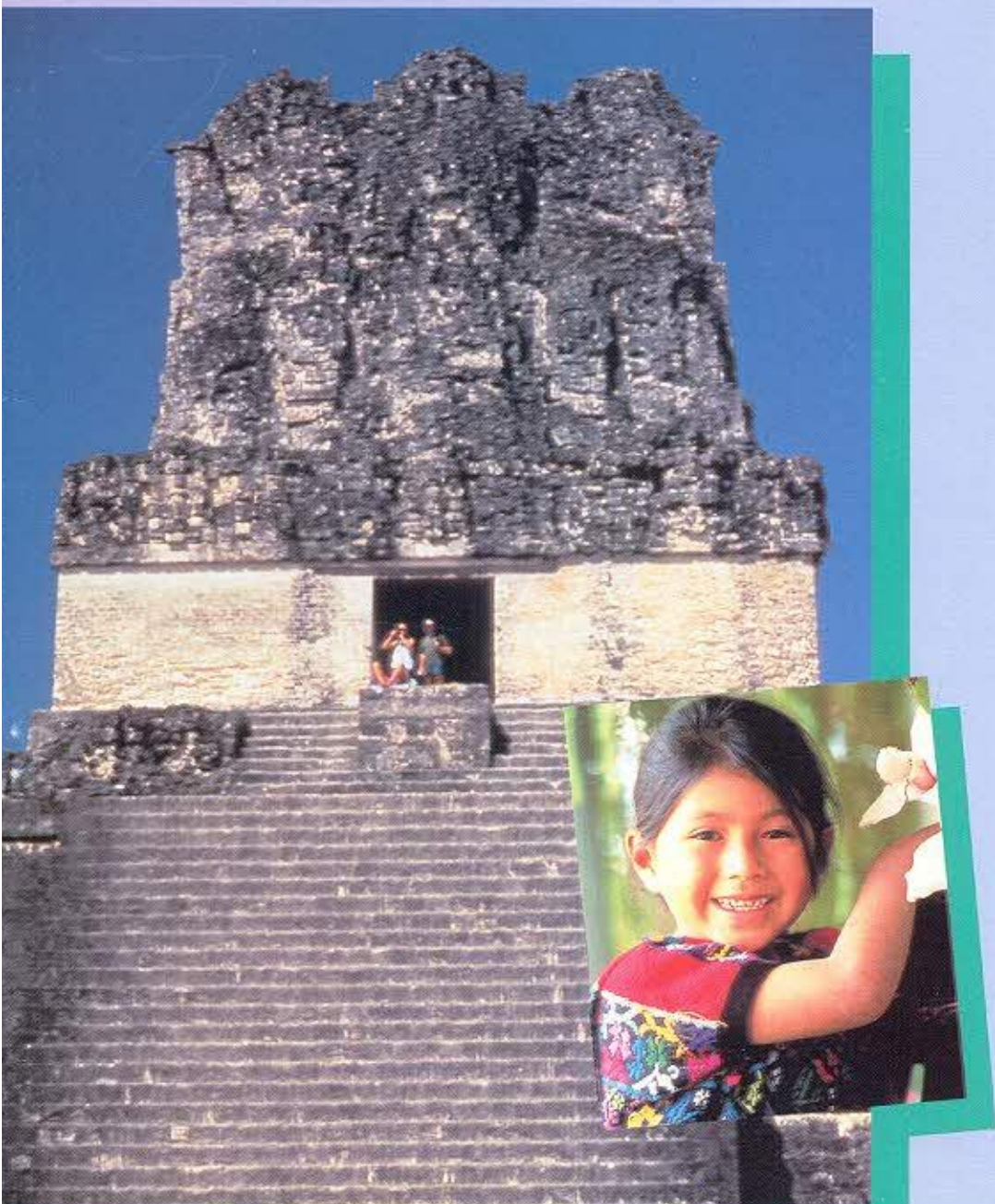


Energy. Magazine

Year 21, number 2, July-August-September 1997



SUPER/OLADE-BID®

Model:

**How to tackle
change in the
electric power
sector**

**Turning point for the
upstream oil sector
of Latin America and
the Caribbean**

**Energy efficiency
in the electric
power sector:
Experiences in
Central America and
prospects**

Energy news

**Calendar of
events**

Contents

- 1 **Editorial**
 - 2 **Technology**
SUPER/OLADE-BID® Model:
How to tackle change in the electric power sector
 - 8 **Financing and Investment**
Turning point for the upstream oil sector of Latin America and the Caribbean
 - 14 **Spotlight**
Guatemala: An open window for investment
 - 20 **Energy Efficiency**
Energy efficiency in the electric power sector: Experiences in Central America and prospects
 - 26 **Energy News**
 - 28 **Statistics**
 - 32 **Notes**
Paraguay's new Hydrocarbons Law is aimed at attracting private-sector investment
- Calendar of OLADE events**
-

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Editorial

Latin America and the Caribbean must make important efforts to adequately meet the future demand for energy and the sector's requirements at the start of the new century. At the same time, one of the fundamental actions of the region's strategy will have to be greater energy efficiency.

As part of the structural changes taking place in the region as a result of modernization, capitalization, privatization, and liberalization processes, efficiency in energy production and use is of the utmost importance. To promote this energy efficiency, however, policies have to be defined to ensure stable prices based on economic costs, and specific energy efficiency programs at the sector, national, and regional levels have to be planned and implemented. In this situation, among the activities to support this restructuring process, OLADE is planning to increase its technical assistance to its member countries to improve the efficiency of their energy systems, using an environmental conservation and sustainability approach.

The present issue of the Energy Magazine includes an article on the

efficiency of the electric power sector, which describes and reviews experiences in the Central American countries and the prospects for these activities in other countries of the region.

This edition also highlights Guatemala, its cultural wealth, some of the country's most important social and cultural aspects, and above all the major decisions being taken by current government authorities to modify the country's legal and economic structure in order to attract investment for the energy sector and inspire confidence in the country.

This issue also has an article on the Electric Power Planning Model, the SUPER/OLADE-BID®, and a review of current opportunities for the upstream oil sector in Latin America and the Caribbean, focusing on international capital flows to the region and changes and schemes prevailing in this area.

