.7%	315.00	2.7%	869.00	7.3%
Gas	1,962.00	16.6%	787.80	6.6%	2,749.80	23.2%
Fuel oil, other	0.00	0.0%	88.00	0.7%	88.00	0.7%
Hydro	4,411.00	37.2%	3,736.00	31.5%	8,147.00	68.7%
Total	6,927.00	58.4%	4,926.80	41.6%	11,853.80	100.0%

tributors, where the government is a major shareholder, will be concluded.

Recent Evolution of the Energy Policy

Hydrocarbons

The National Government made further adjustments to the contract and public framework for oil exploration and production. These changes intend to avoid the risk of supply shortages that the country is facing owing to a decline in exploratory activities, which would generate both a fiscal and balance-of-payments crisis. In addition, efforts are being made to improve national competitiveness with respect to other producer countries.

A five-year straight-line amortization system was introduced. In addition, there is a new flexible royalty settlement scheme, starting with a rate of 5% for fields that produce less than 5,000 BCD and which goes as high as 25% in fields with a production of over 600,000 BCD. Finally, Ecopetrol's share in partnership contracts has declined from 50% to 30% and the modified R factor continues to be applied.

With these changes, it is expected that exploratory activities will be reactivated and that the share of the oil and gas sector in the balance of payments, royalty payments to territorial entities, and revenues to the country's public coffers from taxes and transfers will be maintained. Oil will thus continue to be a key factor for growth of the national economy.

As for natural gas, the state oil company Ecopetrol reached an agreement with the partners in Cusiana and Cupiagua so that production

will amount to 100 million cubic feet per day as of the year 2001.

The National Government adopted various decisions aimed at reforming the pricing and tariff-setting policy by establish tariff-setting formulas that reflect real costs of the different energy products that are part of the energy input basket.

The new rules intend to achieve three objectives: on the one hand, apply a correct pricing policy; on the other, give the appropriate signals to the users with respect to the cost of goods and services; and finally send correct signals to all the players in order to promote the public or private expansion of the facilities required for the production, sale, and marketing of these goods and services.

The price liberalization scheme will be gradual for the entire fuel distribution chain. At first, the end-user price was liberalized in the major cities of the country and, to the extent that market prices and their structure will permit it, the wholesale price will also be liberalized.

On the basis of the new structure, future increases in gasoline prices will depend on the evolution of international gasoline prices, the evolution of the exchange rate, and the level of competition between retailers over the short term. As for the medium term, these increases will depend on the competition between wholesale distributors, once the margin of these distributors has been liberalized.

Electric power

With the enactment of public services and electric power laws, electric power service delivery began to be transformed. The new regulatory framework has fostered the

breakup of the business of delivering electric power service and the participation of new players, and has contributed to putting the finances of new utilities on a sound footing, all of which is aimed at consolidating services with a viable financial scheme.

In the electric power sector, the Ministry of Mines and Energy promotes service delivery with tariff levels that reflect the cost of the service, adjusted to clearly defined quality levels and in order to increase service coverage. As a result, in order to comply with the above, the Ministry has outlined a concrete strategy with three areas of action:

The first is *regulation*, where efforts were focused on: i) avoiding dominating positions on the exchange; ii) defining payment guarantees for marketers and generators on the bulk energy market; iii) establishing quality standards for the national transmission system; iv) establishing standards for handling losses in the national transmission system; and v) simplifying approval procedures for the baseline marketing cost to facilitate the arrival of new marketers into existing markets.

In 1999, progress was made in liberalizing the transmission business. In compliance with the provisions of regulation CREG/051 of 1998 on the introduction of competition in the expansion of the National Transmission System (STN) by means of international public bidding invitations, the Ministry of Mines and Energy authorized the bidding process to develop two 230-kV lines, with a length of 266 km and 85 km, respectively.

In addition, in order to ensure that a large number of users would be able to benefit from electric market

deregulation, as of January 1, 2000, power consumption restrictions to the users wishing to participate in the competitive market were reduced from 0.5 MW to 0.1 MW (that is, from 270 MWh to 55 MWh of monthly energy). This generated an expectation of 13,000 potential new unregulated users that would help to give greater thrust to the market and who would benefit from price cuts that unregulated users have enjoyed up until now. At December 1999, there were 1,042 unregulated users and, according to the administrator of the trade system, this number amounted to 2,232 by April 2000.

The second area involves building up the State's capacity in activities for *supervising and monitoring* service delivery. By means of the resolutions of the Energy and Gas Regulation Commission No. 070 of 1998 and No. 025 of 1999, service quality indicators and their goals were defined, aimed at standardizing service delivery and protecting the rights of consumers.

The third area is *accelerating the rate of service expansion*, especially the areas that are not interconnected, taking advantage of the resources made available by the State from the sale of its companies and maximizing the resources provided by third parties to each project. For this purpose, in addition to the privatization processes that have already been described, the former Colombian Electric Power Institute was transformed in order to concentrate its action in the identification and structuring of energy solutions, in keeping with the potential conditions of the non-interconnected areas.

In the electric power sector, the participation of the private sector has been consolidated and the State

will shortly be in a better position and have a greater capacity to work in monitoring, regulating, and promoting competition and the rational use of energy resources for the benefit of society.

After almost five years since the electric power market was set up, there are 90 public players and 70 private players.

Rational Use of Energy

The rational and efficient use of energy should be viewed as a business opportunity and as a way to raise the competitiveness of the players involved in the sector. The State should in this case advocate the reduction or dismantling of barriers that might prevent the development of a services market focusing on this activity.

Strategies

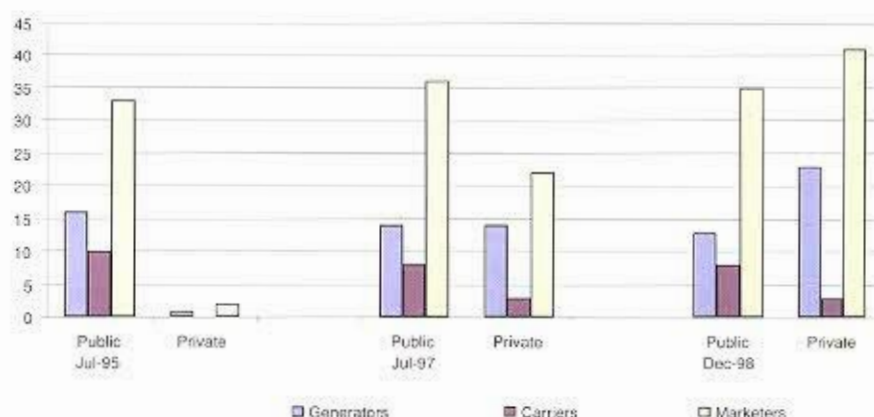
Pricing policy: a new pricing policy has been set up and revised in order to reflect the true costs of energy products. Thus, over the last few years, a program has been developed to eliminate subsidies in the rates for electricity sectors and

in fuel prices for the transportation sector.

