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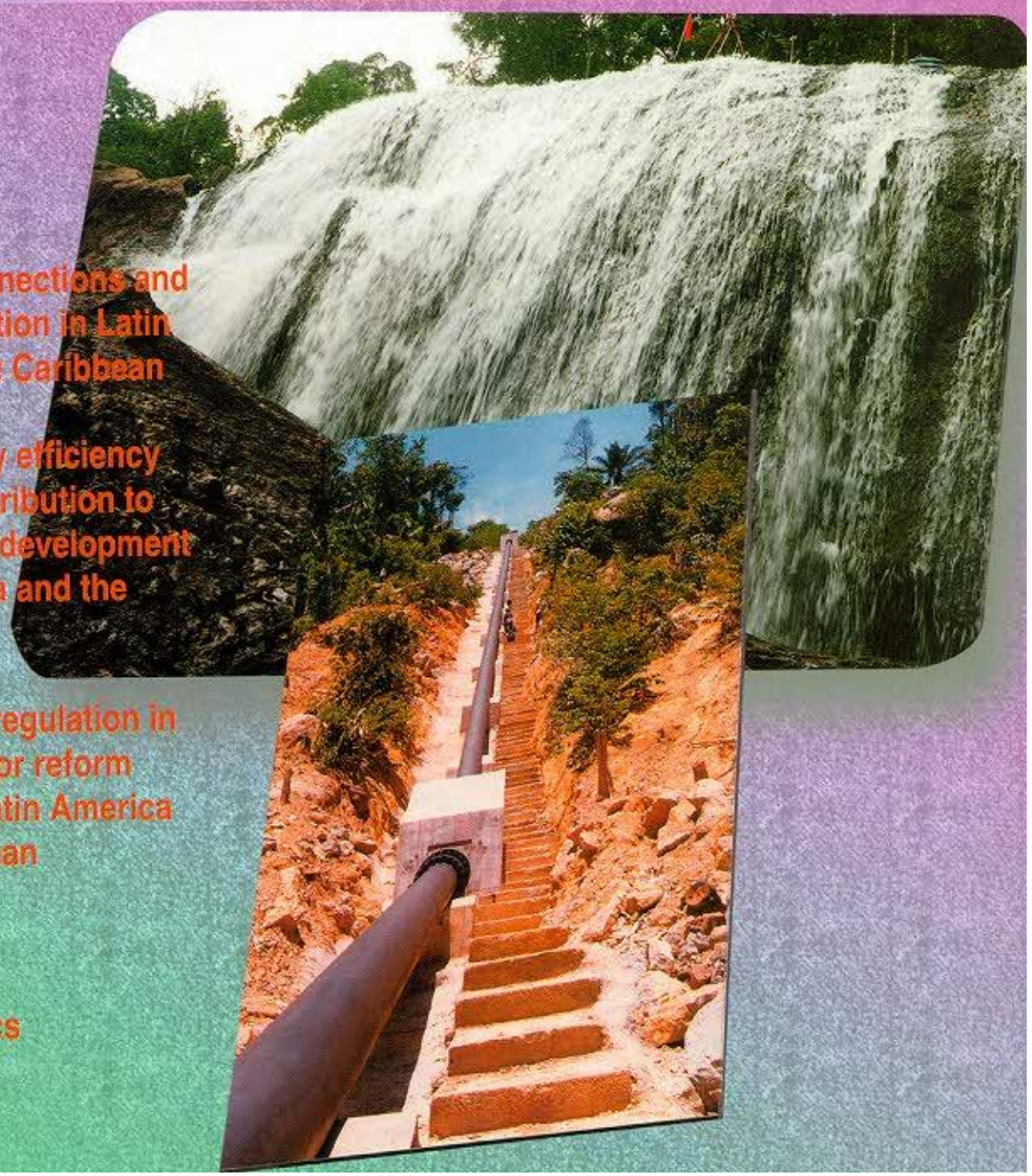
LATIN AMERICAN ENERGY ORGANIZATION

GUYANA: natural resources and development

Energy Magazine

Year 23, number 4, October-November-December 1999



Energy interconnections and regional integration in Latin America and the Caribbean

OLADE's energy efficiency programs: contribution to the sustainable development of Latin America and the Caribbean

Environmental regulation in the energy sector reform processes of Latin America and the Caribbean

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ISBN 02544-845

Editorial

Physical interconnection in the energy sector of Latin America and the Caribbean has made major strides over the last few years. Nevertheless, the projects that have been identified and especially the possibility of new interconnection initiatives in the gas, oil, and electric power subsectors will widen opportunities to complement resources and promote regional integration processes.

The implementation of these projects, whose feasibility in most cases has been confirmed, should necessarily consider the three dimensions of sustainable development: economic, environmental, and social.

In this context, the countries of Latin America and the Caribbean will have to make major efforts to adjust their legal, regulatory, and institutional frameworks to a new scheme for energy development where the private sector will have a fundamental role to play. Likewise, they will have to consolidate actions to ensure the financing of these projects.

This issue is dealt with by one of the articles of the present issue of the *Energy Magazine*, which provides a brief overview of the OLADE's Central Topic for 1999: Energy Interconnections and Regional Integration in Latin America and Caribbean.

The spotlight section in this issue is focusing on Guyana and the noteworthy impetus this country has given to its energy sector, which is viewed as one of the fundamental pillars of its socioeconomic development and which also contributes to Guyana's recognized role in promoting integration and cooperation processes of the Caribbean subregion.

In addition, there is an article on energy efficiency programs that OLADE has been implementing, highlighting the high potential for energy conservation in the region and the economic benefits that can be achieved through demand-side management actions and energy resource conservation.

Finally, there is an article on environmental regulation involving in energy sector reforms in Latin America and the Caribbean, which intends to contribute to environmental protection in the region's energy development.

Luiz A. M. da Fonseca
Executive Secretary

Energy interconnections and regional integration in Latin America and the Caribbean

Energy policies in integration processes

Energy integration policies issued by the countries can be found in various instruments: subsector development plans or else national energy forecasting studies, which examine the benefits that can be achieved by interconnection projects. They can also be found in another instrument: the regulatory and institutional frameworks that provide the norms and mechanisms that have to be complied with in international energy trade operations. Finally, the international treaties, agreements, and conventions are other instruments that set global guidelines for promoting energy interconnections and that enable the countries to go in similar directions.

In **Central America,** the common view that a subregional electric power integration project will bring major advantages makes it evident that, even when this topic is not explicitly referred to in national energy programs, the countries of the area agree on the political approach to integration. In Mexico, sector development programs do not use integration processes as a reference but the more recent initiatives for electric power and gas interconnection with the Central American countries can be explained in the light of the potential for development in these countries, where high energy consumption growth rates can be observed. Likewise, electric power interconnections between the first two countries could facilitate, over the medium and long term, energy transfers to the Central American Isthmus through Mexico, to the extent permitted by technical and economic conditions.

The energy policies of the countries of **Mercosur plus Bolivia and Chile** have been aimed at ensuring complementation among the different countries, providing a wide range of opportunities for the private sector. The location of energy resources in the different countries enables local demand to be complemented by means of electric power or natural gas interconnections. Energy integration is facilitated by a more homogeneous progress in reform and modernization and greater coordination using market mechanisms. As a rule, the participation of private capital provides an option for securing the capital that is needed to develop the electric power infrastructure, promoting it as a business opportunity.

Although major bilateral agreements have been drawn up, the energy policies of the **Andean countries** do not include strategies aimed at ensuring integration. To date, the current electric

power interconnections have responded to specific situations or as a backup for border systems without optimizing the joint use of resources; and as yet there are no gas interconnections between the countries of this subregion.

As for the **Caribbean**, there is a variety of entities promoting energy integration. Nevertheless, specific policies are required in each one of the countries to address the issue of integration. Initiatives aimed at presenting common stances suggest that there is a political will to move ahead in energy integration and cooperation in the subregion.

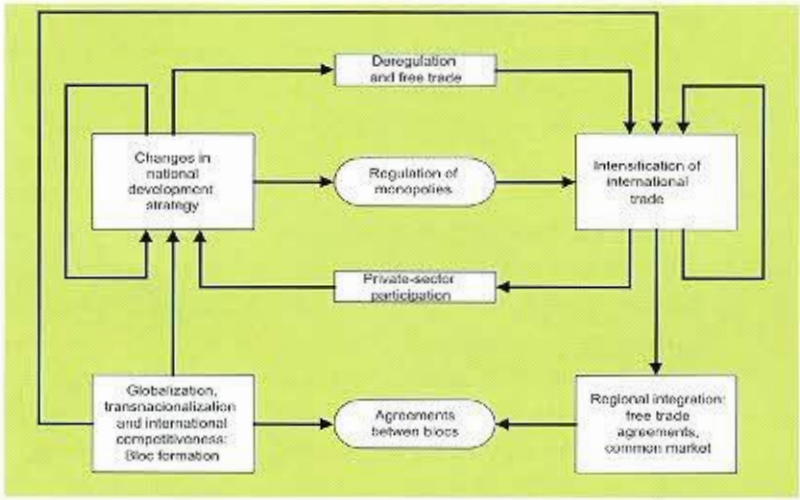
Specificities of integration

As part of the energy sector reform process of Latin America and the Caribbean, the concept of *competition* is an essential ingredient for the opening up of *private-sector participation* and energy integration in the different subregions. The enlargement of *energy markets* highlights the need for a competition that will enable the customers of electric power service to receive part of the *benefits* stemming from reform and competition.

Despite the advantages of energy interconnections, it is necessary to note that, according to CIER studies, power interconnections can involve *drawbacks*, for example in terms of marginal costs; it is therefore advisable to focus attention on mechanisms for the allocation of benefits. Another aspect that has to be taken into account is the energy reserves of a producer country, mainly in terms of reduction of reservoir storage, which could mean a fall in local electric power supply in cases of long-lasting droughts or unforeseen events. Over the long term, the intensive use of natural gas would contribute to reducing the reserves of this primary energy source.

As for natural gas, a radical transformation of company structure has been observed in the region. In some cases there has been a *vertical and horizontal breakup* in the different stages of the gas chain, whereas in other cases there has been vertical integration as a result of the participation of private-sector players in gas production and transport and power generation. The new natural gas market profile has permitted an intensified development of subregional interconnections essentially owing to the growing need for additional electric power generation capacity at lower costs and under environmentally compatible conditions.

Inter-relations between Reforms and Energy Integration



Electric power subsector

In the **Central American Isthmus** there are two subregional interconnections (Guatemala–El Salvador and Honduras–Nicaragua–Costa Rica–Panama) that have facilitated occasional exchanges and backup in emergency situations. They have been highly useful to tackle power generation crises in various countries, which is no doubt of much benefit for the subregion. With the SIEPAC Project, it is expected that an electric power connection between El Salvador and Honduras, as well as the construction of a new line from Guatemala to Panama, will be concluded. The possibility of an electric power connection between **Mexico** and Guatemala is favorable, since the prefeasibility study concluded that this interconnection would provide substantial benefits for both countries. At present, Mexico has various interconnection points with the United States along its northern border and one interconnection with Belize on its southern border. The regulatory frameworks of the subregion's countries do not mention the establishment of a subregional electric power market; they only refer to energy export and import functions, probably because of their focus on current interconnections rather than on the creation of a competitive market. Nevertheless, the *Framework Treaty for the Electric Power Market of Central America* provides the institutional and legal basis to set up a regional electric power market and has created two agencies: the *Regional Electric Power Interconnection Commission* (*Comisión Regional de Interconexión Eléctrica—CRIE*), which is the market's regulatory institution; and the

Regional Operator Entity (Ente Operador Regional—EOR), which is coordinator of the national dispatch entities.

Mercosur has major hydro, gas, oil, and coal reserves. The binational hydropower projects of Salto Grande, Itaipú and Yacyretá have been a driving force behind the subregion's energy integration process. In the subregion, there are exporting countries such as Argentina, Bolivia, and Paraguay, which have made available to their neighboring countries large volumes of surplus natural gas and/or electricity, and there are importing countries, such as Uruguay, Chile, and Brazil, which complement their domestic supply by importing energy. Brazil in particular has resorted to energy supplies from Venezuela, Paraguay, Uruguay, Argentina, and Bolivia, in order to meet its growing domestic needs. At present there are about 15 interconnection projects in this subregion: three binational projects; nine interconnection lines; and three electric power interconnection projects in the process of being built. Likewise, there are at least ten other future electric power interconnection projects that have been identified, among which binational hydropower projects and interconnection lines between national grids. This highlights the major strides taken by the subregion in electric power integration, which have contributed to opening up the possibility of establishing a large wholesale power market over the medium and long term.

Except for Paraguay, which is in the process of revising its Electricity Law, the regulatory frameworks of the remaining countries have incorporated various aspects of foreign trade in electricity. Regarding this, Argentina has made important progress by means of Resolution 21/97. In Mercosur there is a large number of conventions, agreements, and treaties that are promoting integration in one way or another. These instruments have the following characteristics, among others: growing participation of private-sector initiatives; economic dispatch of respective interconnected systems; rational development of the diversity of primary energy resources and reserves; electric power supply security and quality; joint and coordinated operation of systems; competition; open market access to transmission; price reflecting the economic costs of service; avoiding discriminatory and asymmetrical practices; availability of information; joint studies aimed at exploring the possibility of greater electric power interaction.