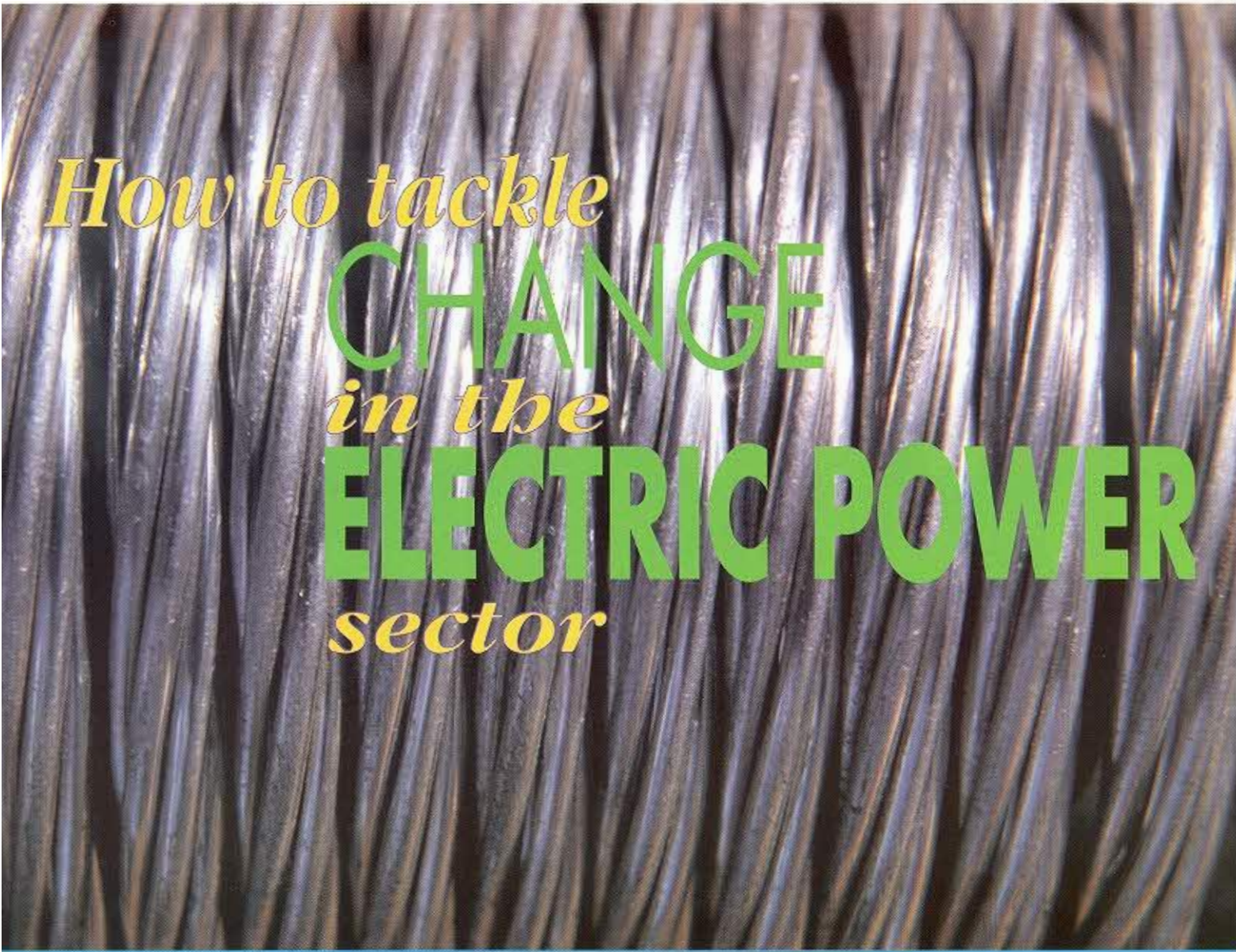
Luiz A. M. da Fonseca
Executive Secretary



The speed and extensiveness of the changes taking place in Latin America and the Caribbean (especially in the electric power sector) have led to a demand for reliable and efficient analytical tools for decision making at both the macro level (global energy planning) and the micro level (company planning and programming). A sound base for sustainable growth in the region is needed, and the regional electric power planning model, the SUPER/OLADE-BID®, provides the required support to attain optimal results.

It is evident that economic recovery and growth require significant amounts of new investments in infrastructure. In the case of electricity, the needs are urgent. In developing countries, the demand for electricity tends to increase more rapidly than gross domestic product.

The electric power sector requires investments at a time when the base for financing has eroded substantially. The debt-servicing burden for the sector's utilities is quite heavy. In almost all the countries, there have been strong political and social pressures on



How to tackle **CHANGE** *in the* **ELECTRIC POWER** *sector*

electricity rates and other variables that have affected power utility company financing and operations.

The large investments that the sector needs will not materialize unless the sector changes the way in which it is financed and managed. It is therefore necessary to reconcile political and social elements with efficient administrative management. Whether they are public or private, the power utilities can only become self-sufficient if they are administered using sound business principles. Participation of the private sector and consolidation of

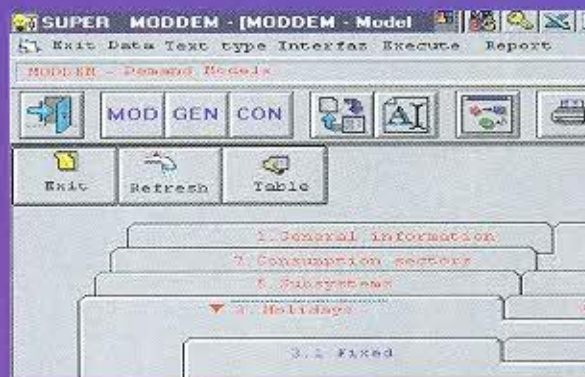
national capital markets are aspects that have to be considered as part of the process of electric power sector expansion.

Environmental conservation and protection have acquired special importance as mankind has the opportunity to thoroughly study the severe problems stemming from the lack of interest in the ecology. The power sector, because of its investments, is obliged to take into account these concerns and analyze in depth the possible impacts of its projects on the environment.

OLADE, with the financial collaboration of the Inter-American Development Bank (IDB), has built a computer system, aimed at prioritizing, scoping, and selecting electric power projects to meet the growing demand for electricity under conditions of uncertainty. The system determines power generation goals for each station of the system, in each stage; it also minimizes the expected operating cost throughout the planning period, and assesses the financial and environmental impacts stemming from the future development of the power sector.

COMPONENTS

The SUPER/OLADE-BID® Model is designed in a Windows environment and is comprised of eight modules that enable the user to assess demand, hydrology, expansion, dispatch, finance, and environmental aspects of the power sector in a given site, country, subregion, or region. Its use is aimed at public and private companies and investors.



REQUIREMENTS

With the latest technological breakthroughs, the software used does not require any special computer know-how on the part of the final users, since there is a user-friendly graphic interface (in Windows). Its installation requires a 486 computer or later, 16 MB in RAM, 100 MB in free hard-disk space, Windows 3.1 or later.

DEMAND MODULE: It models load curves on the basis of historical information and demand forecasts supplied by the user; simulates and assesses energy conservation and load management programs; and conducts a pre-dispatch of the nonconventional energy sources and scheduled energy exchanges between power generation utility companies and consumers with special regimes.

HYDROLOGICAL MODULE: It provides hydrological information for the optimization and simulation modules and generates results such as:

- Natural inflows in each project site, for a given period, discounting the impact of the system's operation, evaporation, and other water uses.

- Hydrological sequences for the simulation of the dispatch of the uncertainty module.
- Available and minimum energy, peak capacity and storable energy for each hydropower project.

PLANNING UNDER UNCERTAINTY MODULE: It obtains power generation expansion strategies, taking into account uncertainty in the most important variables of the planning process. It is characterized by the following:

- Explicit representation of uncertainty in variables (demand, fuel costs, lead times, investment costs, and hydrology).
- Representation of financial constraints to ensure, for example, that an expansion plan will not exceed a power utility's capacity to pay.

- Least-risk strategies.
- Adaptation of decision-making to the values observed in certain variables, thus emulating the way of acting of the planners.
- The mathematical solution of the optimization problem uses breakdown techniques.

THERMAL MODULE: It obtains expansion in predominantly thermal systems and generates the following:

- Least-cost expansion plans for large thermal systems.
- It calculates short-run marginal costs for each step of the load duration curve and the marginal benefit of thermal projects.
- It produces least-cost expansion plans for small thermal systems.

HYDROTHERMAL DISPATCH MODULE: It simulates the least-cost

operation of hydrothermal systems and includes the following functions:

- Calculation of equivalent subsystems.
- Optimal operating policy.
- Simulation of system operation.
- Calculation of marginal operating costs.
- Calculation of marginal benefits of interconnections.
- Calculation of marginal benefits of thermal projects.

FINANCIAL MODULE: It analyzes the financial management of the utilities, integrated with the system's expansion plans. The analysis that is conducted is based on generally accepted financial practices. The reports that the module produces are meaningful, similar in most of the power utilities, except for certain characteristics inherent to each

country. The results produced are mainly aimed at decision-makers inside the power utility company, regulatory agencies, and national and international financing institutions.