Promotion and development of energy service companies, with the transformation or conversion of already existing companies, which could be consolidated as promoters or implementers of actions aimed at the efficient marketing and use of energy on an ongoing basis, as is occurring in other countries that have included energy sector reforms.

Financing: establishment of financial schemes that would permit obtaining leverage for projects at reasonable rates, which is a strategic element for technological change. The studies that were carried out indicate that, as a rule, financial entities know nothing about the rational use of energy and how to evaluate this kind of project; this prevents industry or rational-use-of-energy service advisors from gaining easy access to resources for this purpose. As a result, a financial support facility is being designed in one of Colombia's financial institutions to promote and develop rational and efficient use of energy programs.

EVOLUTION OF BULK ENERGY MARKET AGENTS



Information: Knowledge about business opportunities for the efficient use of energy is one of the key elements for the development of this market. Information about costs and benefits of rational-use-of-energy technology and services.

Of equal importance is the establishment of a culture involved in the efficient use of energy at all levels, including potential rational-use-of-energy market service suppliers, financial institutions, and of course the public at large; the fundamental purpose of this culture would be the establishment of an attitude of commitment on the part of society and the environment.

Achievements

In 1981, ISA and the National Association of Industrialists published a Manual for Energy Saving in Industry, to foster the rational use of energy and respond to the power rationing taking place at the time.

Between 1984 and 1990, the Ministry of Mines and Energy, with the support of Ecopetrol, Carbocol, ISA, and Colciencias, formulated and developed the Program for the Rational Use of Energy in the Industrial Sector, in order to avoid the high growth of liquid fuel consumption and to promote its technical and economic substitution. Eighty-nine energy audits were carried out, and numerous technical visits were made to industrial plants and thermoelectric stations.

In 1988, the Ministry of Mines and Energy and the Energy Commission signed the Eurcolerg Agreement to support the formulation and imple-

mentation of natural gas use projects, electric power load management projects, and other actions favoring the rational use of energy.

As of 1991, it started developing the plan for the mass extension of gas use, which became one of the most important achievements of the rational-use-of-energy policy. It also sought the substitution of inefficient uses of some energy products such as electricity and firewood for cooking and water heating in the residential and commercial sectors, as well as coal, Castilla crude and products stemming from petroleum in the industrial and electric power generation sectors.

In 1992, as part of the ESMAP technical assistance program of the World Bank, an energy efficiency study was conducted in the residential, commercial, and public sectors; it was the most elaborate research ever conducted to support the formulation of rational-use-of-energy plans and programs.


In the area of energy saving and conservation, as well as efficient use of energy, the Project for the Standardization, Certification, and Labeling of Household Appliances was launched. It was able to set up 11 technical standards for Colombia, which are now being studied for mandatory enforcement.

During the period 1997-1998, ISA, UPME, the Ministry of Mines and Energy and other sector institutions developed a rational-use-of-energy campaign. In the month of December 1997, it was disseminated in the country's media.

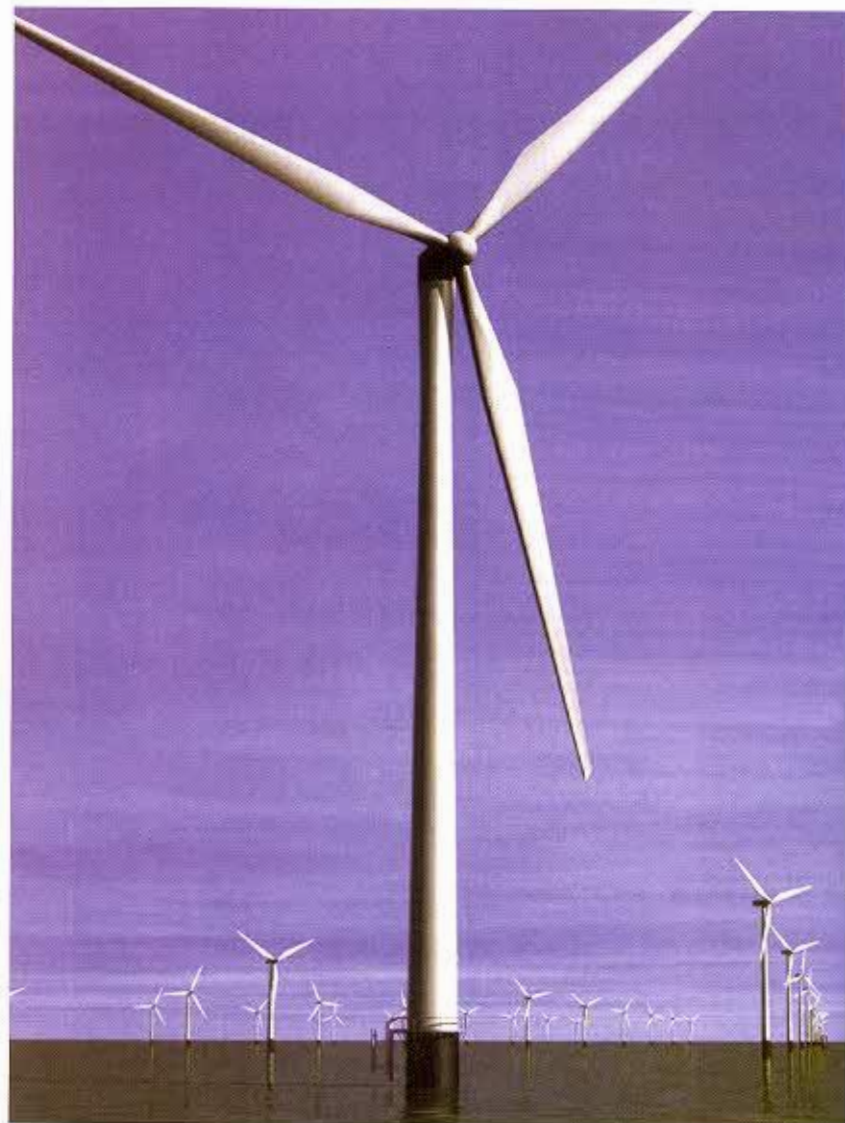
As part of the set of activities proposed by the Committee Assessing the Electric Power Situation, a short-term rational-use-of-energy plan was designed to tackle the El Niño Phenomenon. It included the publication of 10,000 posters with rational-use-of-energy recommendations and their distribution in high schools on the basis of a program for the establishment of university leaders, and seminars were conducted with industrial and trade associations focusing on rational use of energy recommendations.