In the **Andean subregion** there is a major potential for electric power interconnection owing to the wide differences in short-term marginal costs between the countries; hourly diversity in peak demand; hydrological diversity; geographical proximity of transmission systems; and difficulty in developing large-scale projects aimed solely at domestic markets. At present there are three points at which the electric power system of Venezuela is connected to that of Colombia. Nevertheless, the energy flows have in general been considerably below those that were planned. In addition, since 1998, there is an electric power interconnection between Colombia and Ecuador, and at present a new

Phases of Modernization

PHASES	CHARACTERISTICS	POLITICAL RESPONSE	DURATION
Pre-Reform	▪ Stagnation and economic crisis ▪ Economic, political, and social stability	▪ Conventional adjustments ▪ Reform proposal	1 to various years; failed attempts
Reform	▪ Short-term stabilization	▪ Effective adoption of the main elements of reform	1 year
Transition	▪ Recovery: boom and greater production efficiency[4] ▪ Social unrest due to imbalance from the impacts of reform[5] ▪ Crisis	▪ Implementation and addition of reforms ▪ Complementary ▪ Concern over surpluses and shortages ▪ Corrections	1 to 5 years 1 year 1 to 4 years
Post-Reform	▪ Long-term stabilization	▪ New approaches (sustainability, regional harmonization, etc.)	

interconnection with greater exchange capacity is being planned. Among the future electric power interconnection projects, there is the Binational Geothermal Project of Tufiño-Chiles-Cerro Negro, which could become the first project of this kind to be developed by two countries of the region. Likewise, as a result of the Peace Treaty between Ecuador and Peru, there has been a significant rapprochement that has led to the signature of a *Treaty between the Republic of Ecuador and the Republic of Peru on Mining and Energy Integration and Complementation*, which in turn has led to the establishment of a Binational Technical Committee for Energy and Mining, which is in charge, among other duties, of proposing initiatives and activities of common interest. At present, a transmission line between Santa Elena (Venezuela) and Boa Vista (Brazil) is being built; it will enable the latter to import hydroenergy and reduce its consumption of high-cost liquid fuel.

In the **Caribbean** there are some initiatives aimed at promoting an international electric power interconnection. Among these, there is the interconnection between Trinidad and Tobago and Venezuela, as well as the development of the binational Dos Bocas hydropower project between the Dominican Republic and Haiti.

The gas subsector

The foreign trade of natural gas from **Mexico** has to date involved purchases and sales with the United States. Imports, which are made for logistic or economic reason, are carried out without the need for prior import licenses. Among the interconnection alternatives with **Central America**, two possible sources of supply have been studied: Mexico could ensure access to energy supplies for Guatemala whereas Colombia/Venezuela could supply Panama. Nevertheless, for those countries that have a marginal profitability, the use of liquefied natural could be viewed as an alternative.

In **Mercosur** there are ten subregional interconnections that are currently operating; they have permitted the creation and expansion of gas consumption markets in the subregion and enhanced the value of gas exploration and development. The gas interconnection between Bolivia and Brazil, which started up in 1999 and will enable Argentina to gain access to part of the Brazilian market, is especially noteworthy. Argentina has also developed major gas interconnections with Chile, as well as with Uruguay. At this time, there are eight interconnections that are being built or are being planned. The new interconnections will depend on the driving force of private business initiatives and the discoveries that are made as a result of exploratory efforts in the subregion, as occurred in Bolivia in 1999, when its reserves increased dramatically.

The countries of the **Andean subregion** have large natural gas reserves, especially Venezuela, which holds the largest gas reserves of the region. The reserves of Colombia and Peru not only enable them to meet their domestic needs, but also provide surpluses that could be exported to other subregional markets. In Venezuela, the greater penetration of natural gas in the country's energy mix is being promoted by installing a competitive scheme with the broad participation of private activities in all stages of the natural gas chain. Its potential export markets are: Brazil, Central America, Colombia, the Caribbean, United States (eastern seaboard), and Puerto Rico. The gas could be carried by pipeline or in methane barges in the form of LNG.

As for natural gas in the **Caribbean,** Trinidad & Tobago, Barbados, and Cuba are gas-producing countries; Trinidad & Tobago is especially noteworthy because it produces natural gas for local consumption and has the potential to export large volumes of natural gas. It recently started to export LNG to Boston in the United States and to Spain, as well as Puerto Rico. Owing to the geographical features of the Caribbean and low demand capacity, physical integration by installing an exclusive gas line for the subre-

Structure (vertical)	Integrated, monopoly			Partial breakup	Breakup	Strict breakup
Ownership	Part of the State	State, incorporated	Mixed or private	Private *(upstream)*	Private, mixed or State	
				State or mixed *(downstream)*		
Operation (basic principle)	Mandatory control	Control, certain business autonomy	Negotiated regulation	Centralized control or negotiated regulation, competition for the contract market	Competition where there is disputability and regulation where it cannot exist (independent, technical)	
Scheme stemming from operation and coordination	**Centralized command and control (CC)**		**Regulated integrated (RI)**	**Single buyer (SB)**	**Competition inside open market (OM), regulation of natural monopolies**	

Phases of Reforms and Energy Integration

Phases of Reform	Characteristics of Integration	Policy Strategy
Pre-Reform	▪ Trade focusing on tapping comparative advantages and future common public projects. ▪ Constraints on foreign direct investment.	▪ Agreements or treaties between States. ▪ Partial dismantling of barriers. ▪ Passive participation of private sector.
Reform	▪ Trade liberalization and openness to foreign direct investment.	▪ General reduction of customs and non-customs barriers. ▪ Withdrawal of the State. ▪ Common external customs regime. ▪ Insertion of private-sector activity.
Transition	▪ Intensification of trade. ▪ Strong physical ties through infrastructure projects.	▪ Active private-sector participation. ▪ Inducement to dismantle barriers. ▪ Common external negotiation in bloc.
Post-Reform	▪ Unification of goods and services and labor markets.	▪ Dismantling of barriers. ▪ Common macroeconomic and financial policy.

gion is difficult. Nevertheless, LNG and GNC could become alternatives, and special attention should be focused on these alternatives.

Barriers

The current oil and gas laws and draft bills in **Central America** make little reference to natural gas. Because of this, the inflow of natural gas to the Isthmus would require the definition of a favorable energy policy for gas, in addition to legal, institutional, and regulatory instruments to implement this policy.

Mercosur has made substantial progress in dismantling barriers. The number of interconnection projects that are currently operating, as well as functioning binational hydropower projects, provides ample proof of the validity of this statement. Nevertheless, attention must be focused on aspects that could eventually hamper the integration process, among which: transmission capacity of national lines; the lack of an operating agreement; electric power surpluses committed as part of binational agreements; gas reserve limitations; distances between production markets and consumption markets; harmonization of import and export regulations; and the distribution of benefits stemming from international interconnections.

In general, in the **Andean subregion** investment plans do not consider international interconnections as alternatives. To date, there is no subregional energy strategy that would permit the establishment of technical, economic, and financial criteria to facilitate interconnection projects between the Andean countries. Moreover there are regulatory differences regarding the creation of competitive wholesale markets.

In the **Caribbean** there is no legislation in the subregion's countries that considers the possibility of electric power integration, even in those countries that have common land borders. It would therefore be necessary to fill this gap not only by providing national regulations but also by drawing up a subregional agreement that could serve as a reference for interconnection projects.

Electric power simulation

The review was conducted with the help of the Unified Regional Electric Power Planning System (Sistema Unificado de Planificación Eléctrica Regional) referred to as the **SUPER®**. On the basis of information provided by the coun-

tries or data available in OLADE, the following cases were analyzed: Central American Isthmus, Andean countries, and Venezuela-Colombia-Central America.

In the **Central American Isthmus** savings in total costs were evident when using higher-efficiency power stations, as well as incorporating new stations whose size would not have been feasible for a local market. As a result, it was possible to postpone investments on the order of 200 MW to the year 2010. During the period of study 1999-2010, the total flow of energy between the countries is on the order of 18,824 GWh, which amounts to three to four times the current exchanges of electricity. Likewise, there was a decline in the average marginal cost in the subregion. These results corroborate the results of studies conducted in the subregion as part of the SIEPAC project that the Central American Isthmus countries have been implementing. Likewise, the **Andean subregion** recorded a total savings distributed between investments and the operation of the electric power systems, observing the postponement of investments until after the year 2010, amounting to more than 700 MW. As for the **Venezuela-Colombia-Central America** interconnection, the Darién buffer zone is a social and environmental barrier that will hamper this electric power interconnection. Nevertheless, the simulations that were conducted showed a major decline in total investment and operating costs, and as in the previous cases, more than 2,000 MW of investment in new power generation infrastructure are being postponed until after the year 2010.

On the basis of the above, it can be concluded that, with electric power interconnections, it is possible that the countries can share their reserve stations, and this would help to limit the construction of new units over the long term. Likewise, hydropower generation and the production of low-cost stations would be tapped at all times, and this will jointly reduce energy costs. Likewise, the use of electric power stations will be enhanced owing to the possibility of integrating the load curves of the different systems, supported by

Elements for Forms of Energy Integration

Forms of energy integration	Elements (lesser or greater intensity)
▪ ***Physical integration*** i. Oil and multi-use pipelines ii. Gas pipelines iii. Developing shared hydropower projects iv. Electric power transmission	▪ One-way transport lines. ▪ Cross-border connection. ▪ Greater bilateral electric power interconnection. ▪ Multilateral interconnection: *i.* International interconnected network with restricted access. *ii.* Import and export permits. *iii.* *International common carrier (electricity, gas)*
▪ ***Policy integration***	▪ Reciprocal information and joint programs. ▪ Exchange of research results. ▪ Mutual support and cooperation mechanisms. ▪ Institutionalization of working groups. ▪ Contingency and consultation mechanisms. ▪ Institutionalization of a multilateral regional organization. ▪ Coordination of energy policies. ▪ Community policy with a subsidiary character.
▪ ***Market integration***	▪ Reduction or dismantling of general barriers. ▪ Dismantling of specific barriers (specific customs duties, etc.). ▪ Liberalization of the circulation of goods, capital, and persons. ▪ Establishment of common standards. ▪ Harmonization of fiscal measures. ▪ Harmonization of regulatory frameworks. ▪ Establishment of single markets.
▪ ***Business integration (region-wide)***	▪ Strategic alliances between regional companies in the subsectors and sectors. ▪ Integration aimed at finding resources or trans-regional markets.

existing complementariness. At the same time, market diversification will be taken advantage of for a better development and production of power generation stations as a whole. As a result, there is the possibility of creating subregional electric power markets.

Gas simulation

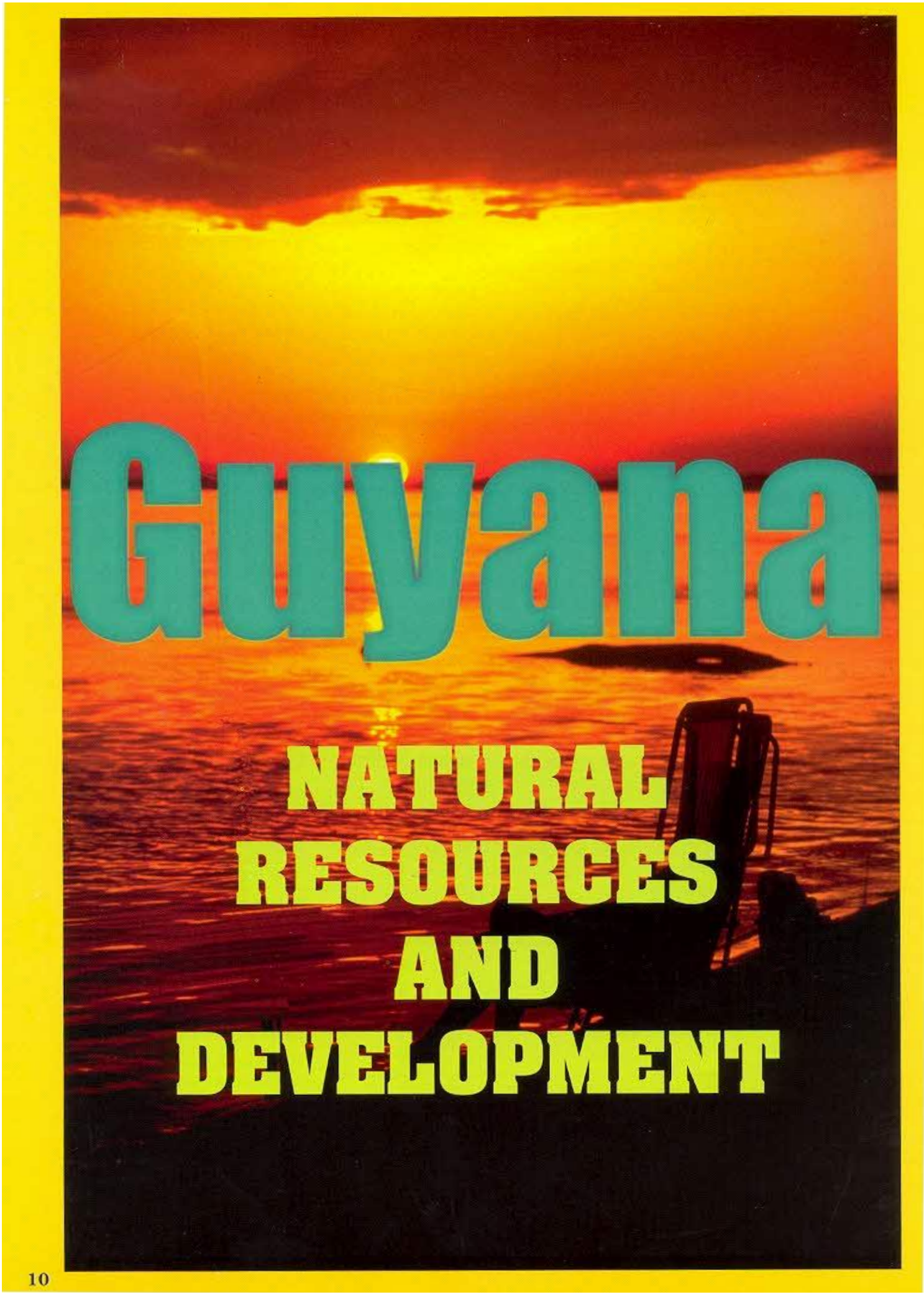
In the case of **Mexico and the Central American Isthmus** the results highlighted the feasibility of the project at the city gate prices that were considered, the volumes to be carried between the years 2005 and 2015 (2×10^{12} cf) and the investments to be made in the gas pipeline (US$820 million). Because of the marginal profitability of the second segment of the gas pipeline, as a result of the long distance to Panama, low gas prices in this country and the low demand of the Costa Rican market, the simulation points to the incorporation of these markets only as of the year 2008. Existing asymmetries between the countries regarding the domestic pricing policy for oil products, which could be substituted for natural gas, would distort the penetration of this energy source in the subregion's markets. One of the constraints for the penetration of natural gas is the size of the markets of the subregion's countries and the distance to the supply outlets. Since there are few gas interconnection alternatives, it would be important to explore the possibility of a supply that would involve the development of alternative fuels, such as LNG, in order to secure the highest benefits for the countries of the subregion. To do this, existing infrastructure and possible expansion, investments required for new facilities, prices, operating costs, and economies of scale should be taken into account.