ENVIRONMENTAL MODULE: It permits qualifying the environmental impacts produced by the power generation projects to make them comparable from the viewpoint of these impacts. The methodology used is based on a multi-objective analysis with the following characteristics:

- Integrating the socioeconomic and biophysical aspects in a single multi-objective function.
- Evaluating project sequences.
- Integrating thermal and hydrothermal installations,

applying environmental parameters for their assessment.

- Search for robust solutions, that is, sound solutions that analyze a wide spectrum of sensitivity.

DISSEMINATION OF THE MODEL

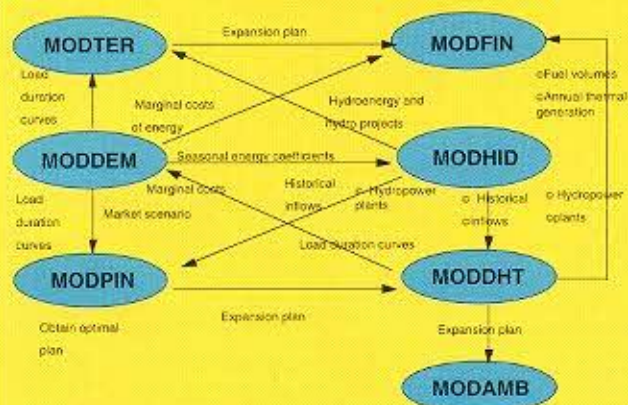
Dissemination of the model takes place via the following:

- Internet
- Users' Bulletin
- Specialized journals
- International seminars and OLADE events.

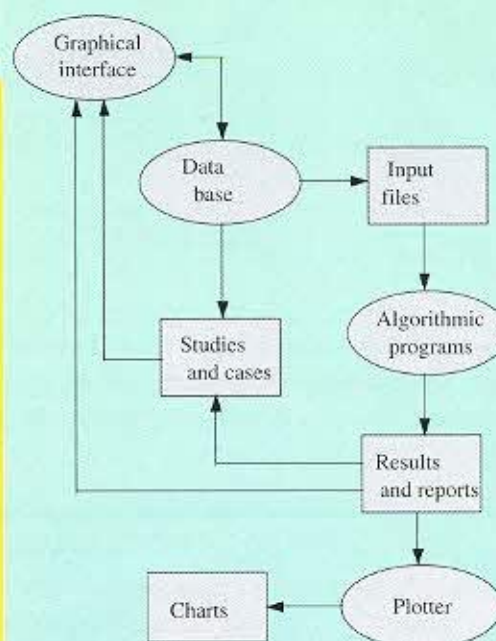
ADVANTAGES

It is a model for power generation planning and the interconnection of power systems and facilitates the

LINKAGES BETWEEN MODULES



ORGANIZATIONAL CHART OF THE MODEL



The SUPER is a system comprised of four computer components that interact, by either generating or transferring information between each other. These components are: graphic interface (Visual Basic); data bases (relational); algorithmic programs (Fortran 77); and plotter.

CURRENT USERS

COUNTRY	COMPANY
Brazil	COMPANHIA ENERGETICA DE SAO PAULO CESP
	COMPANHIA PARANAENSE DE ENERGIA COPEL
	ELETRONBRAS
Chile	EMPRESA NACIONAL DE ELECTRICIDAD ENDESA
	COMPAÑIA NACIONAL DE TRANSMISION ELECTRIC TRANSELEC
Colombia	CORPORACION ELECTRICA DE LA COSTA ATLANTICA CORELCA
	EMPRESA DE ENERGIA DE BOGOTA EEB
	EMPRESAS PUBLICAS DE MEDELLIN EPPM
	EMPRESA DE ENERGIA DEL PACIFICO EPSA
	INTERCONEXION ELECTRICA S.A. ISA
	ISAGEN
	UNIDAD DE PLANEACION MINERO-ENERGETICA UPME
	INSTITUTO COSTARRICENSE DE ELECTRICIDAD ICE
Ecuador	INSTITUTO ECUATORIANO DE ELECTRIFICACION INECEL
El Salvador	COMISION EJECUTIVA HIDROELECTRICA DEL RIO LEMPA CEL
Honduras	EMPRESA NACIONAL DE ENERGIA ELECTRICA ENEE
Nicaragua	INSTITUTO NICARAGUENSE DE ENERGIA INE
Panama	INSTITUTO DE RECURSOS HIDRAULICOS Y ELECTRIFICACION IRHE
	INTER-AMERICAN DEVELOPMENT BANK

The Permanent Secretariat of OLADE has set the goal of disseminating the use of the model throughout the region, as well as outside the region. The Organization's sound commitment and the positive interaction with the users of the model guarantees, over time, the quality and effectiveness required to maintain a computer system that is in keeping with the power sector's current demands.

following activities: assessing demand scenarios; establishing least-risk strategies under conditions of uncertainty; defining the indicative

plans of projects; simulating the operation of hydrothermal systems; conducting financial analyses; and assessing environmental impacts.

TRAINING

In order to enhance use of the model, OLADE offers training courses to the users of the model as specified below:

- Two-day seminar for executives, addressed to managers and chief executive officers of power utilities and aimed at presenting the scope and qualities of the model and its advantages.
- Two-week basic course, especially addressed to new users and aimed at providing basic instruction on using and handling the model.
- Advanced one-week course, addressed to users who already have experience in using the model and aimed at studying in depth specific topics regarding the mathematical formulation of the modules and other issues that may be of interest to the users.

In addition, OLADE annually organizes a meeting of users, where experiences are shared and comments and suggestions on possible improvements that can be incorporated into the model are made.

Finally, the users of the model are organized by means of the Technical Committee and Secretariat of Users, which coordinate with OLADE all the activities that are conducted on the regional power planning model, the SUPER/OLADE-BID®.





**Latin American Energy
Organization**



European Commission



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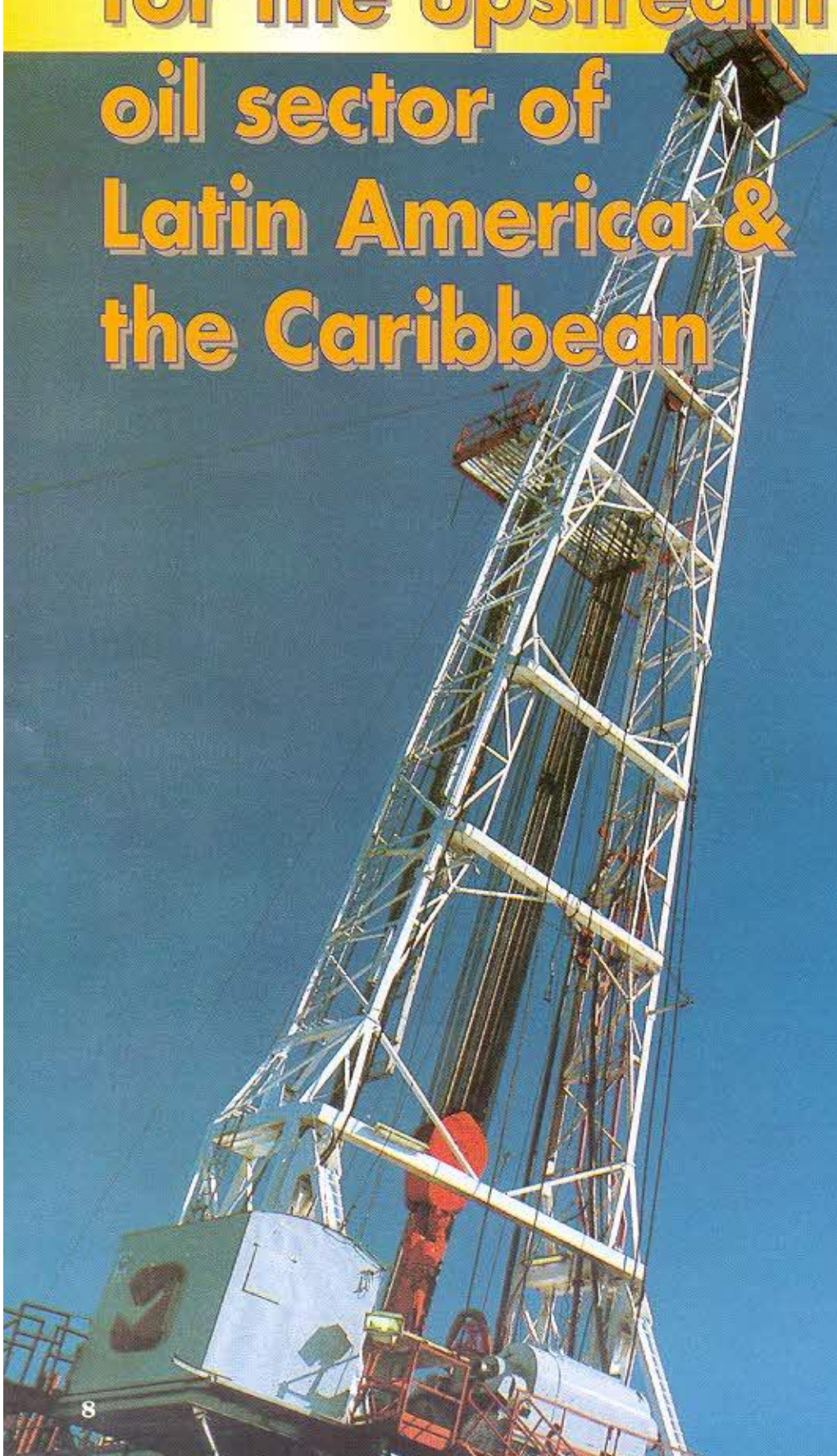
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Turning point for the upstream oil sector of Latin America & the Caribbean