Afterwards, the Natural Gas for Motor Vehicles Program was promoted for the public passenger transportation sector, aimed at substituting gasoline for natural gas. Likewise, the use of a new technology, consisting of mixing gas with diesel to reduce the consumption of the latter in freight transport, was proposed.

An agreement with IDB, amounting to US\$10 million, was signed to fund energy efficiency programs.

At present, the UPME is elaborating a Strategic Plan for the Rational and Efficient Use of Energy in Colombia in a context of open markets and deregulated environments; its objective is to set up strategies to meet the energy needs of the population, using available resources rationally and efficiently and promoting a sustainable energy economy, by incorporating and developing new technologies and processes on the basis of a citizen culture for this purpose. 

Modernization Process and Renewable Sources of Energy in Latin America and the Caribbean



Up until the end of the eighties, renewable sources of energy were associated with energy supply for the rural sector and stand-alone systems and were generally synonymous with firewood. At present, however, this view of renewables is changing thanks to the capacity of these sources to generate electricity for the electric power grid. There are various projects with an installed capacity amounting to dozens of megawatts and there are many others being built or being processed for concession.

Biomass, small, mini and micro hydropower stations, wind energy, solar energy, and geothermal energy are all now included under renewable sources of energy.

To review the repercussions of modernization on the development of renewable sources of energy for power generation, the following energy sources/technologies will be considered:

- Those that generate electricity associated to local or national networks (biomass, wind and geothermal stations).
- Those that generate electricity for isolated/remote areas

(small hydropower stations and photovoltaic systems).

- Thermal solar systems.

As part of the new scheme that is in force owing to the reorientation of the State's role, the change in coordination schemes, and the liberalization promoting the participation of private-sector players in energy development projects, renewable sources of energy must compete on the market with conventional commercial technologies, and this has forced them to find alternatives to cut building and operating costs.

The share of renewable sources of energy in the region

The highest contribution from renewable sources of energy to ***national power grids*** in Latin America and the Caribbean comes essentially from wind and geothermal energy, with technologies that in some countries have found a profit margin comparable to conventional energy sources.

At the end of 1999, the use of wind energy for power generation worldwide accounted for a total installed capacity of 13,400

MW, of which only 0.6%, equivalent to 85.2 MW, was located in Latin America and the Caribbean. Nevertheless, whereas the increase in wind-based power generation in the world for 1999 amounted to 37%, in the region this increase was 93%. For the year 2002, it is expected that there will be about 20,000 MW of installed capacity in the world, with Latin America and the Caribbean accounting for close to 400 MW, equivalent to 2% of the total, reflecting major growth in the use of this resource in the region.

In the case of geothermal energy, the modernization process that started up in the nineties has given new impetus to pre-existing development, especially in those countries that have major resources and where there are provisions that promote investment in this technology by independent producers, namely, Costa Rica, El Salvador, Guatemala, Mexico and Nicaragua. The geothermal potential for power generation in the region has been estimated at between 5,600 and 6,700 MW, and therefore the prospects for generating electricity using this resources are highly promising.

In the case of biomass, despite the difficulty of obtaining accurate information, it can be estimated that, in Latin America and the Caribbean as a whole, there is about 1,250 MW of thermoelectric capacity using biomass as feedstock (including municipal solid waste) for power generation. This capacity is slightly higher than that available from geothermal energy and accounts for about 1.5% of total thermoelectric capacity.

The most extensive use of this biomass takes place in Brazil, Cuba,

Chile, Nicaragua, and Guatemala and is closely linked to the sugar cane industry, with cogeneration schemes and partial sales of surpluses to the power grid. In Chile, cogeneration schemes are linked to the timber industry. With respect to the future, various projects are being promoted, as in Brazil and Honduras, involving about 100 MW. The Fuel Alcohol Program, using alcohol as a substitute for gasoline, which was developed in Brazil in the eighties, is noteworthy; the Brazilian Government has announced that this program will be reactivated.

Wind projects in Latin America and the Caribbean	
Country	Installed capacity (MW)
Argentina	14.0
Barbados	0.3
Brazil	20.2
Costa Rica	46.4
Cuba	0.5
Jamaica	0.2
Mexico	2.7
Peru	0.7
Total	85.0

Renewable sources of energy and rural development

To supply electricity to rural areas, small hydropower (SHP) stations, solar photovoltaic systems, and hybrid systems (wind, photovoltaic, diesel) are important.

Small hydropower stations can become supply alternatives, either through public institutions or with the participation of the private sector. In the region, recent important progress can already be observed in countries such as Bolivia, Colombia, Nicaragua, and Peru, which have government mechanisms that

can promote the implementation of small stations and that have involved municipalities and sectional governments in electric power generation activities.

Not only from the standpoint of number of stations, but also from the standpoint of total installed capacity, the cases of Argentina, Brazil, Colombia, and Mexico are noteworthy, as they accounted for 90.5% of the total amount reported.

Photovoltaic energy has been developed through even smaller and more dispersed systems in almost all the countries of Latin America and the Caribbean. As a rule, the projects are aimed at meeting minimum electricity requirements in schools, health centers, commissariats, and other community buildings, as well as individual and group housing.

In the majority of cases, the programs implemented in the region are justified not only from the standpoint of simply energy but also because of the high socio-economic value of the service provided to education, health, communications, and other activities involved in rural development.

Tapping solar heat

The contribution of flat solar panel technology to saving the consumption of conventional fuels is important because it replaces electricity, natural gas, liquefied petroleum gas and, in some cases, firewood, which involves savings in foreign currency or resources that could be aimed at other uses. At the same time, they also constitute a major contribution to the reduction of greenhouse gas emissions. This technology is for the most part in

the hands of private-sector initiatives, with building, sales, and maintenance companies in almost all the countries of the region.

The production of solar panels and equipment is done in formally established factories and in small companies; in the latter case, the need for state regulation to set standards for production and thus guarantee equipment quality for the end-user has been observed.

There are countries that have furthered the development of these systems, among which Barbados, Brazil, Colombia, Jamaica, and Mexico. Their more extensive use might require specific provisions to give incentives to, and standardize, the use of these systems in new buildings, as an energy saving strategy.

Reforms in the renewable energy subsector

The transformation of the electric power sector in Latin America and the Caribbean means that electric power generation activities will be increasingly facing conditions of disputability, and this has forced companies that promote renewable sources of energy to optimize their investment and operating costs, reaching attractive levels of competition in several countries.