As for natural gas, three scenarios envisaging the possibility of incorporating gas from Camisea as well as from Venezuela were reviewed for **Mercosur.** The results indicated that the subregion of Sao Paulo and southern Brazil exert a major influence in determining projects for implementation in the future, whether because of the volumes that might be required or because of city gate prices that are comparatively higher than in the other consumption centers of the subregion. In view of the latest gas discoveries in the subregion, the supply structure will be heavily influenced by the dynamics of recent discoveries. Nevertheless, this subregion could be supplied mainly by gas from Bolivia, in addition to the own production of the southeastern and southern basins of Brazil. Over the long term, Venezuela could supply LNG to the markets of Sao Paulo and Rio de Janeiro in Brazil. The Buenos Aires metropolitan area could receive gas from southern Argentina or eventually from the reservoirs of southern Bolivia. The production of Neuquén could preferably meet the demand coming from the cities close to Santiago and Concepción. The markets of Uruguay would preferably be supplied by gas from the basins of Neuquén and northwestern Argentina, whereas Paraguay's demand would be met by gas from Bolivia.

Owing to the remanent capacity of the Bolivia-Brazil gas line, there is a tendency to export Bolivian gas to Sao Paulo. The discovery of gas reserves in southern Bolivia could lead, over the medium term, to the building of a new gas line that would run through Paraguay and be connected at Porto Alegre. Likewise, this discovery could affect the new projects from Argentina to the southern and southeastern markets of this country. As long as there are gas surpluses in southern Bolivia and deficits in Argentina, the volumes of the border basins will be aimed at the latter country.

Regarding the **Caribbean**, the size of some of the markets of the subregion's countries, the distance and difficulty of access to the supply points are constraints on the penetration of natural gas. These constraints could be eliminated if compressed natural gas (CNG) could compete technically and economically with the market prices for liquid fuels that it would have to substitute. The Trans-Caribbean gas line project would only be justified if Venezuela were to export large volumes of gas to the eastern seaboard of the United States and if the opportunity price of well-head gas were lower than US$0.50 per MMBTU. This project cannot compete with that of LNG supplies from Trinidad & Tobago or Venezuela.

Summary of the document Energy Interconnections and Regional Integration in Latin America and the Caribbean, prepared by OLADE as the central topic presented at the XXX Meeting of Energy Ministers of the member countries, 1999c`q


Guyana
NATURAL
RESOURCES
AND
DEVELOPMENT

HYDROPOWER

Currently, electricity generation for the national grid is totally petroleum-based. The country's hydropower resources remain virtually untapped. Guyana's Energy Policy moves to minimize dependence on imported oil and the development of hydropower is viewed as a major potential contributor to this. Small, mini and micro hydropower schemes will be developed to supply isolated communities, particularly in remote and hinterland areas, while plans are being put in place for the construction of large hydropower schemes, through local/foreign private investment, primarily to supply the national grid.

Moco-Moco Hydropower Plant

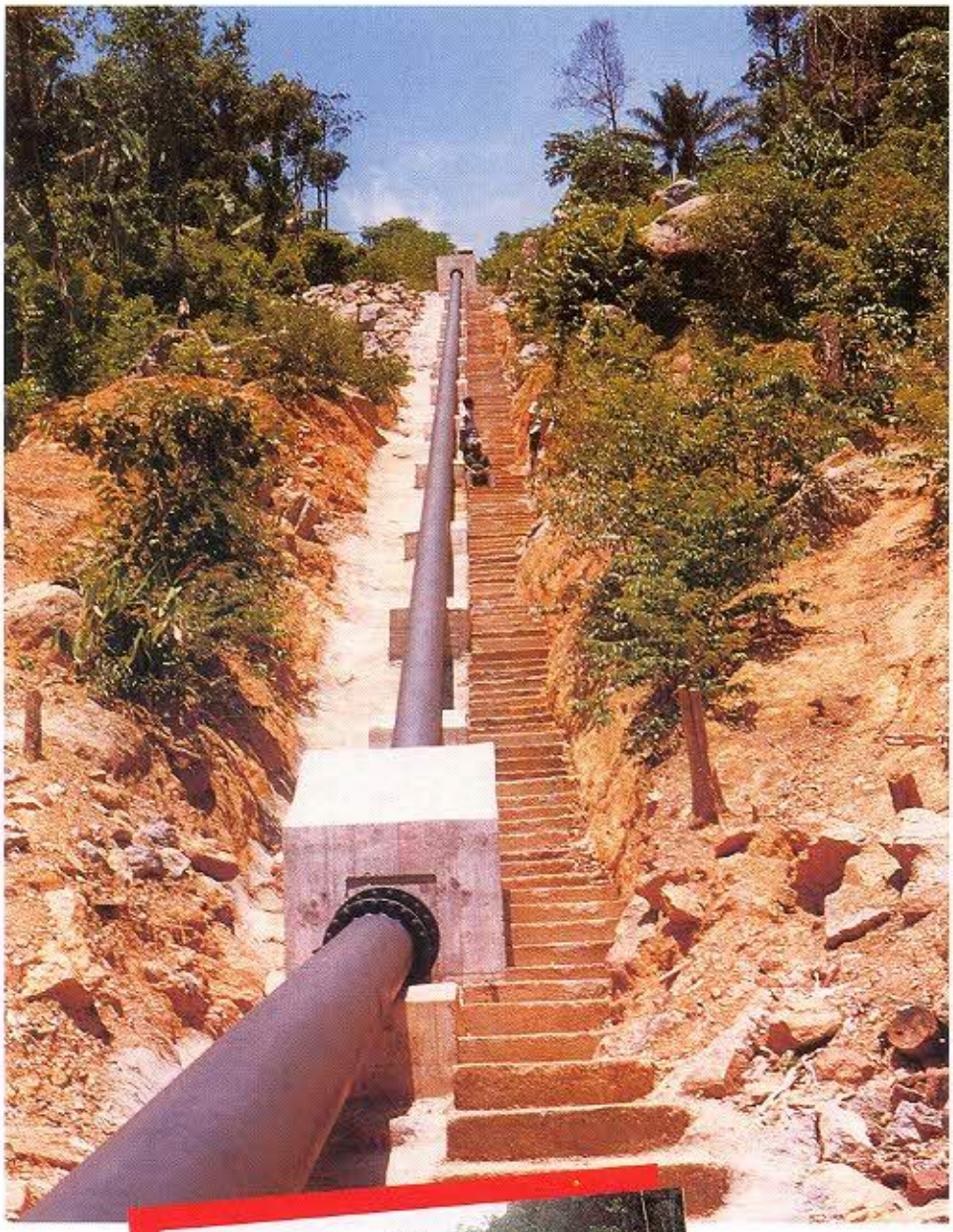
In conformity with this strategy, Guyana has witnessed the construction of a 500-kW hydropower plant located in the hinterland region of Guyana. The plant, located at Moco Moco in the southwest of the country, near the border with Brazil, was completed in May 1999. This was made possible through a transfer of technology and financial assistance from the People's Republic of China. This 500-kW plant provides power to Lethem, the main load center, and several other small communities located within 22 kilometers of the station. In the future, when demand rises above the maximum capacity of the station due to the increased international trade that is expected between Guyana and Brazil, as well as other economic activities, other surrounding potential hydro sites can be harnessed.

For example, commitments have already been made to utilize the natural resources available in the region for the production of agricultural and agro-industrial products such as cashew nuts, peanuts, peanut butter and canned juices.

Lethem is a township of 700 inhabitants (with another 1,000 in surrounding communities) in the southwestern part of Guyana, near the border with the country's giant neighbor, Brazil. Apart from being the administrative center for the Upper Takatu/Upper Essequibo Region, the largest in the country in terms of land area, Lethem is an important transit point for contact with the Roraima State in Brazil, facilitating the commercial activities of a number of small traders. The region, with its vast savannahs, is an important cattle-raising area. An airstrip at Lethem accommodates daily flights from the capital city of Georgetown.

Prior to the completion of the Moco Moco project, Lethem was supplied with electricity by a diesel-powered generator operated by the local government administration. This supply was restricted to a few hours a day and was often affected by fuel supply shortages because of the high costs of supplying the area with petroleum products from Georgetown.

Guyana is a country rich in natural resources, having a vast potential for new and renewable energy. These include solar, wind, biomass, and hydropower, the latter two being the most attractive. Their development, however, has not been in keeping with their potential, and the country still remains heavily dependent on petroleum products as its major source of energy.



In 1994, the Government of Guyana entered into a cooperation agreement with the Government of China and the development of the Moco Moco hydropower site to supply electricity to Lethem and its surrounding areas was included. Construction of the plant commenced in May 1997, and the plant was completed on May 1999. It was commissioned on November 22, 1999, and residents of the area now have power 24 hours a day.

Technology Transfer

One very important aspect of the Chinese assistance to build this plant was that of transfer of technology and know-how. Guyanese engineers visited China prior to the commencement of the construction to familiarize themselves with the technology and plant design. Once construction started, Guyanese engineers and technicians worked together with their Chinese counterparts.

Tumatumari

The Government of Guyana, the CHEQ Consortium of Quebec, Canada, and Tumatumari Hydro Incorporated (THI) of Guyana, have signed a Memorandum of Understanding for the construction of a 45-MW plant at Tumatumari, located on the Potaro River.

A 1.5 MW plant previously built in the fifties by a mining company at Tumatumari has been inoperable for many years now. CHEQ will construct a new plant primarily to supply a large gold mining operation. The Government of Guyana has agreed to purchase the power, should for any reason the gold mining entity be unable to do so.

Currently, CHEQ is in the process of arranging financing for the project, while working on finalizing the terms of the Power Purchase Agreement (PPA) with Omai Mining Company Ltd., which will be buying the power.

Amaila

The Amaila Falls is located on the Kuribrong River, a tributary of the Potaro River. It lies adjacent to the Kaieteur Falls, the largest waterfall in Guyana, and the Kaieteur National Park. A pre-investment

feasibility study will be completed in the first half of 2000 and construction could commence during the last quarter of the year. It is envisaged that the project will be developed in two phases of 100 MW each by a private developer.

Tiger Hill

This is another hydropower site that is being looked at to supply power to the load centers of the Coastal Area. The power potential, coupled with its close proximity to main load centers, where 85% of the country's population is concentrated, makes this a hydropower site worth considering. The site is situated approximately 60 km upstream along the Demerara River from the bauxite mining town of Linden, and 170 km upstream from the river's mouth, where the capital city of Georgetown is located. The initial development of the site envisions 56 MW. However, the site is a low head one and would require inundation of large forest areas.

Hosorroro Micro Hydro

It is expected that 10-kW hydro plant with an attendant micro agri-factory will be completed by the second quarter of the year 2000. Site surveys were done at Hosorroro, located in the northwestern part of the country, followed by detailed design. Analysis shows the availability of 10 kW of power, which can best be used to supply a small agro-industrial plant in the area.

The Government of Guyana is committed to the development of the country's energy resources through private sector partnerships, both local and foreign. Guyana sees itself a land of opportunity for hydropower investments. The Montreal Engineering Company conservatively estimated the potential as being somewhere in the vicinity of 7000 MW.

Studies have been done up to the prefeasibility level for all hydropower sites from 5 MW upwards. These are available upon request. But while we speak of large hydropower development in Guyana, we must take into consideration the existing small load demand. One of Guyana's most valued natural resource, however, is bauxite. Guyana has the highest quality metal grade bauxite available in the world. The availability of the large amounts of reliable and affordable power will facilitate the economically viable process of smelting to be done locally. The availability of large amounts of cheap power is also likely to stimulate other industrial activities, particularly by private investors.

The high capital investments required for hydropower stations are also a major deterrent for investment by government. Private investment, therefore, is where emphasis is being placed.

OTHER RENEWABLE ENERGY

Biomass

Fuelwood is used extensively as a domestic fuel and to a lesser extent as a commercial fuel. Some charcoal is also produced almost exclusively for domestic use.

Some of the available rice husk and in situ woodwaste from the timber industry is being used for energy purposes, but way below their potential. One strategy being promoted is the establishment of central electricity plants in areas where there is a high concentration of mills.