Luiz A.M. da Fonseca*
Carlos Jaramillo**

In the sixties, the international oil industry was vertically integrated. About 75% of world oil production was controlled by the majors, which produced in countries that held large petroleum reserves. The oil was then refined in the countries of origin of the companies, where their principal markets were located.

In the seventies, however, with the nationalization of the petroleum sector by oil-producing countries and the establishment of state oil companies in various parts of the world, some of which in Latin America and the Caribbean, the oil industry's vertical structure was broken up. This period was characterized by the oil industry's expansion toward new business, such as fertilizers, petrochemicals, lubricants, mining, etc.

In the eighties, the industry underwent a profound crisis and started restructuring its oil companies. This crisis was also due in part to low oil prices and gradual changes in state-owned enterprises.

Likewise in this decade, the companies of the major oil-producing countries tried to integrate their large reserves into the international downstream sector. In Latin America, Venezuela's state oil company, Petróleos de Venezuela (PDVSA), and Mexico's state oil company, Petróleos de México (PEMEX), were noteworthy as companies that inserted their oil reserves into international downstream activities. The former company now has a refining capacity

outside Venezuela of about 700,000 barrels per day.

The nineties are noteworthy for the globalization of the economies, market liberalization, and the definition of a new role for the State in the economic sector as a whole and the energy sector in particular.

World oil production controlled by the majors has declined substantially and now accounts for hardly 15%. This decline is the result of both increased production by the oil companies of the oil-producing countries and the boom of the so-called independent producers.

Because of the growing importance of natural gas in the petroleum industry, the sector is now being called the oil and natural gas sector. This new situation is due to the clean characteristics of natural gas and its capacity to comply with environmental requirements, as well as its wider use as a fuel for regional integration, facilitated by the opening up of country borders to international trade and its growing use for generating electricity.

The combination of natural gas and electricity has been used not only to cover the region's electricity deficit and to promote its economic development but also by the oil companies themselves in their own operations, which are becoming important electric power producers. In other words, electric power production has become a downstream activity of the natural gas sector.

Another trend that has been observed is the involvement of several power generation utilities in gas production processes as a strategy to ensure supply. This trend has been viewed as part of the evolution toward globalized integral energy companies.

To provide an idea of the dimension of the oil industry, according to ECLAC data, the 52 major oil companies in the world are handling about US\$760 billion per year. This figure is three times greater than the exports of Latin America and the Caribbean in 1996 and three times the total amount of foreign capital that entered the region between 1990 and 1996.

Why Latin America and the Caribbean?

The changes occurring in the oil sector of Latin America and the Caribbean aimed at creating an infrastructure that will facilitate private capital investment will transform the region into one of the world's principal frontiers for oil and gas exploration and production, as important as the other frontier zones, such as the countries that were formerly part of the Soviet Union and the deep waters of the Gulf of Mexico in the United States.

At present, Latin America and the Caribbean as a region ranks second in terms of oil reserves, just behind the Middle East, with an average useful life of 41.7 years. Its natural gas reserves, although lower than those of other regions of the world, have an average useful life of 51.6 years, which demonstrates its high development potential (see Tables 1 and 2).

In the United States and Europe, these indices are 9.7 and 8.2 years for oil and 8.7 and 18.6 years for natural gas, respectively.

Consolidation of the region's democratic processes has helped to minimize the political risk for foreign investors. Likewise, the current legal and regulatory frameworks which are defining clear rules and providing attractive business condi-

tions have given impetus to foreign investments in the region.

International capital flows

Close to 75% of international capital flows to developing countries, considering all areas of the economy, were concentrated in 10 countries, 4 of which are in Latin America (see Table 3). This capital comes predominantly from private-sector investment, but a high share is speculation capital.

According to the journal *World Watch* (May-June 1997 issue), North-South investments grew from US\$44 billion in 1990 to US\$234 billion in 1996.

Foreign investments in Latin America and the Caribbean have been rising substantially in the present decade, according to data from the International Monetary Fund (IMF) (see Table 4).

In 1995, investments in the oil and gas sector, as indicated in Table 5, amounted to US\$121.8 billion, of which about 60% came from the private sector.

In Latin America and the Caribbean these investments amounted, in 1995, to US\$7.8 billion by private-sector companies and US\$11 billion by state enterprises, which indicates the predominance of the latter in the region's economies.

State reform processes and liberalization of the sector to encourage national and foreign private-sector investment will certainly produce changes in this ratio, whether as a result of privatizations or as a result of strategic partnerships that the state enterprises are establishing with foreign companies and national private companies. According to data obtained by OLADE from its member countries, it is expected that, over the

TABLE 1
WORLD OIL AND GAS RESERVES
(by region in 1996)

REGIONS	OIL			GAS		
	10(9)BBL	% of total	R/P years	10(12)m3	% of total	R/P(years)
United States	29.8	2.9	9.7	4.68	3.3	8.7
Canada	6.9	0.7	9.4	1.93	1.4	12.6
Latin America	126.0	12.3	(a)	7.81	5.6	(a)
Europe	20.5	2.0	8.2	5.42	3.9	18.6
Ex Soviet Union	85.5	8.4	25.5	57.28	40.4	81.1
Middle East	876.3	85.2	93.1	45.79	32.5	> 100.0
Africa	87.5	8.4	25.0	9.31	6.5	> 100.0
Asia-Pacific	42.4	4.1	15.7	9.11	6.4	40.1
World Total	1036.9	100	42.2	141.33	100	62.2

Source: BP Statistical Review of World Energy 1997
(Broken down by different region)
(a) See Table 2