In addition, power generation technologies that use renewables have benefited from international pressure to incorporate environmental and social considerations into energy projects. This has encouraged companies that manufacture equipment to tap these resources to lower the prices of their installations, thus increasing demand and reducing investment costs.

The norms introduced in electric power subsector legislation and in government strategies to promote diversification of energy supply, self-production, and small-scale and medium-scale generation have exerted a positive influence, ensuring in some cases a market for the energy produced.

In the case of small-scale projects, the new regulatory frameworks that are in force in the majority of the countries of Latin America and the Caribbean provide that the State is in charge of supplying energy to rural populations, especially dispersed populations, which has helped to secure the resources needed for developing projects aimed at tapping renewables for

(population, municipalities, private sector, and central government), are more sustainable and benefit from more support from end-users, who then value the energy service that is provided and pay for it in one way or another (contribution of materials or manpower or payment of a monthly rate). In some cases, on the basis of the projects that were developed, equipment manufacturing or service delivery companies have been set up.

Nevertheless, the cost of energy stemming from renewables is still high compared to the purchasing power of the rural population. Therefore it is of the utmost importance to have support from governments and international agencies, especially for the funding of equipment. In this context, some countries have adopted innovative funding schemes such as revolving funds, equipment rental, bank loans, and subsidies for start-up capital.

Although renewables are being consolidated as a valid alternative in both commercial and social terms, a series of barriers must still be overcome to guarantee their adequate operation and mass development, such as adequate institutional frameworks, cultural habits, funding, technological know-how, and appropriate maintenance of equipment, requiring for each type of barrier a specific approach to ensure dismantling.

Prospects for renewable sources of energy over the short and medium term

The available potential of different renewable energy resources in Latin America and the Caribbean is quite high and still far from being adequately tapped. There is a large

Geothermal projects in Latin America and the Caribbean	
Country	Installed capacity (MW)
Mexico	753.0
Costa Rica	125.0
El Salvador	105.0
Nicaragua	70.0
Guatemala	5.0
Argentina	0.7
Total	1,058.7

meeting the needs of this sector of the population.

Thus, the majority of the programs that are being implemented are rural electrification or social action programs, where energy is the principal vector for the development of the population, for which purpose direct mechanisms have been established for the participation of the population in the prioritization and implementation of projects through prefectures, municipalities, and cooperatives. These projects, with schemes from the bottom up

Biomass: Projects being developed in Latin America and the Caribbean	
Sources/technologies	Projects
Energy plantations - forest waste	<ul style="list-style-type: none"> • Brazil, more than 100,000 ha (for coal) • Honduras, 300 ha (tobacco plantations) + 400 ha (industrial consumption, starting) • Nicaragua, 3,400 ha (sugar mill) • Chile, 18.4 MW with waste
Sugar cane - cogeneration	<ul style="list-style-type: none"> • Cuba, 726 MW • Central America (Guatemala 190 MW)
Municipal solid waste	<ul style="list-style-type: none"> • Brazil, 80 MW (incineration)

number of projects being implemented, under concession, or being studied, which enables us to conclude that the contribution of these energy sources to electric power generation in the region will increase over the short and medium term.

In the case of wind energy, it is expected that by the year 2002, about 400 MW, in addition to the 85 MW that are already being generated, will be commissioned. Because of its importance, Argentina has enacted a specific law for

promoting this resource and solar energy.

As for geothermal energy, it has been forecast that by the year 2002, about 350 MW, in addition to the 1,058 already existing, will start up. In Chile and Peru, specific laws have been passed to promote geothermal energy.

Various small hydropower projects are being built, studied, and offered; therefore the contribution of SHP over the short term will rise, generating small amounts of power

basically to meet the needs of the rural sector.

Biomass could be highly developed, especially if adequate measures are taken in countries that are optimizing their sugar and wood industry to incorporate cogeneration, as well as the integration of forest production with electric power generation.

It is also worthwhile to emphasize that, in the urban area, an adequate policy for the collection and development of municipal solid waste,

Small hydropower stations: Summary of regional experience (up to 5 MW)		
Country	Number of stations	Installed capacity (MW)
Argentina	128	139
Bolivia	12	36
Brazil	475	926
Chile	22	23
Colombia	59	85
Cuba	164	13
Ecuador	22	26
Mexico	71	117
Nicaragua	2	3
Paraguay	1	1
Peru	64	13
Venezuela	50	19
Total	1070	1400

Rural electrification programs in LAC (with photovoltaic solar energy component)	
Country	Program
Argentina	Program for Electricity Supply to Dispersed Rural Population (PAEPRA)
Bolivia	National Rural Electrification Program (PRONER)
Brazil	State and Municipality Energy Development Program (PRODEEM)
Mexico	Poverty Abatement Program (PRONASOL)

especially in large and medium-sized cities, could contribute to upgrading electric power supply while providing solutions for the disposal of municipal waste using a sustainable recycling scheme.


Solar photovoltaic energy projects will be increasing substantially, mainly in Argentina, Bolivia, Brazil, Colombia, and Mexico owing to the social approach introduced into the development of their electrification programs.

In addition to meeting the energy needs of rural areas, renewable sources of energy must integrate and consider environmental ele-

ments, essentially linked to climate change issues, so that the characteristics of renewables can be enhanced and tapped and so that they can supply not only energy/electricity but also mitigate/absorb greenhouse gases.

Conclusion

Modernization in both urban areas and rural or isolated systems has led to new schemes for the development of renewable sources of energy aimed at ensuring competitive participation in the market without subsidies. Modernization was first viewed as a sign that the development of these sources

would be left behind. Nevertheless, the growth in their use means that these technologies have their slot in the region's energy matrix. In the case of stand-alone systems, their development depends on the commitment of governments and the private sector so that they can support socially oriented energy projects, on the development strategies that are adopted, and on the amount of technical and financial resources that are allocated. Likewise, the contributions that, in this context, nongovernmental organizations and university sectors involved in development can make should also be considered. 

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ENERGY EFFICIENCY AND THE DEVELOPMENT OF RENEWABLE SOURCES OF ENERGY: CHALLENGES TO BE DISCUSSED AT ***EUROLAC 2000***

Ministers and Secretaries of State in charge of the economy and energy sector of Europe, Latin America, and the Caribbean; representatives of companies that supply goods and services for the energy sector, cooperation agencies and financing institutions from the two regions; experts, researchers, and university professors and students have confirmed their participation in the Energy Conference and Exhibition of Europe, Latin America, and the Caribbean – ***EuroIac 2000***, which will be taking place on June 19-20, 2000, in Cartagena de Indias, Colombia.