Bagasse is currently being utilized for the cogeneration of steam and electricity in the sugar industry. The analysis of the potential of this energy source reveals that, with improved efficiency, much more power could be generated than is currently done with available bagasse. The state-owned Guyana Sugar Corporation (GUYSUCO) has plans to upgrade its electricity generation plant with a view to making all power in excess of its own needs available to the national grid.

Energy Farms

An area of land has been identified and seedlings have been planted for fast-growing trees in the drive to establish an energy farm. This will be used to supplement the biomass fuel from seasonal crops such as sugar and rice.

- A small nursery has been established to produce seedlings for the project.
- A 1200-acre plot has been fully evaluated by Lands & Surveys Department and will be reserved for this project.
- Several charcoal dealers have indicated their interest in the project. A second nursery has been established with this in mind.
- Seeds are being procured from overseas.

Solar and Wind Power

Currently, solar and wind power play a small role in Guyana's energy spectrum, but their potential cannot be disregarded in the future. Some photovoltaic systems have been installed primarily at

health centers in remote areas for lighting and refrigeration. There is also a company producing solar water heaters, even though it appears that demand is below expectations. The following new projects are being considered by the GEA:

1. Development of a wind turbine to be constructed locally. It will be demonstrated to the indigenous villages such that the villagers can build their own wind turbines to work along with special and indigenous water pumps.

2. The installation of a wind turbine generator and solar panels to partly power the Guyana Energy Agency (GEA) building. These demonstration units are to be installed by the second quarter of 2000.

INTERCONNECTION WITH BRAZIL

Financing is being sought for a feasibility study of a Brazil/Guyana transmission line. This is in keeping with OLADE's integration efforts and the memorandum of understanding between Guyana and Mercosur. All member countries of Mercosur are already interconnected: Brazil, Argentina, Paraguay, and Uruguay. The construction of this line will allow Guyana to buy cheap power initially. Guyana will eventually, through the same transmission line, be able to sell energy to Latin America, thus stimulating investments by local/foreign private companies in Guyana's numerous hydro sites.

FISCAL INCENTIVES

All equipment and materials imported for the purpose of renewable energy development are free of taxation and duties. There is also a regime of fiscal incentives for industrial development of Guyana, including energy. The legal framework to promote foreign investment is already in place. The Government of Guyana remains committed to the encouragement of private investment in the energy sector.

THE PRINCIPAL COMPONENTS/ELEMENTS OF MOCO-MOCO MINI HYDROPOWER STATION

A. Civil works, that is, the construction of:

i. A small dam or weir
ii. Low-pressure glass reinforced plastic (GRP) pipe
iii. A forebay
iv. A high-pressure steel penstock
v. Powerhouse
vi. Access road

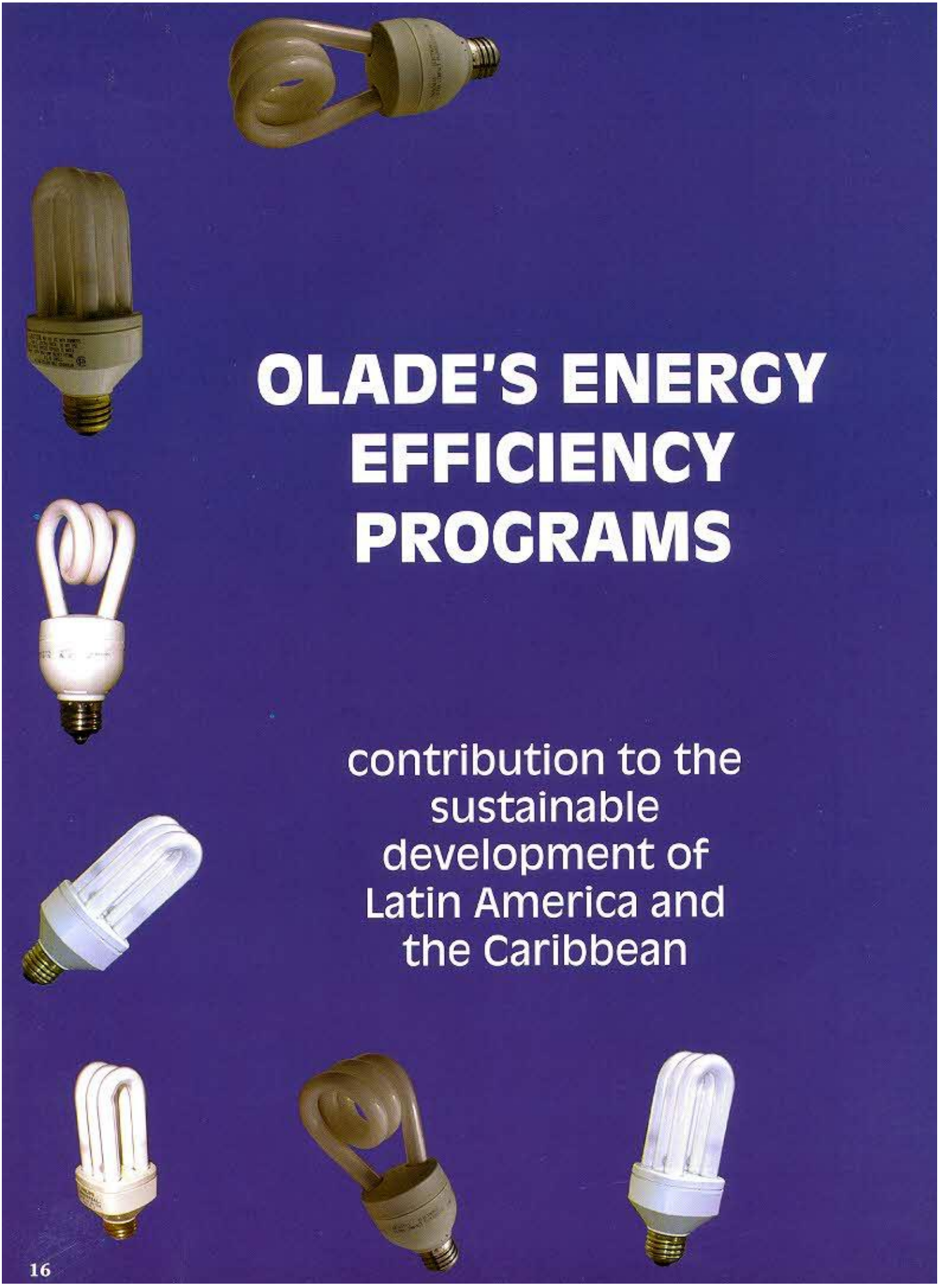
B. Installation of electromechanical equipment:

i. Turbines and governors
ii. Generators and transformers
iii. Control and excitation devices

C. Construction of transmission line

The principal engineering parameters

Catchment area	26 km2
Gross head	220 m
Average discharge	0.61 m3/s
Net head	0.32 m3/s
Dam	30 m
Low pressure (GRP) pipe	1,340 m
High-pressure (steel) penstock	560 m
Diameter of penstock	450 mm
Diameter of GRP pipe	600 mm
No. of turbines	2
Rated discharge	0.16 m3/s
Installed capacity	2 * 250 kW
Transmission line length	21 km
Transmission voltage	13.8 kV
Access road length	4 km
TOTAL INVESTMENT COST	**US$3.6 million**


OLADE'S ENERGY EFFICIENCY PROGRAMS
contribution to the sustainable development of Latin America and the Caribbean
16

With the implementation of concrete energy efficiency projects, OLADE has shown the economic advisability of conducting demand-management and energy conservation actions for all players involved in an energy efficiency program. The Organization has thus been achieving the institutional objective of conserving the region's energy resources.

Looking ahead at the changes that are taking place in the energy sector's structure, OLADE's energy efficiency programs were based on profit-earning measures so that economic attractiveness could become the determining factor for the decision of implementing them.

In order to secure the State's contribution to ensure the sustainability of energy efficiency programs, a strategy aimed at involving government officials in implementing demonstrative efficiency projects was applied. These projects have included the participation of the energy ministries and regulatory entities so that practical demonstrations can help to raise awareness about the advisability of energy policies geared to creating a suitable environment for efficiency by means of energy laws and regulations. As part of the propitious environment for efficiency, the facilities for the establishment and operation of energy service companies as a driving force behind energy efficiency programs have been taken into account.

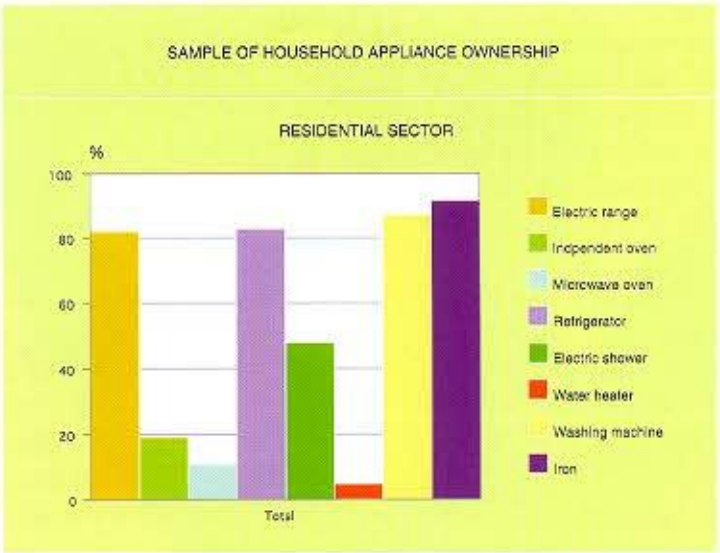
Participation of energy efficiency in sustainable development

The search for sustainable development, that is, development that proposes that the human being is both the subject and target of development, assumes the incorporation of energy efficiency as one of the principal objectives of an energy policy oriented in this direction.

The Energy and Sustainable Development Project in Latin America and the Caribbean, being conducted by OLADE and ECLAC with funding from GTZ, believes that what occurs in the three dimensions of development is of the utmost importance: the socioeconomic dimension, the environmental dimension, and equity.[1] As part of the conclusions of this project, a systemic approach with a comprehensive focus was proposed to strike a balance in the progress achieved in these dimensions.

The importance of the objective of energy efficiency for sustainable development stems from the incidence that it can have on all elements of the dimensions considered to improve economic productivity, reduce the risk of rationing, reduce the cost of energy inputs, enhance productive efficiency of companies in general and the energy sector in particular, mitigate environmental pollution, support natural resource conservation, and even reduce household expenditures.

Energy efficiency projects developed by OLADE have attempted to reach most of the above-mentioned objectives. The measures aimed at becoming part of the programs come from the analysis of the participation of end-uses, as the basic element, and then from a selection based on the economic benefits that can be obtained for all the players of a program.[2] The benefits are determined on the basis of a detailed analysis of each one of the individual players, throughout the program's duration. Priority has been given not only to the programs with the highest potential benefits but also to those where existing barriers can be overcome with greater facility, discarding those programs where there are inconveniences for one of the players.



Energy efficiency in end-use and supply

When referring to energy efficiency in general, one should differentiate between programs aimed at improving supply, on the one hand, and those aimed at improving efficiency in energy use, on the other.

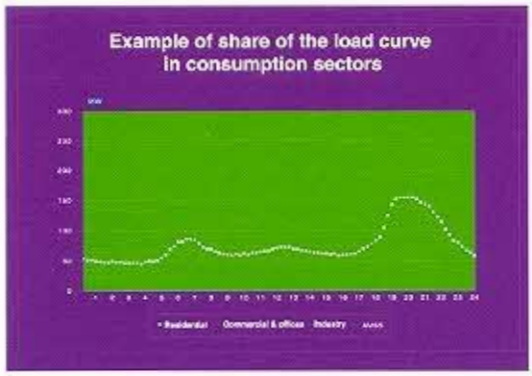
Programs aimed at improving efficiency in energy supply are all in the hands of energy companies and depend almost exclusively on their decision making. Profit-earning measures promote themselves. OLADE has worked in this group of programs, especially in efficiency of electric power generation and reduction of power losses in electric power systems. Nevertheless, the present article will focus on programs focusing on the efficient use of energy.

By contrast, programs to improve the efficient use of energy depend on the decision of the users; in other words, the measures that are proposed require promotion and awareness-raising actions aimed at a large number of persons, who as a rule are not sufficiently trained to understand an economic analysis fully and therefore require additional actions demonstrating profitability. In this situation, the responsibility for indicating economic advisability of the actions is in the hands of the designers of the programs, and therefore this is the emphasis of OLADE's technical assistance.

OLADE Projects in Efficient Use of Energy

OLADE-EC Project on Demand-Side Management in the Central American Isthmus (PIER Central America)

The specific objectives of the Project on Demand-Side Management in the Central American Isthmus are to reduce the need for investments to meet the fast-growing demand for electricity; improve the economic and financial situation of power utilities by reducing operating costs and increasing net earnings; develop national and regional engineering capabilities in this area; and raising the awareness of customers on the advisability of the rational use of energy not only for the country but also for the customers themselves.



In its first two phases, the project conducted a regional assessment and then focused on the cities of San José (Costa Rica), San Salvador (El Salvador), and Managua (Nicaragua). In its current phase, the project is being carried out in Guatemala City (Guatemala), Panama City (Panama), and San Pedro Sulas (Honduras).

The project's activities can be summarized as follows: situation assessment and prospects for electric power supply and demand in the six capitals of the Central American Isthmus (Guatemala City, Panama City, Managua, San José, San Salvador, and Tegucigalpa); selection of the first three countries; elaboration of a plan of action for each city based on a detailed study of the supply system and use of electricity in each capital by means of metering and surveys; support for application of low-cost measures; elaboration of feasibility studies for the measures that require higher investments; and dissemination of the results of the project in the subregion and region.