TABLE 2
PROVEN RESERVES AND PRODUCTION OF OIL AND GAS
IN LATIN AMERICA AND THE CARIBBEAN - 1996

COUNTRY	OIL			GAS		
	Reserves 10(6) BBL	Production 10(3) BPD	R/P Years	Reserves 10(9) M3	Production 10(6) M3	R/P Years
Argentina	2386.4	785.0	8.3	619.2	31641.0	17.9
Barbados	2.4	1.0	6.6	0.1	28.9	3.5
Bolivia	120.3	34.3	9.6	109.6	5863.0	18.7
Brazil	4922.9	785.8	16.8	151.7	8456.0	18.6
Colombia	2812.0	823.5	12.4	217.0	5815.0	37.3
Cuba	78.0	22.1	9.6	ND	43.0	ND
Chile	30.0	9.2	8.9	45.0	2535.0	17.8
Ecuador	3453.0	384.9	24.6	23.1	935.8	24.7
Guatemala	526.0	14.6	98.7	0.6	11.0	54.5
Mexico	48796.0	2855.0	46.6	1916.1	43478.0	44.1
Peru	373.0	120.3	8.5	200.6	983.5	294.0
Suriname	26.0	4.9	14.5	0.0	0.0	0.0
Trinidad and Tobago	551.0	129.2	11.7	350.5	9068.0	38.7
Venezuela	55328.0	2775.4	65.5	4065.0	37338.0	108.9
LAC Total	130305.0	8557.1	41.7	7704.6	149,186.2	51.6

Source: OLADE/SIED®

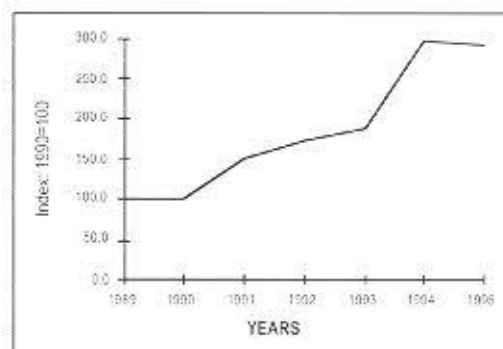
TABLE 3
THE TEN DEVELOPING COUNTRIES THAT ARE MOST ATTRACTIVE
FOR PRIVATE-SECTOR INVESTMENT

Private-sector capital flows in absolute terms (1995)
in all economic sectors
in terms of absolute investment value

Country	% GDP	US\$ million
China	7	44,681
Malaysia	14	12,115
Indonesia	6	11,382
Mexico	4	10,877
Thailand	5	8,236
Hungary	17	7,484
Brazil	1	6,943
Argentina	2	5,187
Chile	7	4,758
India	1	4,430
Total		117,091

Source: World Watch, May-June 1997

TABLE 4
MEMBER COUNTRIES OF OLADE:
DIRECT FOREIGN INVESTMENT INDEX¹



Source: International Monetary Fund, International Financial Statistics

¹ Corresponds to capital shares, reinvested earnings, and other capital involving transactions between companies and subsidiaries. It does not include direct investment capital flows for exceptional financing, such as debt-to-capital conversion.

TABLE 5
CONCENTRATION IN THE WORLD OF PRIVATE-SECTOR
INVESTMENT IN OIL AND GAS: 1995

	US\$ 10(9)	Composition %
PRIVATE CAPITAL		
United States	25.5	
Canada	6.6	
Latin America & Caribbean	7.8	
Western Europe	17.7	
Middle East & Africa	6.5	
Far East	7.7	
Total Private	71.8	58.8%
STATE CAPITAL		
Latin America	11.0	
Other regions	39.0	
Total State	50.0	41.1%
Overall Total	121.8	100.0%

Source: BP Statistical Survey, Oil & Gas Journal, CLADE

TABLE 6
LATIN AMERICA AND THE CARIBBEAN: ESTIMATES
OF INVESTMENTS IN OIL AND NATURAL GAS
Five-year period 1997-2001
(Data in million U.S. dollars per year)

COUNTRY	Expected value	State investment	Probable Private Investment	% of Private Investment
Venezuela(a)	5,907	6,516	5,040	45.8%
Brazil (a)	5,100	4,185	1,183	31.4%
Mexico	7,005	5,731	1,013	22.7%
Argentina	2,800	960	2,240	80.0%
Colombia(a)	2,754	1,224	1,530	55.6%
Ecuador	807	282	625	65.1%
Chile	575	145	434	75.0%
Peru	390	117	273	70.0%
Bolivia	325	98	226	70.0%
Trinidad&Tobago	175	85	88	50.0%
Costa Rica	63	47	16	25.0%
Guyana	25	19	6	25.0%
Paraguay	21	15	6	30.0%
El Salvador	12	3	9	75.0%
Other countries	3	1	2	60.0%
Total	23,669	16,023	12,591	36.3%

(a) Includes investments in petrochemical industry.

(b) The figure includes US\$1.3 billion of investment in the refining subsector and is for the year 1997.

Source: Total investments: OLADE survey on member countries, update based on data from various specialized journals. Percentages of share of private-sector investment: OLADE estimates, except for Venezuela, Colombia, Ecuador, and Chile, countries for which official data are available from the respective Energy Ministries.

next few years (1997-2000), the share of private-sector capital in the region's oil industry will be about 36.5%, amounting to US\$11 billion per year (see Table 6).

Conditions for private-sector investment

Facts indicate that there is an excellent outlook for private and foreign investment in the upstream segment of the oil sector of Latin America and the Caribbean. The following conditions are being sought by these investors: existence of reserves, guarantees that there will be no expropriations, political stability, suitable legal and regulatory frameworks, compliance with international standards in contracts and arbitration, the definition of the maximum exploitation rate (MER) aimed at, on the one hand, preserving oil deposits and helping to maximize their production and, on the other hand, permitting an adequate return on investments.

The availability of discovered oil, although desirable, does not represent a necessary condition for investment. In Venezuela, for example, the shared earnings scheme that was adopted instead of the shared production scheme, preferred by international companies, has not prevented them from massively participating in international bidding processes. In addition, these companies have paid US\$2 billion merely for bonds aimed at reserving areas in the bidding rounds for oil and gas exploration areas. There is no doubt that this country has an extremely high oil potential, which of course partially

contributed to the success of the bidding process that were announced.

Changes in the regional oil sector

In the present decade, important legal reforms have been promoted in the majority of the countries of Latin America. These reforms have been most extensive in the follow-

be mentioned, however, that Mexico has liberalized its natural gas industry, secondary petrochemical activities, and contracting of specialized oil drilling and reservoir development services, by means of in-kind payments.

The common aspects of the above-mentioned reforms are tied to the establishment of a free-market approach and adaptation to macro-economic adjustment conditions:

the reduction of fiscal pressures, putting the finances of public enterprises on a sound footing, price adjustments, and the elimination of subsidies.

From the structural viewpoint, reforms of the legal system in the oil sector depend on the following aspects:

- Changes in the contracting scheme for oil exploration and production (upstream).
- Lifting the barriers to participation in oil transport, refining, and marketing (downstream).
- Modernization of public enterprises and formulation of new company strategies for adaptation to the new international economic scenario.

In addition, the options adopted by the countries regarding the extent of the State's control in oil activities extend from the maintenance of public monopolies with strategic partnerships

(Brazil, Chile, Mexico, and Venezuela) and the intense promotion of private investment although keeping a predominantly public structure (Colombia and Ecuador) to the privatization of industry under different schemes (Argentina, Bolivia, and Peru).

OLADE's role

As the preeminent government forum for the energy sector of Latin America and the Caribbean, OLADE is responsible for reviewing the reforms promoted by the States, examining the legal and regulatory frameworks they have established, and making available to the member countries the experiences in the region.

In addition, the Organization conducts forecasting studies on oil and natural gas, as well as technical studies that can be used by the member countries as references in the different stages of the oil and gas production chain.