Both the European Commission and OLADE conceived the idea of holding ***EuroIac 2000*** for the specific purpose of promoting the development of renewable sources of energy and energy efficiency in the new framework of competitiveness in the energy sector of Latin America and the Caribbean.

The Conference is being sponsored by the Ministry of Mines and Energy of Colombia and organized by OLADE, the Institute for Energy Diversification and Saving (IDAE) of Spain, and the National Technical University of Athens (EPU-NTUA), Greece.

The central topics of the Conference are energy efficiency and the development of renewable resources in Latin America and the Caribbean and the European Union, which will be studied from the standpoint of their evolution, current legal frameworks and policies, experiences in the two regions, and the potential for financing and investment opportunities.

In this context, it should be noted that clean energy generation and the efficient use of energy by end-users are among the most attractive alternatives to meet the energy requirements of the countries of Latin America and the Caribbean.

The rise in energy efficiency actions, an area in which the European Union has a wide range of experience, can help ensure a greater availability of resources, improve the quality of life, curtail investment needs, reduce future energy supply costs, lift the pressure on financing these costs, mitigate environmental impacts, and raise competitiveness.

The countries of Latin America and the Caribbean should continue implementing, in

some cases, or should promote the implementation of, in other cases, national energy efficiency programs that will facilitate investments in this area, train persons and companies, ensure technological upgrading, and set norms and regulations, among other important elements, which along with the European experience will be the focus of ***Eurolac 2000***'s discussions.

In addition, the share of renewables in the power generation matrix in Latin America and the Caribbean is not as yet very important compared to that of conventional energy sources; nevertheless, over the last few years, their use has been increasing as a result of efforts being made by the international community to reduce environmental pollution and because of the decline of conventional fuel imports being fostered by the countries to balance their economies. Furthermore, current technological development has helped to reduce power generation costs and enhance service reliability.

The tapping of renewable sources of energy, as demonstrated by successful projects in Europe,

Latin America and the Caribbean, in addition to reducing pressure on the demand for fossil energy and thermoelectric and hydropower generation, is generally carried out with clean energy technologies that exert a smaller impact on the environment, thus fostering the potential for comprehensive sustainable development schemes in both urban areas and rural and remote areas.

Renewables can be considered complementary but they are also necessary for the energy matrix of the countries of Latin America and the Caribbean, where there are already many important experiences consolidating their use. The exchange of these experiences with European experiences will be among the topics to be focused on in ***Eurolac 2000***.

The objectives of ***Eurolac 2000*** will be fully achieved thanks to the participation of preeminent public figures and experts in energy development, from both Europe and Latin America and the Caribbean.



Eurolac
2000 *more sustainable efficiency*

Cartagena de Indias, Colombia
June 19-20, 2000



ARGENTINA-BRASIL: Gas Integration

The Energy Secretary of Argentina, Daniel Montamat, and the President of the Argentine Gas Company, Héctor Formica, signed an Inter-institutional Cooperation Agreement with the Director General of the National Petroleum Agency of Brazil, David Zylberstajn.

The Agreement will be in force for ten years and involves the exchange of information and experience in terms of regulation, science, techniques, and environment, as well as the harmonization of norms and procedures to promote natural gas integration and trade projects.



ECUADOR: MORE OIL RESERVES

On May 17, 2000, the Minister of Energy and Mines, Pablo Terán, announced the discovery of about 500 million barrels of oil in the province of Orellana, in the country's Amazon region, in a block explored by the Argentine oil company Pérez Companc.

Officials of the Ecuadorian state oil company Petroecuador stated that Ecuador's oil potential is as yet untapped, as highlighted by this recent drilling. According to data from the oil company, at December 1999, total remanent reserves amounted to 3,293,000,000 barrels, which means that this new finding has increased Ecuadorian crude oil reserves by 13.2%.



GUYANA: OFFSHORE OIL FIND

The Canada-based company, CGX Energy Oil has announced a find of two potentially giant fields offshore Guyana. CGX has a concession offshore between the mouths of the Corentyne River to the east and the Demerara River in the west. "We are really excited," said Kerry Sully, President and Chief Executive Officer of CGX Energy. CGX holds a 100% interest in a 15,464 square kilometer exploration license in Guyana.



MEXICO-PANAMA: BUILDING A HYDROPOWER PROJECT

Mexico's Ingenieros Civiles Asociados (ICA) announced that it has signed an agreement for the construction of hydropower project known as ESTI for the generation of 122 MW in Panama. This project is worth US\$193 million. ICA plans to begin construction in July and will have 40 months for completion.



NICARAGUA: RESTARTING OIL EXPLORATION

The National Energy Commission announced that, after 20 years, Nicaragua is opening its doors once again to oil exploration.

The Government of President Arnoldo Alemán is setting up a new law that would permit the granting of oil and gas exploration concessions. It is estimated that the first exploration activities could start early next year.



PERU-ECUADOR: OIL AND ELECTRIC POWER INTERCONNECTIONS ARE GIVEN NEW THRUST

The Ministers of Energy and Mines of Peru and Ecuador, Jorge Chamot and Pablo Terán, respectively, signed the Agreement for the Elaboration of Oil Pipeline Interconnection Studies and the Framework Agreement for Neighboring Electric Power Interconnection.

The oil pipeline interconnection project is aimed at laying out a pipeline from the southeastern area of Ecuador to the point of connection with the northern Peruvian oil pipeline. This would enable oil that is produced in this area of Ecuador to be carried via the northern Peruvian oil pipeline to the port of Bayóvar.

The high-voltage interconnection of the Peruvian electric power system with that of Ecuador will optimize the power generation plant that will be installed in Machala, Ecuador next year using gas from the Gulf of Guayaquil as feedstock and will facilitate electricity trade between the two countries.



VENEZUELA: NEW BIDDING PROCESS FOR GAS FIELDS

The Minister of Energy and Mines of Venezuela, Alí Rodríguez Araque, reported that in June 2000, it is expected that a bidding process for 11 gas reservoirs, with reserves estimated to be on the order of 23 billion cubic feet, will be launched.

With this bidding process, which will close next December, the Venezuelan Government will be obtaining investments amounting to a total of US\$3 billion.



EUROPE: ACTIONS AGAINST THE GREENHOUSE GAS EFFECT

Renewable sources of energy would enable the European Union (EU) to meet up to 40% of the international commitments it made in Kyoto (1997) to fight global warming.