The elaboration of the plan of action in each one of the cities is based on a study of the load characterization, aimed at determining the share of end-uses in energy consumption and the system's load curve.

This study is conducted by means of stratified sector surveys and metering with electronic recorders at different levels of the system, at substations, among user groups and the largest users, and in individual appliances and equipment. The information that is obtained from this study helps to focus efforts on where they will be most effective; the potential savings from each one of the measures that are proposed facilitate a detailed economic analysis, which is described below. The results of the study are not for the exclusive use of the project because the utility companies that are being worked with have used them for tariff studies and demand forecasting, thanks to a better understanding of their load.[3]

The second important component of the studies being carried out is the economic analysis of the measures proposed for selecting them and setting priorities. For this analysis, the costs and benefits that a measure produces for each one of the players involved were taken into account: participating cus-

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tomers, nonparticipating customers, distribution utility, generation utility, and society as a whole. The outstanding benefits for each one of the players are the basis for selecting the measure; the facility of implementing the measures taking into account existing barriers is yet another element considered for this selection.

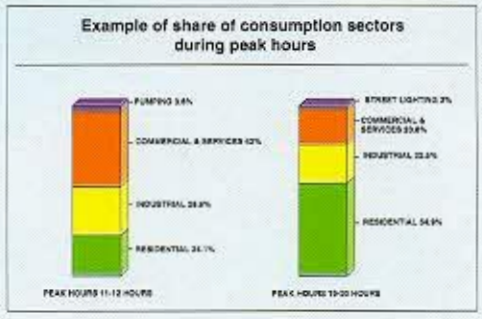
The long-term plan of action is set up by bringing together the measures selected in similar programs in order to insert them into common implementation strategies. The plan that is proposed is comprehensive since it considers actions tailored to the specific environment, as well as program implementation activities, in order to set up a suitable environment for energy efficiency taking into account the following: laws and regulations; information and dissemination; education and training; integration of equipment suppliers; technical and financial assistance.

In order to provide an overview of the project's achievements, the results expected from the 10-year plans proposed for the three first cities of the Isthmus are presented below:[4]

For San José in Costa Rica, savings of 250 GWh/year and the displacement of 101 MW have been envisaged, with an estimated investment of US$24 million for the complete program, thus avoiding costs in the amount of US$230 million. In Managua, Nicaragua, 66 GWh/year would be saved and 20 MW would be displaced, with an estimated investment of US$4 million for the complete program, thus avoiding costs in the amount of US$39 million. In El Salvador, for San Salvador a saving of 92 GWh has been envisaged, along with a displacement of 38 MW on the basis of an investment of US$9 million and a cost reduction of US$177 million.

The difference in potential reflects the diversity of conditions observed in the three countries, not only in terms of size of electric power system, but also in terms of the importance of end-uses in each country and their different share in consumption and the load curve. This is probably one of the major conclusions of the studies that were conducted, that is, the need to analyze the behavior of end-uses in each one of the countries, owing to the differences in customs and climates, which are naturally reflected in the behavior of the electric power load.

Another result that was obtained is that, as a direct result of the project's implementation, in the three Central American power utilities, there has been an upsurge of effective interest in DSM, which is evident in the establishment of permanent units to focus on the implementation of specific programs. Also worthy of mention are the project's indirect benefits, such as a better knowledge of electric power consumption characteristics (consumption habits and ownership of appliances), which can be used for other purposes such as tariff-setting, power loss control, substitution of electricity for other fuels, and evaluation of future demand.



As part of the initial implementation phase, efficient energy end-use appliances were purchased, such as: compact fluorescent lamps, incandescent energy-saving light bulbs, efficient refrigerators, power motor speed controllers, solar energy systems for water heating, and timers for electricity-powered water heaters.

After a sale contract was signed by the customers, all of these appliances and devices were installed in pre-selected neighborhoods (barrios), and the results are being monitored in order to determine the economic advantages for the power utilities and their customers. The recovery of financing for the appliances is done through the monthly bill for electricity. The amount recovered from the payments will be used to set up a small fund that will serve to continue providing coverage for these actions.

OLADE-EC Project on Demand-Side Management in the Andean Countries (PIER Andean Project)

The success of the project in the Central American Isthmus has enabled the European Commission to approve funding for a similar projects for the Andean countries. In June 1999, an agreement was signed whereby OLADE and the European Commission committed to implement an energy efficiency project in the electric power sector of the three countries of the

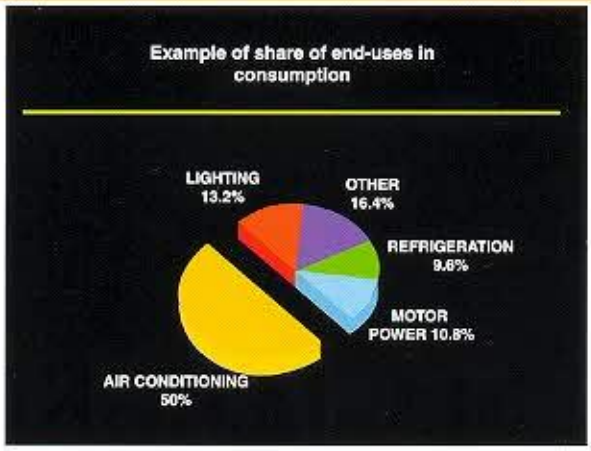
Andean Group. The European Commission is in the process of selecting and hiring the European consulting firm that would complement Latin American technical assistance for the implementation of the scheduled activities.

The current status of energy efficiency development in the countries of the subregion is different from that in the Central American countries. The development is also different between these countries. To this must be added the different load structure which is expected from the results in Central America, in order to require creative and appropriate solutions and proposals for each one of the circumstances that are observed.

Promotion of ESCOs in Latin America

Energy service companies (ESCOs) focus on the development, installment, and funding of projects designed to improve energy efficiency among the customers of energy companies, assuming the technical and financial risk on the basis of their knowledge and experience. Their services are part of project costs and are recovered with their participation in the savings generated by their projects. The objectives of these companies convert them into a powerful driving force behind energy efficiency and interest in the development of efficiency.

As a rule, the rules for operating ESCOs cannot be the same as those for the companies that are involved in another type of activity, especially because the technical and financial risk that they take should be duly covered in order to avoid distortions that would undermine the sound financing of these activities. The savings that provide the resources to ensure investment recovery are not simple to calculate and in many cases they come from comparing a situation that never existed with the results obtained from the operation of ESCOs using savings measures.



The start-up of ESCOs in Latin America has turned out to be especially difficult. Because of this, OLADE has submitted to the European Commission a project to foster the establishment of and support the operation of energy service companies. The Commission accepted the concept and started up the first phase of the project, aimed at reviewing the European experience and selecting countries for the following phase of promoting companies that can enter into partnerships with European ESCOs to start activities. OLADE is participating in this project in association with two European consulting firms.

Conclusions

The experience acquired by OLADE in developing energy efficiency projects has enabled it to go beyond mere compliance with its institutional objectives and to work effectively in contributing to the sustainable development of its member countries.

To summarize in a few words what is most relevant in this experience, emphasis should be placed on the fact that in-depth analyses indicate that there is a large potential for energy conservation in the region despite the under-consumption observed in some of our countries and that, in addition, this potential can be tapped by means of programs that are profitable for all the players involved, contributing to reducing environmental pollution stemming from energy production.

Another important conclusion is the demonstrated need for studying load characteristics in each one of the different localities where energy efficiency programs are proposed in order to learn about the reality of the share of end-uses and adequately substantiate the proposal of measures.

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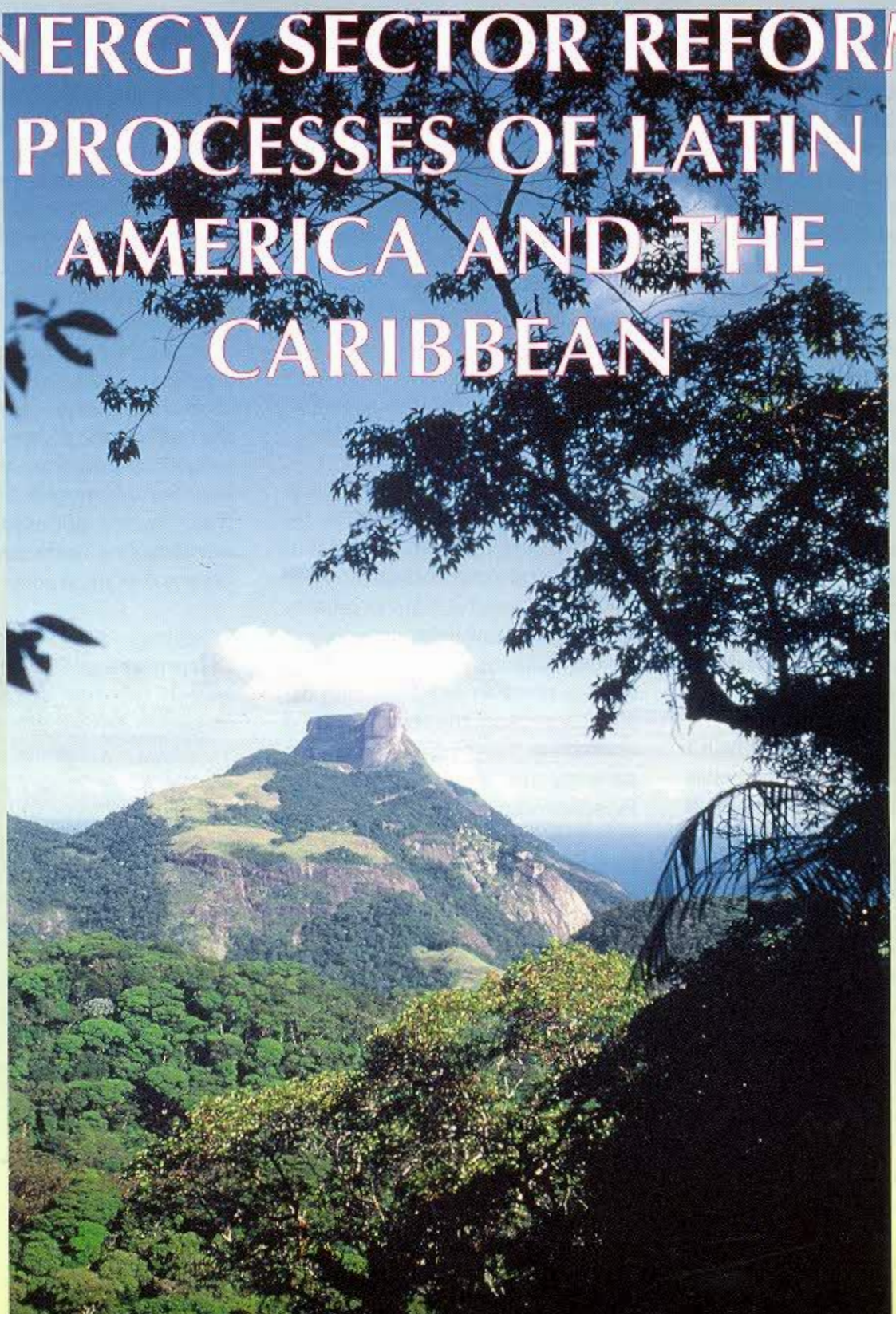
ENVIRONMENTAL REGULATION IN THE ENERGY SECTOR REFORM PROCESSES OF LATIN AMERICA AND THE CARIBBEAN



INTRODUCTION

This article intends to contribute to the debate on environmental protection policy in the energy sector re-regulation process of Latin America and the Caribbean (LAC). The results of the OLADE-ECLAC-GTZ Project on Energy and Sustainable Development in Latin America and the Caribbean and the OLADE-University of Calgary-CIDA Project on Environmental Law for the Energy Sector are included in this review. The aspects being emphasized include some of the instruments that have to be considered in developing environmental laws and policies in the region. It is very important to underscore that the enactment of laws and their effective application should be based on a coherent energy-environmental policy. In addition, taking advantage of the incorporation of environmental concerns into energy integration programs (bilateral and/or subregional), the article highlights the advisability of promoting the harmonization of environmental policies and norms between countries.

EVOLUTION OF ENERGY REGULATION

Traditionally, the strategic scheme for the energy sector required that one single institution be in charge of all sector-related functions in the countries. Over the last few years, energy sector transformation in Latin America and the Caribbean has increasingly tended to separate the sector's different functions, whether political, regulatory or business, and distribute them among the system's various players. It should be noted that the countries that have undertaken these reform processes have not always followed a single model but rather have attempted different variations of this scheme depending on their specific realities. In general, as a result of energy sector modernization, the State has transferred its business activities (energy production, transport, and marketing) to the hands of the private sector and has kept for itself the role of regulator of these activities and the sector in general. This separation has been viewed not only as a necessity to promote sector efficiency but also as convenient because, among other reasons, with the traditional scheme it was highly unlikely that penalties could be applied or that control could be effectively exercised.

Growing environmental concerns about development processes have led to their inclusion in the debate about new regulations for the energy sector. For purposes of environmental protection, the new framework of division of functions also turns out to be more convenient.

On the basis of the above-mentioned transformations, important changes have been made in policymaking and the design of regulatory norms (legal frameworks, regulations) for performing more specific roles such as supervision and monitoring of compliance with norms, conflict arbitration, and power of surveillance over services. Nevertheless, as a general trend, the separation and clarification of these functions require further conceptual development.