The growing participation of private initiatives in the region's energy sector is confirming its role as a new important player in the sector. The groundwork for its incorporation into OLADE's activities is being laid by the implementation of joint projects, business meetings, and events that facilitate its contact and inter-relation with the governments of the region's countries.

ing seven countries: Argentina, Bolivia, Brazil, Colombia, Ecuador, Peru, and Venezuela.

The only country that has not changed its oil laws is Mexico, which according to the provisions of its Constitution of 1917, placed oil and gas production exclusively in the hands of the State. It should

SUPER[®]

OLADE - BID



Minimum requirements:

**486 micro-processor,
16 MB of RAM memory,
100 MB free disk space, speed 66 MHz, VGA color monitor, mouse, Windows 3.1, and DOS 5.0**

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P.O. Box 17-11-6413
Quito, Ecuador

Phones: (593-2) 539-675/598-280/598-122

Fax: 593-2-539684

E-mail: olade1@olade.org.ec

The good citizen company

Today, what is being observed in the large oil corporations is a greater concern for environmental issues and a greater commitment to the individuals and communities that are affected by their activities.

The breakthroughs made by the oil and natural gas industry in using techniques and procedures to produce these resources with a lesser environmental impact allow us to expect that, unless another better and cheaper fuel is developed, hydrocarbons will continue to be the most important fuel for the coming century and that oil companies will continue to play a leading role in the energy sector.

Nevertheless, there will be a broader participation of the oil companies in the social and cultural life of the communities where they operate, whether by means of sponsorship schemes or by means of participation in social development schemes. The marketing itself of these companies increasingly reflects the fact that their activities are not isolated from the social environment in which they evolve but are an integral part of the daily activities of citizens and society. 

Edited version of the presentation made at the National Advanced Studies Institute of Ecuador (IAEN) on July 7, 1997.

* Luiz A. M. da Fonseca, Executive Secretary of OLADE

** Carlos Jaramillo, OLADE Consultant in Hydrocarbons

UPDATE ON THE REGION'S ENERGY SECTOR

State monopolies with strategic partnerships

- In Brazil, the National Congress has just ratified new oil legislation providing that PETROBRAS will continue to be a state-owned enterprise with rights over production areas that have already been identified and permitting the establishment of strategic partnerships that can fluctuate between 1% and 100% share in selected areas. For new areas, the State will conduct bidding processes.
- In Chile, although the company ENAP continues to control upstream activities, international prices govern the market and therefore the upstream sector itself.
- In Mexico, as a result of provisions of the Constitution of 1917, there is a state monopoly of upstream activities but in order to modernize PEMEX, the Government decreed measures that permit private-sector investment in the transport and distribution of natural gas and in secondary petrochemical activities.
- In Venezuela, only upstream activities have been liberalized to admit private-sector investment. In downstream activities strategic alliances in the American and European markets have been forged.

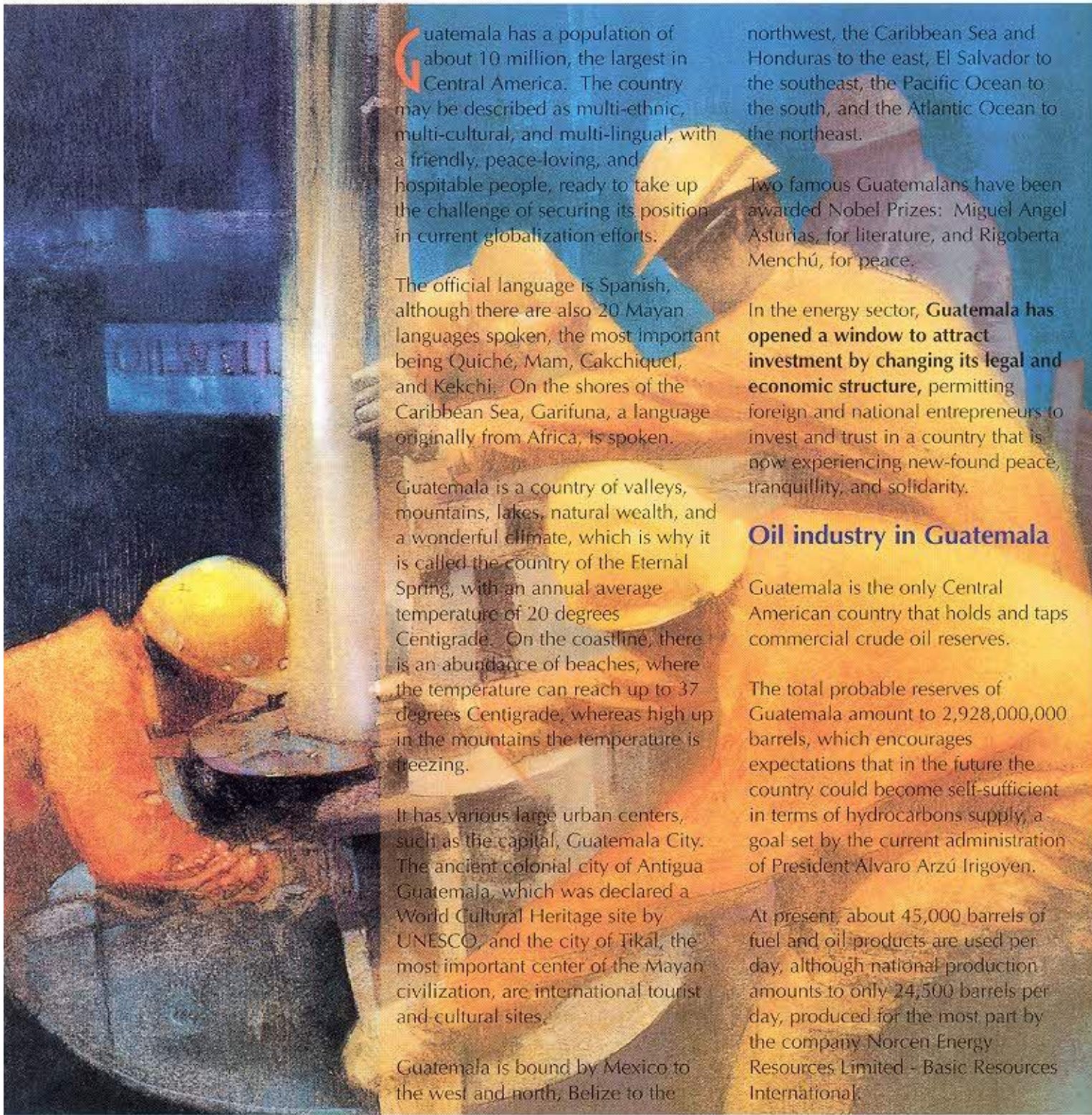
Predominance of the State with greater promotion of private-sector investment

- Colombia and Ecuador have privatized their state enterprises but seek to expand private-sector participation using different contracting schemes, with partnership contracts in Colombia and participation contracts in Ecuador.

Privatization of industry

- In Argentina, the privatization scheme of YPF (1993) has determined that the State controls about 20% of the shares (golden share). The remaining shares are broken down as follows: 45% on international stock markets in highly disseminated packages; 13% in pension funds; 12% in the provinces of the Nation; and 10% for oil employees.
- In Bolivia, production and transport stages have been capitalized and the same scheme will be applied to the market infrastructure.
- In Peru, the various units of PETROPERU have been sold using international bidding processes. The major fields of production have already been privatized and a licensing contract has been subscribed, providing for the free availability of the oil that is extracted. 60% of the La Pampilla Refinery, the largest in the country (Mobil Oil, REPSOL, and YPF), has been privatized.

GUATEMALA: AN OPEN WINDOW FOR INVESTMENT



Guatemala has a population of about 10 million, the largest in Central America. The country may be described as multi-ethnic, multi-cultural, and multi-lingual, with a friendly, peace-loving, and hospitable people, ready to take up the challenge of securing its position in current globalization efforts.