This estimate was calculated during an interparliamentary meeting on renewables in the European Union, which took place in the Portuguese archipelago of Madeira, in early May of this year.

The European Union had committed to reducing its carbon emissions by 8% in 2010, compared to 1999. This would involve 500 million tons of carbon, as calculated by Pedro Sampaio Nunes, who is in charge of this problem in the European Commission and who has specified that the large-scale development of renewables could lead to savings amounting to 200 tons of waste.

Bidding process for two geothermal concessions

El Salvador

El Salvador, the smallest of the Central American countries, with a surface area of only 21,000 square kilometers and population density of 286 inhabitants per square kilometer, has managed to develop a stable, reliable economy, as indicated by a country risk rating of Baa3 granted to it by Moody's Investor Services and a rating of BB+ by Standard and Poor's.

At present, the country is highly attractive for foreign investors, especially because of its suitable legal framework for private-sector investment.



San Vicente Geothermal Field

Among its objectives, the General Law for Electricity and its Regulations is aimed at developing a competitive market in electric power generation, transmission, distribution, and marketing activities. To tap hydropower and geothermal resources for electric power production purposes, a concession has to be granted by means of a bidding process. Once granted, the concession is permanent, transferable, and awarded to the entity that bids the best price. The electric power that is generated by the concession holder can be sold on the basis of contracts with different customers, such as other power generation utilities, intermediary firms or brokers, end-users (domestic or international), and/or the spot market.

In this framework and considering the current economic policy for public sector modernization, the Government of El Salvador, through the General Superintendence of Electricity and Telecommunications (SIGET)

will start up the process for prequalifying the firms that are interested and capable of participating in international bidding processes for two concessions aimed at producing electrical energy by ensuring the complementary exploration, development, and production of the San Vicente and Chinameca geothermal reservoirs, both of which have a probable minimum potential of 30 and 54 MW, respectively, and a probably maximum potential estimated to be 108 MW for each reservoir.

Specifically for the projects, a suitable level of scientific information for both geothermal reservoirs will be provided, including essential groundwork determining their feasibility and the outcome of the financial assessments and reappraisals, which have been favorable. Furthermore, it is expected that the market will be offering interesting prices for electrical energy on both the contract and spot markets.

For more detailed information of interest to potential investors or independent power producers, regarding the country, the



La Vieja, Chinameca Geothermal Field

geothermal reservoirs to be awarded, and the process to be conducted, please ask for the illustrated brochure available from SIGET or its web site: www.siget.gob.sv. Inquiries can also be made directly to the Electricity Manager's Office in the Department of Technical Standards and Concessions, Gerencia de Electricidad, Departamento de Normas Técnicas y Concesiones, phone (503) 288-0066, fax (503) 288-0069, or e-mail siget@siget.gob.sv

Executive Secretary of OLADE Speaks at the World Forum on Energy Regulation

"Frankly, I know of no region in the world that, over the last 10 years, has taken up as many challenges and made as many efforts as Latin America and the Caribbean to adjust to globalization, to promote democracy, and to ensure modernization of their societies and the abatement of poverty," stated Dr. Julio Herrera, Executive Secretary of OLADE, in the address he delivered to more than 1,000 delegates at the World Forum on Energy Regulation held in Montreal, Canada, on May 21-24, 2000.

A summary of this address, focusing on "Regulatory Aspects of the Energy Sector in Latin America and the Caribbean", is provided below.

1. Some warnings

When referring to regulatory aspects of the energy sector in Latin America and the Caribbean, some prior clarification must be made. First of all, transformation, meaning modernization and liberalization, is a process that is under way and that the countries are carrying out on the basis of their own political, economic and socio-cultural realities.

Second, it is impossible to visualize the energy sector's new characteris-

tics without taking into account current efforts of Latin America and the Caribbean to adapt to the globalization of its economy and communications, which is also under way.

Third, as a personal observation but which I believe everybody here agrees with, the impact of energy sector transformations has become apparent over the last ten years. We are therefore referring to our own efforts, because many of us have been and continue to be players in the



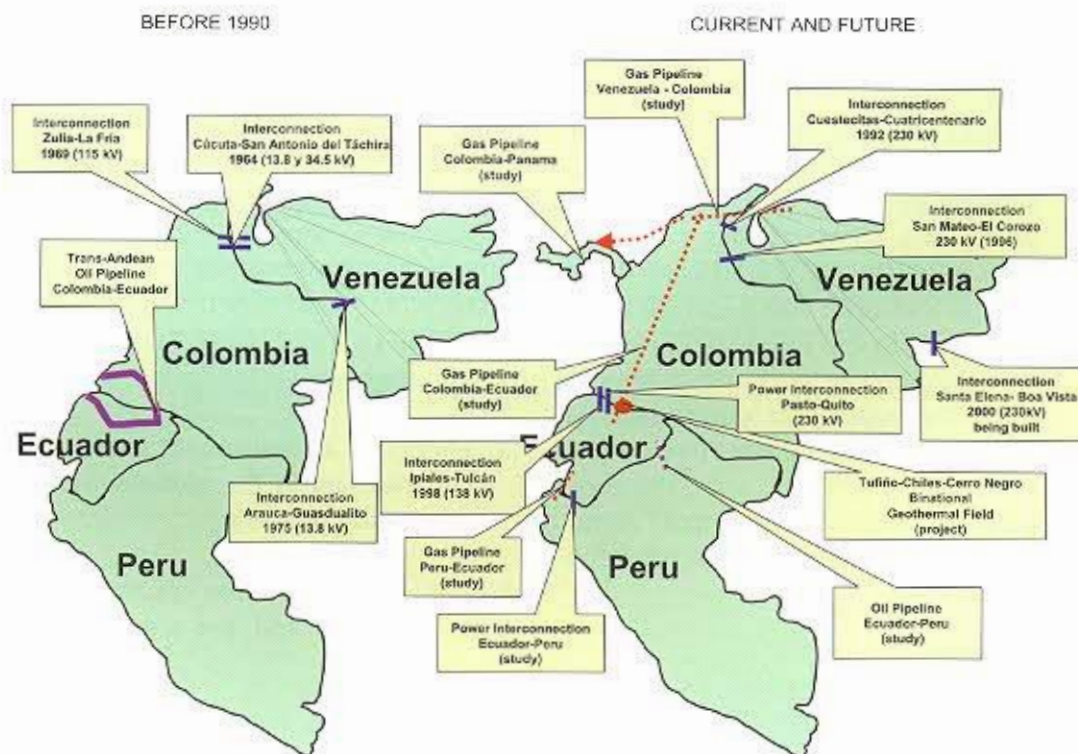
development of energy during those years.