The design of legal frameworks is a specific function of public policymaking entities so that they can facilitate achievement of the energy sector's objectives. Regarding those functions involving the application and supervision of these norms and with the arbitration of conflicts that could arise among the different players, the trend is toward the establishment of institutions that are increasingly independent from political power. Nevertheless, regarding these two aspects, there are still major problems:

- In some cases, there is no clear separation of these two functions, since there are various regulatory entities that have overlapping jurisdictions.

- In other cases, the functions of supervising, monitoring, and arbitration, although they are clearly separate, have been assigned to specialized entities at the subsector level (electricity, oil, natural gas). Bearing in mind the strong interactions of the energy chains both in terms of production and consumption, the establishment of standard-setting institutions and frameworks that are extremely specialized generates regulatory voids.

- At the other extreme, there are some situations where the agency in charge of oversight covers such a wide jurisdiction (the full spectrum of public services) that it does not always reckon with the necessary internal specialization.

Since competition is permitted in only some of the links or segments of one single production chain, the following has been proposed: vertical and horizontal breakup, open access to networks (electricity, natural gas), and the liberalization of markets in oil activities. Nevertheless, in some cases, actual restructuring of electric power and natural gas chains did not fully address this need for segmentation, leaving at the same time the regulatory agency without any instruments to monitor monopolistic practices. In

addition to their difficulty in fulfilling their antitrust duties, the regulatory agencies are still too weak to cope with highly concentrated energy chains, and this reduces their capacity to defend the interests of consumers, which is one of their principal purposes.

REGION'S ENERGY REQUIREMENTS

The economic expansion and demographic growth of Latin America and the Caribbean have led to a rise in energy demand. According to forecasting data, for the year 2010, the region will be needing an installed capacity of 336 GW, which is 100 GW more than current capacity. In any case, the supply of energy to the population is indispensable, albeit insufficient, for development. So that this development can become sustainable, however, environmental considerations will have to be taken into account, among other factors. Energy efficiency, the rational use of energy, and demand-side management, as well as the promotion of nonpolluting energy sources, help to address energy-related environmental concerns, which must be channeled within the framework of a comprehensive national protection policy.

INSTITUTIONALIZATION OF ENVIRONMENTAL POLICY

At the start of the nineties and throughout the decade, major strides have been observed in environmental policy in Latin America and the Caribbean. In almost all the countries, the legal framework and the institutional structure of environmental policy have changed substantially. Various countries have managed to systematize efforts that previously had been isolated and specific and probably very unequal in the different areas and subsectors. At the same time, decentralization and citizen commitment have been promoted in decision making. The task is all the more complex as a result of the reforms and greater involvement of the private sector in the energy subsectors.

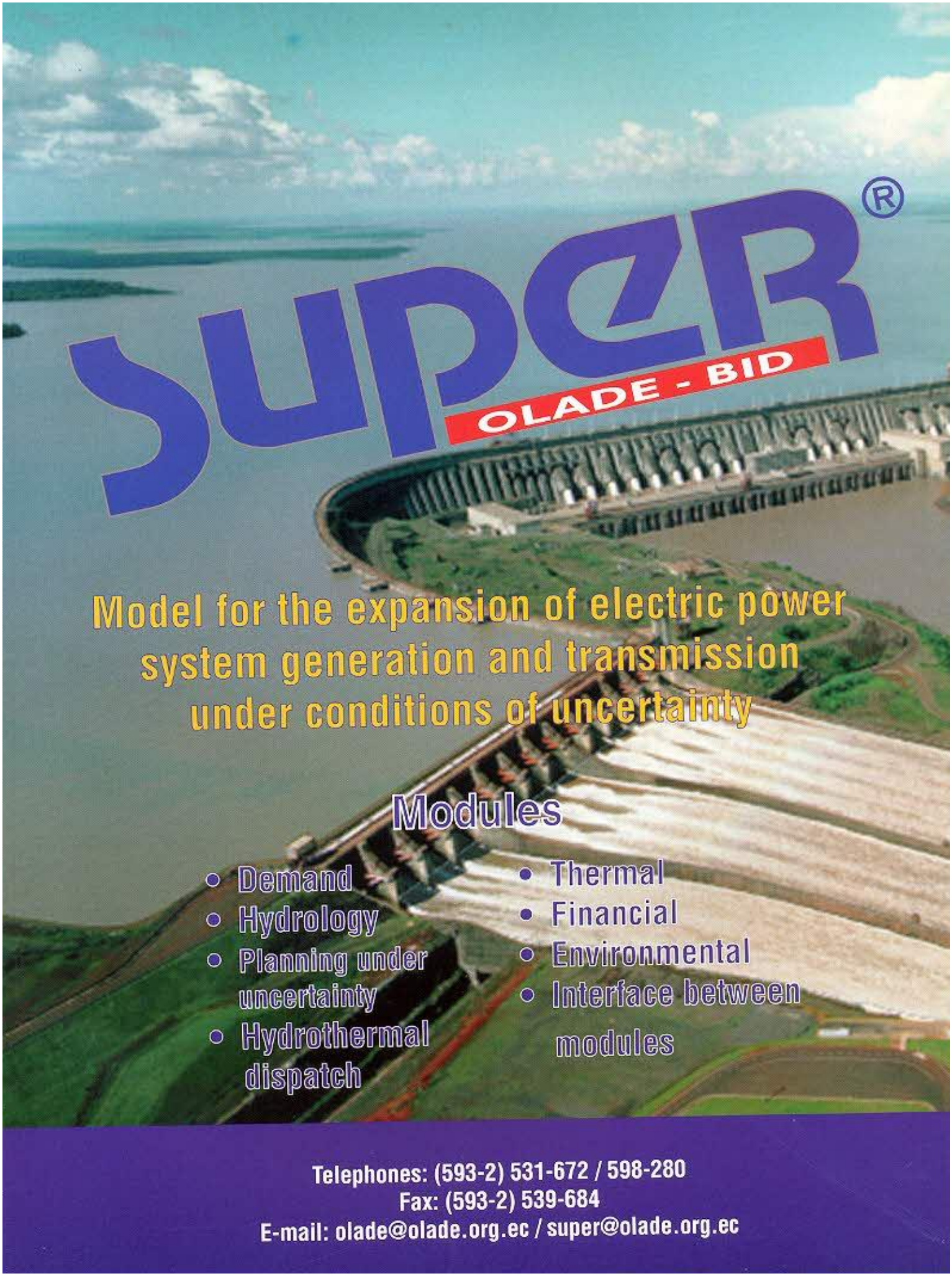
Concern for the environment has appeared gradually in some of the countries of LAC in the seventies. In the energy sector, the first activities involved not only cleaning but also reducing emissions into the air and water coming from oil industry facilities such as refineries and wells. The state oil industries of Venezuela, Colombia, Mexico, Brazil, and other countries created Environmental Control Units within their own companies. The example given by the oil industry of incorporating environmental issues into its activities has been adopted by companies from other subsectors (electric power and coal). The inclusion of environmental considerations depends heavily on the willingness of the companies in the different subsectors. The large hydropower projects of the eighties in the region regularly included studies on their environmental and social impacts, as required by multilateral and bilateral financing institutions. These institutions played an important role in incorporating environmental aspects into general development policy and specifically in establishing environmental impact assessment studies that became mandatory for large projects.

Air pollution problems in large cities has led some of them, for example, Mexico City and Santiago de Chile, to develop specific regulations for transportation and industry and even to create specific institutions aimed at improving air quality. As for national energy policies, environmental considerations appeared in fuel quality regulations and, in some countries, in promoting less toxic energy products.

Over the last few years, in many countries of the region, new environmental laws have been adopted or existing laws have been modernized. Interministerial environmental commissions and, in some cases, environmental ministries/secretariats have been organized. Some countries have granted environmental rights to their citizens, and this has enabled them to participate in the decision-making process of development projects that affect them. Nevertheless, in many cases the actual power of the new institutions is still quite weak. To date, in policy implementation, measures with environmental objectives in LAC have been mostly "command and control". There have been almost no incentive-type measures (for example, fiscal discrimination on taxes to energy products with more toxic substances). Principles such as the "polluter pays" principle, the internalization of environmental costs, and the resulting allocation impacts are being incorporated into the debate.

REGULATORY FRAMEWORK FOR ENVIRONMENT: CONSIDERATIONS

The national constitutions of the region's countries are taking up environmental concerns using more advanced approaches that are leading to the design, formulation, and application of more structured and effective legal frameworks for environmental protection. The Constitution currently in force in Ecuador includes the environment in its chapter on collective rights. Thus, Article 86 specifies that "The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State shall protect the right of the population to live in an environment that is healthy and ecologically balanced and that guarantees sustainable development; it shall ensure that this right is not undermined, and shall guarantee the preservation of nature."

Likewise, some countries have qualified environmental preservation, the prevention of environmental pollution, and the establishment of protected areas, among others, as matters of public interest; set forth schemes for penalties and imposed administrative, civil, and criminal liabilities for the infringement of environmental protection norms; recognized the community's right to participate in the decision making for projects that might affect them and the right to information; established the State's liability for environmental damage caused by State institutions, their delegates and concession holders; organized fiscal incentive systems for environmentally friendly behavior; and incorporated the principle of prevention. In terms of energy, specifically, some have declared that the promotion and use of clean technologies and nonpolluting energy are a state policy.

Now, the greatest challenge for the States is to enforce these constitutional precepts by means of comprehensive environmental policies, sufficiently developed legal and regulatory frameworks, efficient mechanisms for applying environmental protection laws, coherent and integrated institutional frameworks, and strong, autonomous, and duly equipped institutions. To this list must be added training in environmental issues for the officials of the various institutions involved in environmental matters.

As a result of the separation of functions mentioned earlier, Latin America and the Caribbean is witnessing a boom in regulations. Regarding environmental matters, it is noteworthy that efforts are being aimed at incorporating modern environmental management and policy tools such as the ordering of national territory on the basis of environmental criteria, environmental impact studies and assessments, environmental licensing, environmental audits, environmental information, citizenship participation, environmental incentives and disincentives, programs for financing environmental projects, environmental education and training, national strategies and their respective plans of action.

The incorporation of the environmental dimension in national development plans and programs and territorial ordering requires that, in their elaboration, the economic value of natural resources be considered and that the following be included: environmental services these plans and programs can provide, environmental characterization of ecosystems including their natural and cultural resources, the soil's natural and potential uses, the imbalances triggered by demographic occupancy, development activities and natural phenomena, etc. This is so the development plan or program and the territorial ordering can be aimed at establishing a due equilibrium between settlement and population growth, development activities and environmental protection measures.

The *environmental impact assessment (EIA)* is one of the most popular tools for environmental regulation and management. The law of El Salvador defines an environmental impact assessment as a set of actions and procedures to ensure that activities, works, or projects exerting a negative impact on the environment or on the quality of living of the population be subject, starting with the pre-investment phase, to procedures that identify or quantify these impacts and to recommend measures that prevent, mitigate, compensate, or rehabilitate these impacts, depending on the case, selecting the alternative that best guarantees environmental protection. Here the quality of the EIA process is emphasized. Most of the countries of the region have adopted the EIA to forecast and avoid (or minimize) the negative impacts of development on the environment. It should be underscored that, for the region, where poverty abatement is a high priority and therefore development is imperative, instruments such as the EIA are means whereby the State, as well as conscientious industry and citizens, can guarantee that development projects are environmentally sustainable. Even on the basis of more elaborate criteria, the EIA process could be applied not only, as is customary, to development activities sponsored by the public and/or private sector, expansions or modifications of already existing projects, and new projects, but also to programs and/or policies in general. This is what Venezuelan and Bolivian legislation, for example, has prescribed.

The type of project that necessarily requires a prior EIA, as well as the scope and content of the EIA, which are also usually determined by the type of project dealt with, is different for each country. In some cases, the decision to require an EIA is at the discretion of the relevant authority. Nevertheless, the content of the IEA in general includes the description of the

environment that will likely be affected, the project's potential impacts on the environment, population, and landscape, socioeconomic issues, evaluation of alternatives, plans for the mitigation of impacts, and abandonment and restoration.

In the process of approving a project, the step following the EIA is the concession or refusal to grant an environmental license or permit, on the basis of the results of the EIA. It is expected that proposals whose EIA yield considerable negative results will be rejected even when the outcome in terms of development is thought to be greater than conservation, as often occurs in our countries. In any case, the optimal situation is to have one single, clear EIA, licensing, audit, and monitoring scheme.

For example, legal frameworks where jurisdiction over the environment is divided among various agencies, which oftentimes is what occurs when there are both energy and environmental ministries without a clear separation of functions, prevent this aspiration from materializing. In order to surmount this problem, a comprehensive institutional framework focusing on environmental issues and that functions efficiently and in a coordinated fashion, avoiding isolated approaches by sector or resource, is what is required.

In keeping with the list, citizen participation in policymaking and project implementation, in addition to being a political right that is an integral part of democracy, is also an instrument that contributes to the better application of any regulatory scheme. Obviously, this contribution may be greater and more effective depending on factors as diverse as the real possibilities (concerns of legitimacy, financing, and participation) and scope of the participation envisaged in the legal framework, citizen interest, effective capacity and necessary information that the interested citizens have available. The latter should be emphasized because the right to information is a principle that complements the right to participation, both of which are effective tools for promoting environmental norms.