The official language is Spanish, although there are also 20 Mayan languages spoken, the most important being Quiché, Mam, Cakchiquel, and Kekchi. On the shores of the Caribbean Sea, Garifuna, a language originally from Africa, is spoken.

Guatemala is a country of valleys, mountains, lakes, natural wealth, and a wonderful climate, which is why it is called the country of the Eternal Spring, with an annual average temperature of 20 degrees Centigrade. On the coastline, there is an abundance of beaches, where the temperature can reach up to 37 degrees Centigrade, whereas high up in the mountains the temperature is freezing.

It has various large urban centers, such as the capital, Guatemala City. The ancient colonial city of Antigua Guatemala, which was declared a World Cultural Heritage site by UNESCO, and the city of Tikal, the most important center of the Mayan civilization, are international tourist and cultural sites.

Guatemala is bound by Mexico to the west and north, Belize to the

northwest, the Caribbean Sea and Honduras to the east, El Salvador to the southeast, the Pacific Ocean to the south, and the Atlantic Ocean to the northeast.

Two famous Guatemalans have been awarded Nobel Prizes: Miguel Angel Asturias, for literature, and Rigoberta Menchú, for peace.

In the energy sector, **Guatemala has opened a window to attract investment by changing its legal and economic structure**, permitting foreign and national entrepreneurs to invest and trust in a country that is now experiencing new-found peace, tranquillity, and solidarity.

Oil industry in Guatemala

Guatemala is the only Central American country that holds and taps commercial crude oil reserves.

The total probable reserves of Guatemala amount to 2,928,000,000 barrels, which encourages expectations that in the future the country could become self-sufficient in terms of hydrocarbons supply, a goal set by the current administration of President Alvaro Arzú Irigoyen.

At present, about 45,000 barrels of fuel and oil products are used per day, although national production amounts to only 24,500 barrels per day, produced for the most part by the company Norcen Energy Resources Limited - Basic Resources International.

By the end of 1997, however, it is expected that production will have reached 30,000 barrels per day.

In Guatemala, there are two oil basins: the Chapayal Basin, which runs through the northern zone of the country, and the Paso Caballos Basin, which runs through the southern part. Both hold an abundance of oil reserves.

A climate of peace in a green world

The Ministry of Energy and Mines of Guatemala, whose Minister, Mr. Leonel López Rodas, is also Chairman of OLADE for 1997, is in charge of energy policies and is the principal driving force behind environmental conservation, enforcing respect for the flora and fauna of the country's different oil exploration and production areas.

Because of this, the Ministry works jointly with the National Environmental Council (CONAMA) and the National Council for Protected Areas (CONAP).

Confidence has led to further contracts

There are currently 23 oil production contracts, which are located for the most part in the northern part of Guatemala.

An extensive oil transport infrastructure has been built in Guatemala. Recently, a 125-kilometer oil pipeline was completed at an approximate investment of US\$30 million; a pumping station, costing about US\$2 million, was also installed.

On the basis of the current contracts, for 1998 an investment of US\$126 million is expected in the different oil fields.

The companies participating in oil exploration and production are fully confident in this investment. As a result, five new companies were included in the list of contracts.

Companies that trust in Guatemala

- Norcen Energy Resources Limited - Basic Resources International
- Triton Guatemala S.A.
- Petróleo y Gas Ramrod
- Enterprise Development Corporation - Underwater Investment
- Compañía General de Combustibles
- Rankin Resources Inc.
- Oil Technology Services
- Compañía Petrolera del Atlántico

Free marketing of fuel

The marketing of fuels (gasoline, diesel, liquefied petroleum gas, jet

fuel, kerosene, bunker) has been liberalized by Government Agreement 99-96 and by modifications of hydrocarbons regulations.

Domestic consumption of fuel amounts to 45,000 barrels per day, of which 40% are refined in the country by the private refineries Norcen Basic and Texas Petroleum, and the remaining 60% of the products are imported from the United States, Venezuela, Mexico, and Ecuador.

Guatemala has 625 service stations, 33% of which are located in the capital city. The companies importing clean products are: Esso, Shell, Texaco, Quinta Compañía, Liquisa, Alka Wenker, Enron, Sidegua, Gas del Pacífico, Gas Metropolitano, Guategas, Hidrogas, Gas Nacional, Tropigas, and Texas Petroleum.

Promoting modernization of the electric power sector

In Guatemala, the electric power sector was modernized after ratification of the General Electricity Act (Decree 93-96), which opened up sector investment opportunities for national and foreign entrepreneurs in power generation, distribution, and marketing.

At present, the daily demand being handled amounts to about 800 MW, which is largely generated by the National Electrification Institute (INDE) and private generators that have invested power production using hydro, thermal, wind, solar, and sugar cane bagasse resources.

With the General Electricity Act, the objectives of free competition and free markets in electric power activities will have been achieved, and monopolies will be avoided with the breakup of state enterprises.

Guatemala's oil history

The history of oil activities in Guatemala, including the thirties, can be divided into four distinct periods:

1. First years of oil exploration	1900 - 1955
2. Well drilling	1958 - 1974
3. New laws governing oil activities	1975 - 1990
4. Upsurge of oil industry activities	1990 - 1997



Lake Atitlán, located in a wide valley surrounded by mountains and volcanos, is one of the major tourist attract. There are many villages of indigenous groups on the banks of the lake.

The policies of the Government have led to substantial increases in electricity coverage over the last three years, ensuring an overall coverage of 58%.

One of the basic goals of the current administration is to continue improving this coverage and to ensure 70% overall national electricity coverage, which would mean that, by 1999-2000, seven out of ten Guatemalans would be benefiting from this service.

In order to reach the 10 million inhabitants of Guatemala, the Electric Power Utility of Guatemala (EEGSA) and the National Electrification Institute (INDE) have made various efforts in energy generation and distribution. It has been concluded that the sector needs to be restructured and more utilities should participate.

Of the 800 MW that are needed daily, the hydropower station of Chixoy, located in the northern part

of the country, generates 34%, whereas the plants of Jurún Marinalá, Aguacapa, and Los Esclavos, located in the southeastern part of the country, generate 18.5%; Enron generates 12.5%; and the sugar mills of Tampa, La Laguna, and Stewart & Stevenson installed in the south generate the remaining 35%.

At present, other companies such as Coastal-Tampa, which generates energy using coal, are participating more extensively. There are also

of users connected to the grid. Peak power demand grew on average by about 8% per year, which reflects an improvement in the load factor.

The average load lasts for about nine hours, from 8:00 to 17:00, with a magnitude of 1.1 of average power capacity. There is a low load for the remaining 11 hours, which is about 0.75 of average power capacity.

Restructuring and modernization help to avoid rationing

The authorities of the electric power sector are coordinating their work to restructure and modernize both institutions in order to provide better service to the Guatemalans.

Since 1996, Guatemalans have not experienced any rationing of electricity, due to the sound management of resource demand and optimization.

Legal guarantees for investments in Guatemala

Guatemala is a free, independent, and sovereign State, whose Political Constitution contains various basic principles ensuring the development of the country's economic activities.

In addition, the General Electricity Act provides a framework exclusively for electric power activities, without any prior authorization or condition by the State, other than those recognized by the Constitution.

This Act establishes the National Electrical Energy Commission in order to guarantee compliance with the General Electricity Act, define controversies between sector players, and determine transmission and distribution rates subject to the pertinent regulations.

The Act also provides regulation for the operations of a bulk market,

where all of the power generation, distribution, transport, and marketing players will be able to participate, thus eliminating the monopolies of INDE and EEGSA.

Privatization of power generation plants

In August 1997, an event of the utmost importance for the country and the government took place, when two power generation plants were privatized: La Laguna located 40 kilometers from Guatemala City; and Stewart & Stevenson, in the southern part of the country, owned by the power utility of Guatemala EEGSA.