2. Processes that are not identical but are related because of the principles and objectives involved

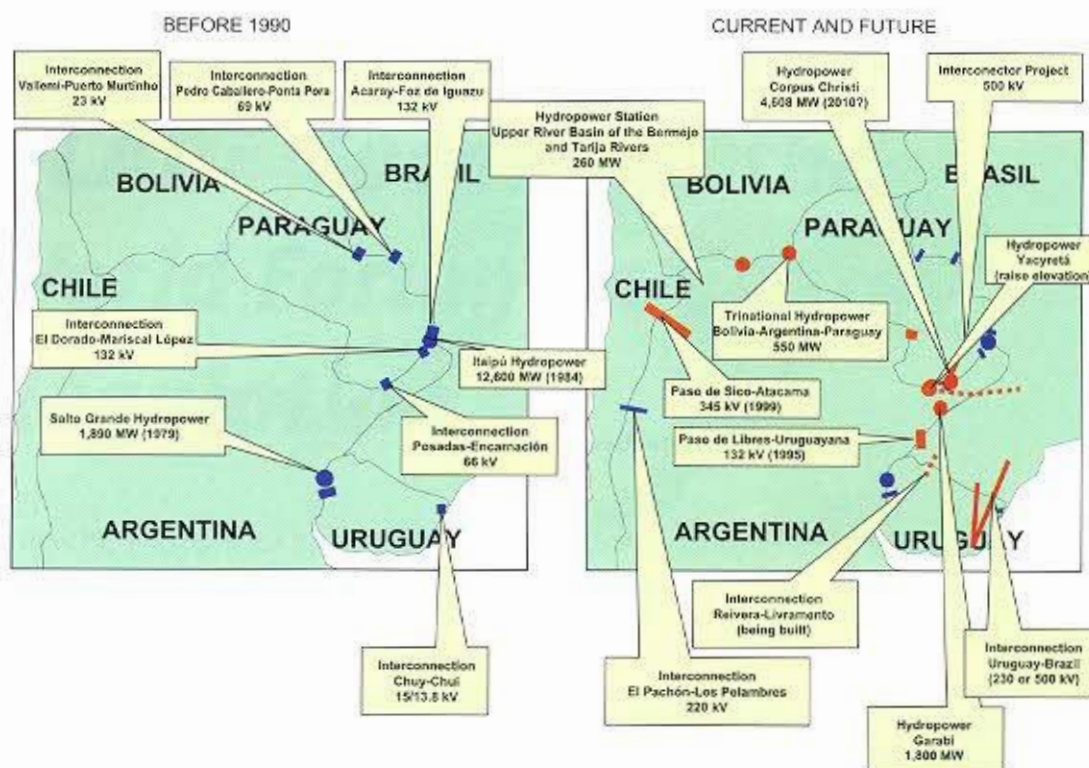
The countries of Latin America and the Caribbean have not adopted a single, blanket model for their respective energy schemes. When examin-

ing the broad outlook for this area of the world, differences are apparent in terms of regulatory frameworks, legal ownership schemes for the principal players, and the degree of integration of its neighbors. On the basis of an approach involving free trade, private-sector participation and competition inside markets, the efficiency and supply security of each national energy system, we can say that these

ANDEAN AREA: ENERGY INTERCONNECTIONS



SOUTHERN CONE: ELECTRIC POWER INTERCONNECTIONS



are some of the driving forces characterizing the transformation process.

The traditional approach assigned to the energy sector a strategic role in ensuring national security, on the basis of which the sovereignty of each country was founded and ensuring an increasingly higher degree of energy self-sufficiency. Over the past few years, this approach has changed, with energy being viewed as an input that is essential for a competitive economy, in the understanding that industrial productivity and quality of life of the population require reliable energy supply at competitive prices. Likewise, for the first time, the concept of environmental impact stemming from energy activities has been introduced.

The depth and complexity of these changes in approach, concepts, and roles given to energy have had, and continue to have, repercussions on the political, economic, social, and even the cultural aspects of the countries. Overcoming the obstacles of a nationalistic bent to achieve systems that are efficient, reliable, and aimed at enhancing the competitiveness of productive sectors and improving the quality of life of the population has involved the continent in a debate in each one of these issues, which has oftentimes been quite harsh.

3. Energy as an instrument and as a contribution to the globalization adaptation process

It could be said that the countries of Latin America and the Caribbean

have unanimously adopted the political decision of inserting their economies in a globalized world and have adhered to the initial tenet that those who are outside globalization enjoy none of its benefits while avoiding very few of its drawbacks. This area of the world has therefore carried out the basic reforms to render this insertion possible.

Political reforms: in order to provide greater transparency to its systems and facilitate broader participation of citizens in decision-making. In many countries, the first step consisted of returning to a democratic system of government or initiating one.

Economic reforms: in order to put public accounts on a sound footing and to combat endemic inflationary processes and thus obtain macroeco-

nomie stability so as to offer a more predictable scenario for investors and establish rules for economic activities that are credible for economic players.

Social reforms: aimed at rationalizing welfare systems, modernizing educational systems, and providing greater health coverage for the population, they have been a priority concern and have led to increases in social spending, allocated by the governments in their different budgets during the nineties.

To these reforms must be added those that are our present concern: energy reforms. In this aspect, so as not to repeat what has already been said, we would like to highlight the new role taken over by the States at this stage. They have substituted totally

Social Spending/GDP (%)									
LAC		Education		Health		Social Security		Housing and Welfare	
1990-1991	1996-1997	1990-1991	1996-1997	1990-1991	1996-1997	1990-1991	1996-1997	1990-1991	1996-1997
10.1	12.4	3.0	3.8	2.7	3.2	4.3	5.3	1.3	1.6

Source: ECLAC

LATIN AMERICA: SOCIAL SPENDING/PUBLIC SPENDING TOTAL	
1990 - 1991	1996 - 1997
41.00%	47.20%

Source: ECLAC

During the decade, the region has recorded significant progress in the amount of public resources aimed at the social sectors.

SOUTHERN CONE: GAS INTERCONNECTIONS

BEFORE 1990



CURRENT AND FUTURE



or partially their business involvement and when they have retained this participation they have sought to install competitive schemes and introduce regulatory and supervisory functions for the protection of the rights and welfare of the consumers so as to counter any possible monopolistic behavior as a result of market liberalization. The energy sector has fostered a very large flow of private

investment, which has contributed to economic growth and, in many cases, has enabled the States to allocate resources to meet the above-mentioned social objectives.