In any case, it is important that our legislation effectively regulate the right to participate and to obtain information, beyond the mere pronouncement of general constitutional and legal rights. When doing so, it must consider the legitimacy (open access versus restricted access to appeal), timeliness (project phase), and scope of the participation because it is no doubt true that public participation can be a factor in delaying approval procedures for a project. Nevertheless, the argument in favor of this participation is that public consultation programs provide the advantage of saving money over the long term because they help to prevent future litigation and acts of protest or violence. Furthermore, citizen participation can actually foster the effective application of environmental law. For example, in Mexico the North American Environmental Cooperation Agreement signed jointly with the United States and Canada is currently in force. Article 14 of this Agreement enables citizens and NGOs interested in filing proceedings to simply claim that any of the Parties is committing infringements of the Agreement by omission, that is, by not effectively applying its environmental legislation. It should be underscored that, although any proceeding stemming from this right is not binding for the Parties, it nevertheless exerts a major moral and political impact.

In addition, it should be added at this point that countries need to regulate effectively the participation of their indigenous population so that their ancestral traditions and specific needs are considered for a more efficient use of resources. Although the demands of this population group goes beyond specifically environmental issues, suffice it to say that protection of their physical environment and biodiversity is a central issue in their criticism of traditional development models. Beyond the environmental implications indicated herein, recognition of the participation of these groups in the development of the region responds to the imperative need for social equity, which is one of the cornerstones of sustainability.

Among the incentives and disincentives that can be used as instruments for environmental policy, fiscal mechanisms are noteworthy. Usually, a command and control system restricts itself to merely penalizing any failure to comply. Although this approach is necessary for attaining the objectives of a regulatory framework, it is insufficient. An approach using incentives and disincentives is required, in keeping with the new environmental policy trends that foster this approach. Under this scheme, for example, fiscal benefits (such as tax breaks) are offered to those companies that invest in technology and equipment to improve their activities in environmental terms, and taxes are levied on the use of environmentally damaging elements and substances.

Furthermore, market-oriented policies and various economic instruments such as sustainable development tools, including the principle of internalization of environmental costs, are becoming increasingly popular. Regarding the latter, it should be indicated that the widespread adoption of this principle would imply greater opportunities for renewable energy sources, because as asserted by the Institute for Energy Diversification and Saving (IDAE) of Spain "the exclusion of social and environmental costs in calculating fossil energy prices prevent prices from reflecting the total cost of a kilowatt-hour of electricity." Evidently the development of renewable energy sources in our environment would require heavy investments and incentives to improve their profitability and technological progress. Nevertheless, the importance of this development would precisely be the use of an economic instrument that favors the environment. The same can be said for social costs, which could also be considered for the valuation of projects and objectives.

Finally, it should be said that, although everything indicated herein has referred basically to national contexts, it is hoped that the binational and subregional integration processes that are taking place in Latin America and the Caribbean will also promote harmonization of environmental policies and legislation between the countries, bearing in mind that environmental problems do not remain within a country's own borders. Indeed, the above-mentioned integration and harmonization interact so that both favor each other mutually. In any case, harmonization is based on the establishment of certain common minimum principles, but in the understanding that each State is free, and has the sovereign right, to impose on itself even higher standards.

CONCLUSIONS

The present article's most salient points can be summarized as indicated below:

1. Existence of a process that is transforming energy sector policies and regulatory frameworks in the region.

2. Definition of the standard-setting, regulatory, and business functions that are to be discharged by each sector player.

3. Need for environmental regulatory frameworks to adjust to the sector's new structure.

4. Gradual development of modern environmental law.

5. Need to complement a comprehensive and realistic environmental policy with fully developed regulations, a consistent and integrated institutional framework, efficient institutions, and due training of government officials in environmental issues.

6. Diversity of environmental policy and management instruments: EIA, participation, information, incentives/disincentives.

7. Need to consider environmental and social costs in the development of energy projects.

8. Need to encourage the harmonization of environmental policy and regulation in the region, in view of the cross-border nature of many environmental problems.

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COLOMBIA: NEW OIL AREAS WILL BE AWARDED

In April 2000, incremental production and exploration areas will be awarded as part of the new oil policy being promoted by Ecopetrol, which is looking for the backing of private-sector capital for the sector's development.

Colombia, with an estimated oil potential of 37 billion barrels of oil equivalent, ranks second in Latin America and eighth in the world in terms of the number of private-sector companies working in the oil sector. At present, there are 77 companies in the country, among which the most reputable oil corporations in the world.

BOLIVIA: PRIVATE-SECTOR INVESTMENT EXPECTATIONS

According to information from the Vice-Ministry of Energy, up to the year 2005, private-sector investments in the amount of US$5 billion are expected in the energy sector. Of this amount, US$4.4 billion will be aimed at the oil and gas subsectors, and the rest at the electric power subsector.

Bolivia plans to export a total of 90 million cubic meters per day by the year 2010; this will require an investment of US$1.4 billion.

DOMINICAN REPUBLIC

The Technical Secretariat of the Office of the President of the Dominican Republic informed that the U.S. power utility AES will invest US$120 million in the recently acquired power distribution utility of the Dominican Republic. For US$109 million, AES obtained from the Dominican Electricity Corporation a 40-year concession to operate 50% of the AES Dominican Distribution Utility.

ARGENTINA: NEW ELECTRIC POWER PROJECT

By means of private financing secured in the amount of US$448 million for a 12-year period by PSEC GLOBAL, construction of a combined cycle project located in San Nicolás, province of Buenos Aires, will begin.

The project, which will be using gas from Paraná as feedstock, will generate about 826 MW and will sell electricity to the bulk power market of Argentina.

VENEZUELA-CUBA: JOINT OPERATION OF REFINERY

The Minister of Foreign Investment and Economic Collaboration of Cuba, Marta Lomas, informed that the Cuban oil refinery, located in the province of Cienfuegos, will be operated jointly by Cuba and Venezuela with the participation of technical experts from the state oil company PDVSA.

After preliminary reviews, specified the Minister, the scheme to operate this unit will be discussed, and it could even become a mixed enterprise.

ECUADOR: ELECTRIC POWER SECTOR PRIVATIZATION PROCESS MOVING AHEAD

According to information from the National Modernization Council (CONAM), the U.S. firm Salomon Smith Barney is providing its advisory services for the recently initiated process of appraising, marketing, and privatizing the 25 utility companies of Ecuador's electric power sector, of which 18 are generators and the rest are distributors.

The first bidding process will take place in the second semester of the year 2000, and therefore the official invitation to bid will be announced on world markets in the next few weeks.

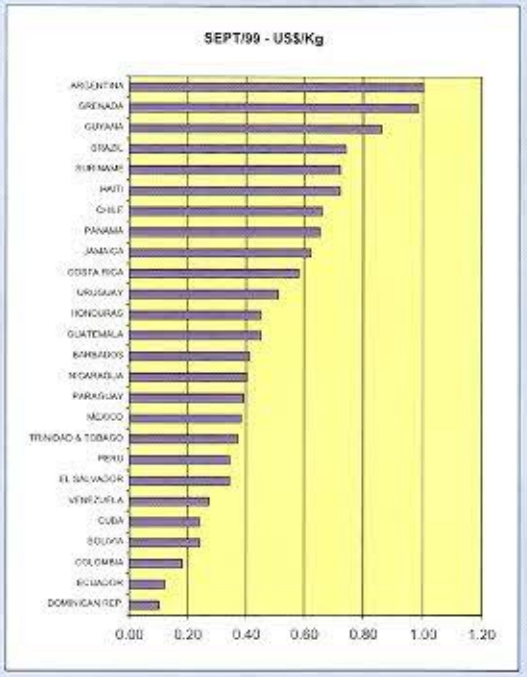
Energy Statistics

DOMESTIC END-USER PRICES WITH TAX

LIQUEFIED PETROLEUM GAS - US$/Kg

COUNTRIES	1999				ER %
	JANUARY		SEPTEMBER		
	US$/Kg	Exchange rate (DC/US$	US$/Kg	Exchange rate (DC/US$	
ARGENTINA	1.00	1.00	1.00	1.00	0
BARBADOS	0.41	2.01	0.41	2.01	0
BOLIVIA	0.26	5.66	0.24	5.92	-1.00
BRAZIL	0.49	1.99	0.74	1.92	5.29
COLOMBIA	0.21	1567.47	0.18	2017.27	-1.91
COSTA RICA	0.41	273.83	0.58	292.48	4.43
CUBA	0.24	1.00	0.24	1.00	0
CHILE	0.66	483.25	0.66	531.11	0
ECUADOR	0.23	7260.00	0.12	13801.00	-7.81
EL SALVADOR	0.34	8.76	0.34	8.76	0
GRENADA	0.98	2.70	0.98	2.70	0
GUATEMALA	0.51	6.96	0.45	7.81	-1.55
GUYANA	0.78	169.57	0.86	179.75	1.23
HAITI	0.73	16.78	0.72	16.94	-0.17
HONDURAS	0.47	13.87	0.45	14.37	-0.54
JAMAICA	0.54	37.54	0.62	39.85	1.74
MEXICO	0.33	10.17	0.38	9.36	1.78
NICARAGUA	0.42	11.30	0.40	12.11	-0.61
PANAMA	0.45	1.00	0.65	1.00	4.70
PARAGUAY	0.45	2860.00	0.39	3315.00	-1.77
PERU	0.66	3.25	0.34	3.46	-7.96
DOMINICAN REPUBLIC	0.10	16.09	0.10	16.05	0
SURINAME	0.72	401.00	0.72	401.00	0
TRINIDAD AND TOBAGO	0.37	6.30	0.37	6.28	0
URUGUAY	0.67	10.95	0.51	11.67	-3.35
VENEZUELA	0.26	573.25	0.27	626.00	0.47

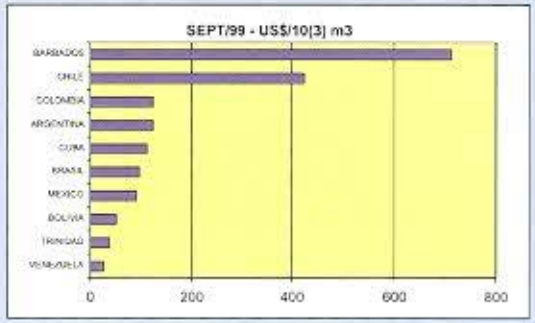
SOURCE: OLADE-GE-SIEE



INDUSTRIAL NATURAL GAS - US$/10(3)m3

COUNTRIES	1999				ER %
	JANUARY		SEPTEMBER		
	US$/10(3)m3	Exchange rate (DC/US$	US$/10(3)m3	Exchange rate (DC/US$	
ARGENTINA	121.72	1.00	121.72	1.00	0
BARBADOS	710.15	2.01	710.15	2.01	0
BOLIVIA	52.82	5.66	50.51	5.92	-0.56
BRAZIL	50.6	1.99	95.32	1.92	8.24
COLOMBIA	133.99	1567.47	122.41	2017.27	-1.12
CUBA	110	1.00	110	1.00	0
CHILE	431.64	483.25	423.02	531.11	-0.25
MEXICO	70.8	10.17	89.74	9.36	3.01
TRINIDAD AND TOBAGO	37.54	6.30	37.67	6.28	0.04
VENEZUELA	24.72	573.25	25.81	626.00	0.54

SOURCE: OLADE-GE-SIEE

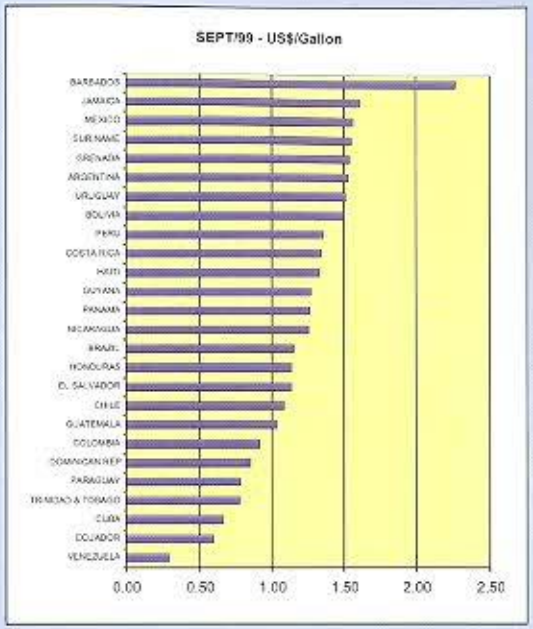


DOMESTIC END-USER PRICES WITH TAX

DIESEL OIL - US$/GALLON

COUNTRIES	1999		TC
	JANUARY	SEPTEMBER	%
ARGENTINA	1.53	1.53	0
BARBADOS	2.26	2.26	0
BOLIVIA	1.57	1.50	-0.57
BRAZIL	0.79	1.15	4.81
COLOMBIA	0.89	0.91	0.28
COSTA RICA	0.89	1.34	5.25
CUBA	0.66	0.66	0
CHILE	1.03	1.08	0.59
ECUADOR	0.99	0.59	-6.26
EL SALVADOR	1.13	1.13	0
GRENADA	1.54	1.54	0
GUATEMALA	1.10	1.03	-0.82
GUYANA	0.87	1.27	4.84
HAITI	1.34	1.33	-0.09
HONDURAS	1.17	1.13	-0.43
JAMAICA	1.20	1.61	3.74
MEXICO	1.33	1.56	2.01
NICARAGUA	1.34	1.25	-0.87
PANAMA	1.02	1.26	2.68
PARAGUAY	0.90	0.78	-1.77
PERU	1.24	1.36	1.16
DOMINICAN REP.	0.85	0.85	0
SURINAME	1.55	1.55	0
TRINIDAD AND TOBAGO	0.77	0.77	0
URUGUAY	1.57	1.51	-0.49
VENEZUELA	0.32	0.29	-1.22