Likewise, private-sector participation and investment have contributed to and built up the development of sub-regional integration schemes. The case of MERCOSUR is the most note-

Domestic Transport and Distribution of Natural Gas

COUNTRY	RESIDENTIAL CONSUMP.		%	INFRASTRUCTURE		%
	thousand cubic mt/year		Increase	kilometers		Increase
	1988	1998		1988	1998	
Argentina	4,202,000.0	5,803,277.0	38.1	55,000.0	92,421.0	68.0
Bolivia	3.0	7.4	147.8	2,247.7	3,405.1	51.5
Brazil ¹	1,022.0	72,730.0	7,016.4	239.4	3,440.4	1,337.1
Colombia	102.3	679.0	563.6	1,200.0	7,630.0	535.8
Chile	0.0	5,890.0		453.0	2,614.0	477.0
Chile XII Region	138,885.0	177,547.0	27.8			
Mexico	103,000.0	987,252.0	858.5		11,877.0	
Venezuela	93.0	113.7				
Total	4,445,105.3	7,047,496.2	58.5	59,140.1	121,387.5	105.3
Total without Arg. ²	243,105.3	1,244,219.2	411.8	59,140.1	109,510.5	85.2

1. CNG 1990 instead of 1988

2. Consumption is without Argentina, Infrastructure is without Mexico

LATIN AMERICA AND THE CARIBBEAN				
	1988	1998	Interannual Growth Rate 88-98	Growth in the Decade
Share of natural gas in primary energy supply (%)	16.9	21.7	2.5%	28.4%
Share of firewood in primary energy supply (%)	12.6	9.1	-3.2%	-27.8%
Electric power service coverage (%)	75.1	87.9	1.6%	17.0%
Electric power generation efficiency (%)	51.0	55.0	0.8%	7.8%
Total electric power consumption per capita (kWh/inhab)	1110.9	1455.3	2.7%	31.0%
Residential electric power consumption per capita (kWh/inhab)	304.7	442.6	3.8%	45.3%
Industrial electric power consumption per capita (kWh/inhab)	585.6	674.8	1.4%	15.2%
Commercial/public serv. power consumption per capita (kWh/inhab)	189.7	251.2	4.0%	48.0%
Final energy consumption by inhabitant (boe/inhab)	5.5	6.3	1.4%	14.5%
Share of natural gas in final consumption (%)	7.0	8.9	2.4%	27.1%
Share of electric power in final consumption (%)	11.6	13.4	1.5%	15.5%
Share of firewood in final consumption (%)	13.7	9.9	-3.2%	-27.7%
kg of CO ₂ per kWh generated	253.0	226.0	-1.1%	-10.7%
kg of CO ₂ per US\$ of industrial GDP	780.0	757.0	-0.3%	-2.9%

Source: OLADE-EC, Energy-Economic Information System (SIEE)

worthy, although there is proof of this integration in other current subregional agreements in Latin America and the Caribbean.

The new paradigms, for the first time, have also fostered environmental protection standards in autonomous systematizations or incorporated into energy regulations. In the understanding that sustainable development is a development that enables

present needs to be met without compromising the capacity of future generations to meet their own needs.

Comparisons conducted between the period before 1990 and subsequent years (drawn from the information supplied by the tables) provide evidence of the achievements in terms of interconnection projects, energy flow trade, access to products and services, higher per capita consumption

LATIN AMERICA AND THE CARIBBEAN

Intra-regional exports of oil and products (thousand barrels)

1988	1996
86,924	332,872
Percentage variation	282.90%

Source: IEMSUR

Intra-regional exports of electricity (GWh)

1988	1996
20,773	41,391
Percentage variation	99.30%

Source: IEMSUR

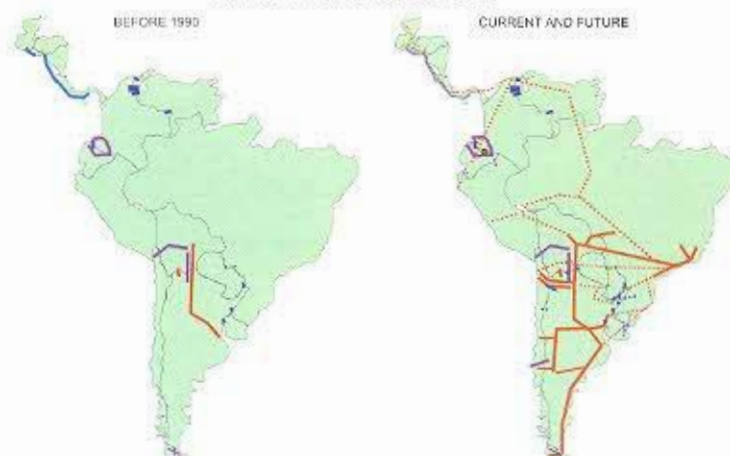
Intra-regional exports of natural gas (Million cubic meters)

1996	2000
2,285	13,690**
Percentage variation	499.1%

**Estimate

Source: OLADE-ECLAC-GTZ Project

LATIN AMERICA ENERGY INTERCONNECTIONS



of commercial energy and the expansion of electricity coverage.

Frankly, I know of no region in the world that, over the last 10 years, has taken up as many challenges and made as many efforts as Latin America and the Caribbean to adjust to globalization, to promote democracy, and to ensure modernization of their societies and the abatement of poverty.

4. Hemispheric Energy Initiative

The countries of Latin America and the Caribbean have not only processed and continue to carry out the national and subregional transformations referred to above, but also actively participate in finding political consensus for the objectives set forth in the Hemispheric Initiative, aimed at setting up a future, which we trust will be soon, for the entire energy system of the Americas so that it can act as a leading player in the consolidation and sustainable development of the continent as a whole.

5. OLADE's commitment

The Latin American Energy Organization is committed to the objective of hemispheric integration based on

subregional and regional consolidation, the strengthening of transformations that have already been made, and the generation of better conditions for those transformations that have yet to be carried out. In this sense, OLADE will conduct further in-depth studies to examine existing regulatory frameworks and to ensure that they will be enhanced in the future, carry out energy forecasting studies and analyses over the next few years, linking them closely to the macroeconomic results for the same period of time, and make a concrete proposal for joint work between this area of the world and others to enhance the competitiveness of production sectors, energy efficiency, and the development of renewable sources of energy.

The reality of the region's energy sector requires OLADE to play a role that, in its origins, it was not expected to play, namely, that of coordinating the indicative plans of governments with the interests and strategies of private-sector companies. We are in the process of drafting new regulations for the Organization that will permit and foster the active participation of the business sector in the activities that our OLADE will have to carry out. 