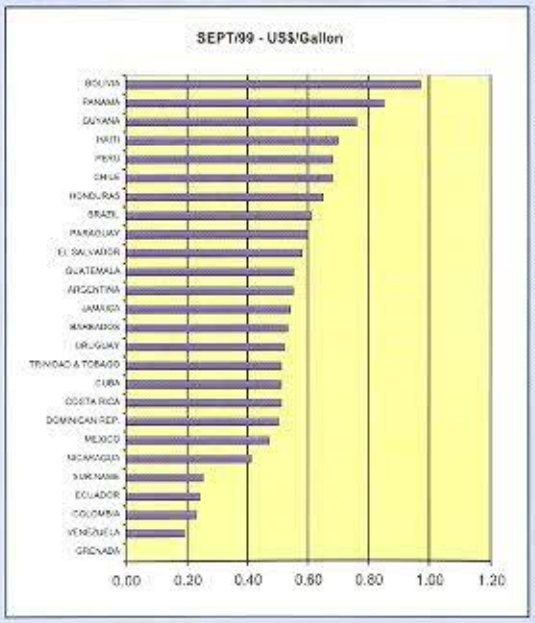
SOURCE: OLADE-EC, SIDE



FUEL OIL - US$/GALLON

COUNTRIES	1999		ER
	JANUARY	SEPTEMBER	%
ARGENTINA	0.55	0.55	0
BARBADOS	0.47	0.53	1.51
BOLIVIA	1.02	0.97	-0.63
BRAZIL	0.36	0.61	6.81
COLOMBIA	0.30	0.23	-3.27
COSTA RICA	0.32	0.51	6.00
CUBA	0.41	0.51	2.77
CHILE	0.34	0.66	9.05
ECUADOR	0.35	0.24	-4.61
EL SALVADOR	0.58	0.58	0
GRENADA	n/d	n/d	
GUATEMALA	0.62	0.56	-1.49
GUYANA	0.54	0.76	4.36
HAITI	0.71	0.70	-0.18
HONDURAS	0.68	0.65	-0.56
JAMAICA	0.27	0.54	9.05
MEXICO	0.26	0.47	7.68
NICARAGUA	0.44	0.41	-0.88
PANAMA	0.53	0.85	6.08
PARAGUAY	0.69	0.60	-1.73
PERU	0.37	0.68	7.90
DOMINICAN REP.	0.50	0.50	0
SURINAME	0.25	0.25	0
TRINIDAD AND TOBAGO	0.51	0.51	0
URUGUAY	0.54	0.52	-0.47
VENEZUELA	0.19	0.19	0

SOURCE: OLADE-EC, SIDE

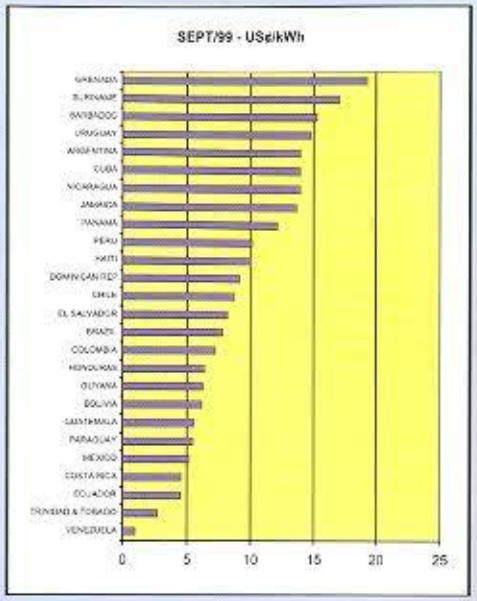


DOMESTIC END-USER PRICES WITH TAX

RESIDENTIAL ELECTRICAL ENERGY - UScent/kWh

COUNTRIES	1999		ER
	JANUARY	SEPTEMBER	%
ARGENTINA	14.06	13.94	-0.12
BARBADOS	15.43	15.28	-0.12
BOLIVIA	6.43	6.17	-0.51
BRAZIL	7.49	7.76	0.44
COLOMBIA	7.57	7.18	-0.66
COSTA RICA	4.69	4.55	-0.90
CUBA	12.86	13.92	0.99
CHILE	9.59	8.69	-1.22
ECUADOR	7.06	4.46	-5.58
EL SALVADOR	8.19	8.19	0
GRENADA	19.26	19.26	0
GUATEMALA	6.22	5.55	-1.41
GUYANA	6.63	6.25	-0.74
HAITI	10.04	9.95	-0.11
HONDURAS	6.56	6.33	-0.45
JAMAICA	13.37	13.63	0.24
MEXICO	5.11	5.13	0.05
NICARAGUA	13.82	13.91	0.08
PANAMA	12.08	12.08	0
PARAGUAY	6.30	5.43	-1.84
PERU	9.16	10.1	1.23
DOMINICAN REP.	9.13	9.15	0.03
SURINAME	17.08	17.08	0
TRINIDAD AND TOBAGO	2.74	2.74	0
URUGUAY	15.21	14.74	-0.39
VENEZUELA	1.06	0.96	-1.23

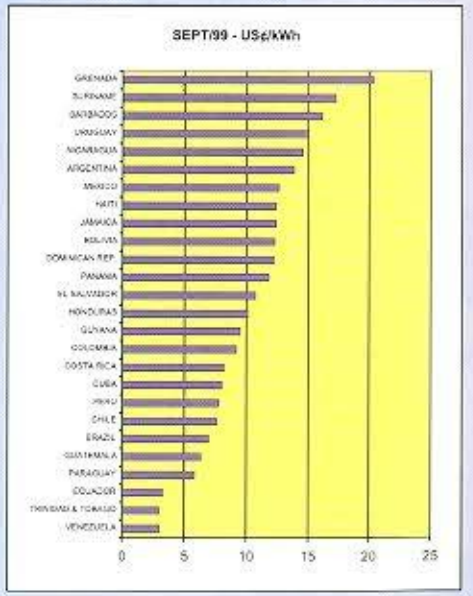
SOURCE: OLADE-EC, SEE



COMMERCIAL ELECTRICAL ENERGY - UScent/kWh

COUNTRIES	1999		ER
	JANUARY	SEPTEMBER	%
ARGENTINA	14.27	13.81	-0.41
BARBADOS	16.33	16.17	-0.12
BOLIVIA	12.85	12.29	-0.56
BRAZIL	6.64	6.89	0.46
COLOMBIA	10.93	9.17	-2.17
COSTA RICA	8.69	8.14	-0.81
CUBA	6.82	8.01	2.03
CHILE	8.47	7.82	-1.31
ECUADOR	5.39	3.22	-6.24
EL SALVADOR	10.70	10.7	0
GRENADA	20.37	20.37	0
GUATEMALA	7.12	6.32	-1.48
GUYANA	10.08	9.5	-0.74
HAITI	12.47	12.35	-0.12
HONDURAS	10.48	10.12	-0.44
JAMAICA	12.16	12.32	0.16
MEXICO	11.31	12.61	1.37
NICARAGUA	15.73	14.51	-1.00
PANAMA	11.76	11.76	0
PARAGUAY	6.70	5.77	-1.85
PERU	6.73	7.7	1.70
DOMINICAN REP.	12.21	12.23	0.02
SURINAME	17.30	17.3	0
TRINIDAD AND TOBAGO	3.01	3.02	0.04
URUGUAY	14.79	14.95	0.13
VENEZUELA	3.25	2.97	-1.16

SOURCE: OLADE-EC, SEE.

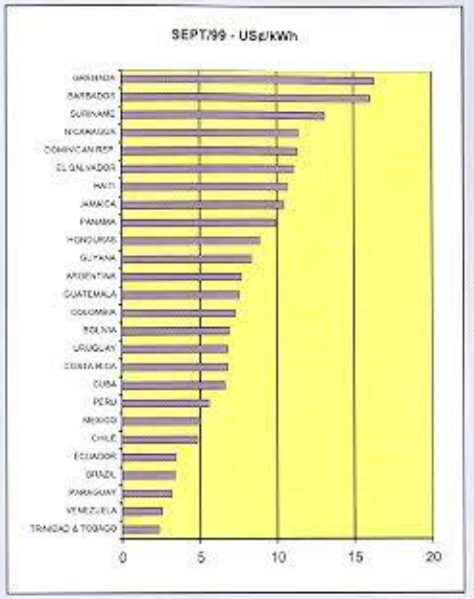


DOMESTIC END-USER PRICES WITH TAX

INDUSTRIAL ELECTRICAL ENERGY - UScent/kWh

COUNTRIES	1999		ER
	JANUARY	SEPTEMBER	%
ARGENTINA	8.05	7.69	-0.57
BARBADOS	16.20	16.04	-0.12
BOLIVIA	7.18	6.87	-0.55
BRAZIL	3.24	3.36	0.42
COLOMBIA	8.45	7.21	-1.95
COSTA RICA	7.25	6.73	-0.93
CUBA	5.47	6.56	2.30
CHILE	5.36	4.8	-1.37
ECUADOR	5.53	3.43	-5.80
EL SALVADOR	11.10	11.1	0
GRENADA	16.30	16.3	0
GUATEMALA	8.42	7.52	-1.40
GUYANA	8.86	8.34	-0.75
HAITI	10.78	10.65	-0.12
HONDURAS	9.15	8.84	-0.43
JAMAICA	10.35	10.43	0.10
MEXICO	4.33	5.02	1.87
NICARAGUA	12.60	11.38	-1.26
PANAMA	9.90	9.9	0
PARAGUAY	3.65	3.15	-1.79
PERU	5.52	5.52	0
DOMINICAN REP.	11.25	11.29	0.04
SURINAME	13.13	13.13	0
TRINIDAD AND TOBAGO	2.31	2.32	0.05
URUGUAY	7.42	6.74	-1.19
VENEZUELA	2.77	2.53	-1.13

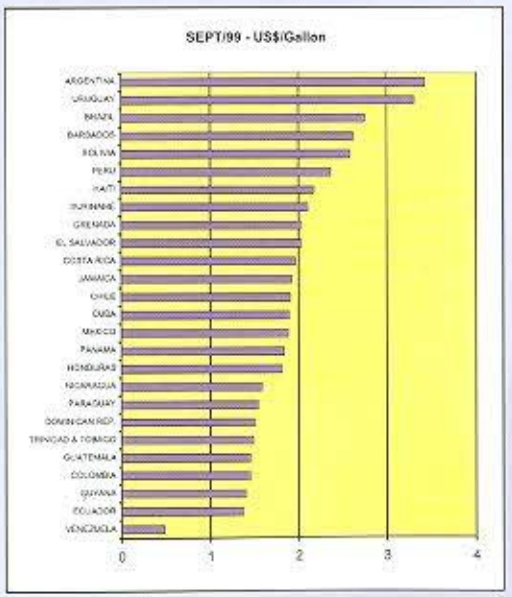
SOURCE: OLADE-EC, SEE.



PREMIUM GASOLINE - US$/GALLON

COUNTRIES	1999		TC
	JANUARY	SEPTEMBER	%
ARGENTINA	3.43	3.43	0
BARBADOS	2.52	2.62	0.49
BOLIVIA	2.55	2.59	0.15
BRAZIL	1.84	2.75	5.15
COLOMBIA	1.27	1.45	1.67
COSTA RICA	1.28	1.96	5.47
CUBA	1.89	1.89	0
CHILE	1.81	1.91	0.67
ECUADOR	1.43	1.37	-0.53
EL SALVADOR	2.03	2.03	0
GRENADA	2.03	2.03	0
GUATEMALA	1.54	1.45	-0.75
GUYANA	0.96	1.4	4.83
HAITI	2.21	2.18	-0.17
HONDURAS	1.88	1.81	-0.47
JAMAICA	1.35	1.92	4.50
MEXICO	1.60	1.88	2.04
NICARAGUA	1.69	1.58	-0.84
PANAMA	1.52	1.83	2.35
PARAGUAY	1.79	1.54	-1.86
PERU	2.27	2.37	0.54
DOMINICAN REP.	1.49	1.5	0.08
SURINAME	2.11	2.11	0
TRINIDAD AND TOBAGO	1.47	1.48	0.08
URUGUAY	3.35	3.31	-0.15
VENEZUELA	0.53	0.48	-1.23

SOURCE: OLADE-EC, SEE.



Notes

New Executive Secretary of OLADE for the period 2000-2003

The Third Extraordinary Meeting of Ministers of OLADE, held in Quito, Ecuador, on November 12, 1999, unanimously elected by applause the current Minister of Industry, Energy and Mining of the Oriental Republic of Uruguay, Dr. Julio Herrera, as Executive Secretary of the Organization for the period 2000-2003.

Dr. Herrera will come into office in January 2000 and will hold the position of Executive Secretary for a three-year term.

The Executive Secretary-elect has a sound academic background and many years of teaching experience. He has held high-ranking positions in both the public and private sectors of Uruguay and has represented his country at various international events. In 1998, he was Minister-Chairman of OLADE.

Dr. Julio Herrera, 50 years of age, holds a doctorate in law and social sciences and has been at the head of his country's energy sector development and its integration into Mercosur over the last five years, as Under-Secretary and then as Minister of State of Uruguay for the energy sector.

The new Executive Secretary of OLADE will have to conduct the long-term strategy that the Third Extraordinary Meeting of Ministers has recently approved for the Organization's activities with respect to the start of the new century.

He will be replacing Mr. Luiz A. M. da Fonseca, a Brazilian national who was Executive Secretary for the period 1997-2000, and who was congratulated by the above-mentioned Meeting of Ministers for his outstanding work, which enabled the Permanent Secretariat to make major achievements in terms of OLADE's policy, administration, cooperation, and programs.