As a result of this sale, US\$30 million were obtained, in addition to power supply to EEGSA over an 18-year period at an average price of 5.3 U.S. cents per kilowatt-hour.

The bidding process was conducted with the greatest transparency. About 15 international companies participated and only 6 qualified and submitted tenders on the day of the sale. The winner of the bidding was the Canadian company Guatemalan Generating Group - Constellation Power Development, Inc.

Tapping geothermal energy for power generation

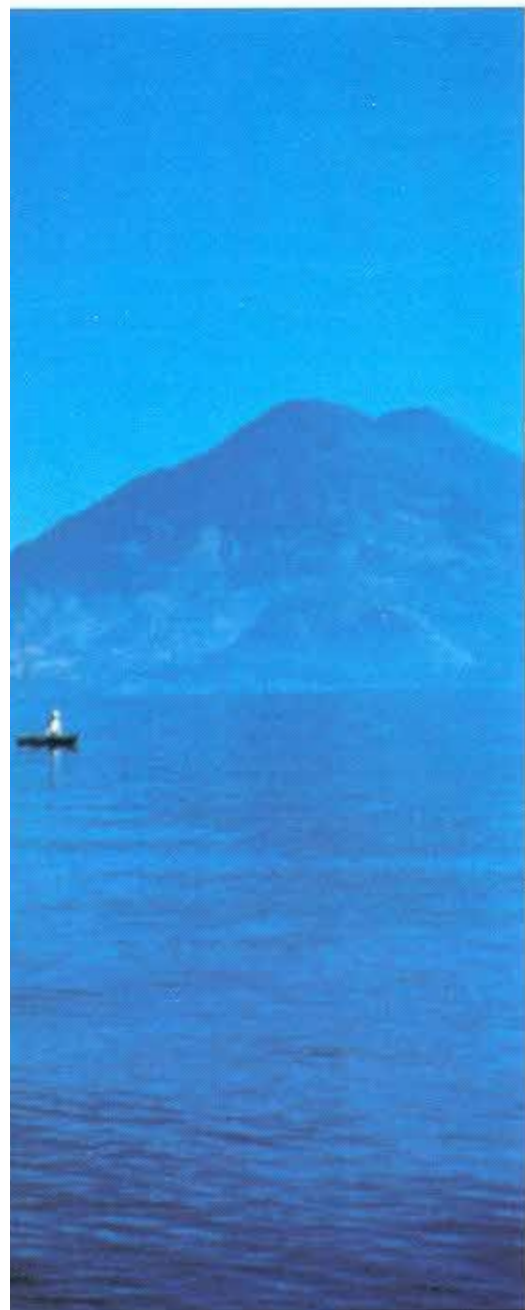
In Guatemala, a series of studies have been conducted to generate electricity using geothermal energy, although no project has as yet materialized. There are advanced feasibility studies, as well as prefeasibility studies available, among which:

- Amatitlán Geothermal Reservoir.
- Zunil II Geothermal Reservoir, in Quetzaltenango.
- Tecuamburro Geothermal Reservoir, in Santa Rosa.
- San Marcos Geothermal Reservoir, in San Marcos.

power generation projects using natural gas as feedstock, which help to lower costs and provide customers with more economical tariffs.

Electric power demand characteristics

Over the last 10 years, electricity consumption in Guatemala grew at an average rate of 8.5% per year, fluctuating in keeping with the country's economic activities, the population's growth, and the number



f Guatemala.



The Minister of Energy and Mines of Guatemala, Mr. Leonel López Rodas, has promoted legal and structural reforms for his country's energy sector as part of a wide-ranging modernization plan.

Business Opportunities in Hydropower Generation in Guatemala

Foreign and national investors have the opportunity to conduct business in the area of hydropower generation in the following projects:

Chulac Hydropower Station

Located 280 kilometers to the north of Guatemala City, it uses the waters of the Cahabón River in the Dulce River Basin on the Caribbean sea versant. It involves two dams, 160 meters and 130 meters high and 965 and 920 meters long, respectively, with two powerhouses, to generate 440 and 340 megawatts, respectively.

Serchil Hydropower Station

Located at 250 kilometers to the northeast of Guatemala City, it uses the waters of the Chixoy River in the

Usumacinta River Basin on the Gulf of Mexico versant. It consists of a dam 140 meters high and 415 meters long. The powerhouse has three 45-megawatt turbines for a total installed capacity of 135 megawatts.

Xalalá Hydropower Stations

Located at 260 kilometers to the north of Guatemala City, it uses the waters of the Chixoy River in the Usumacinta River Basin on the Gulf of Mexico versant. It consists of a dam 97 meters high and 280 meters long. The powerhouse, with its three turbines, will be generating a total of 330 megawatts.

Camotán Hydropower Project

Located at 180 kilometers to the northeast of Guatemala City, it uses the waters of the Grande de Zacapa River in the Motagua River Basin on the Caribbean Sea versant. It has a dam 82 meters high and 470 meters long, with a powerhouse with two turbines to generate 59 megawatts.

Oregano Hydropower Project

Located at 150 kilometers to the northeast of Guatemala City, it uses the waters of the Grande de Zacapa River in the Motagua River Basin on the Caribbean sea versant. It involves a dam 115 meters high and 290 meters long, with a powerhouse with two turbines to generate a total of 69 megawatts.

Santa María II Hydropower Project

Located at 190 kilometers to the west of Guatemala City, it uses the waters of the Samalá River in the Samalá River Basin on the Pacific Ocean versant. The project has a reservoir to generate 60 megawatts.


El Palmar I Hydropower Project

Located at 190 kilometers to the west of Guatemala City, it uses the waters of the Samalá River on the Pacific Ocean versant and will generate 23 megawatts, for a total of 123 GWh per year.

Champey Hydropower Project

Located at 280 kilometers to the north of Guatemala City, it uses the waters of the Cahabón River in the Dulce River Basin on the Caribbean sea versant. It has a dam 14 meters high and a crown length of 54 meters, with a powerhouse with two turbines to generate 60.2 megawatts or, alternatively, 54.8 megawatts.

El Guayabo Hydropower Project

Located at 110 kilometers to the northeast of Guatemala City, it uses the waters of the Motagua River on the Caribbean Sea versant. It has a dam 65 meters high and a crown length of 395 meters, with a powerhouse with two turbines to generate a total of 74 megawatts. 

Now

is the time to invest
in Guatemala

In Guatemala the oil industry is moving ahead, and the Ministry of Energy and Mines is preparing 11 preliminary areas for bidding in 1997-1998.

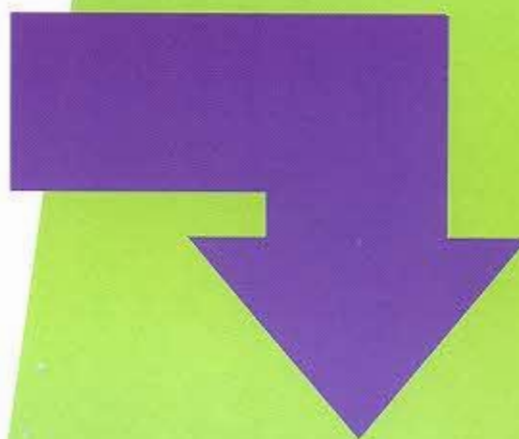
These areas are located in the northern part of Guatemala, in the Department of Petén, where the largest production of oil is currently located.

The date for opening the bidding process is scheduled for the first days of November 1997 and the deadline is set for April 1998.

All the information on the areas, well reports, seismic reconnaissance, and geology for Guatemala is available from the General Directorate of Hydrocarbons of the Ministry of Energy and Mines.

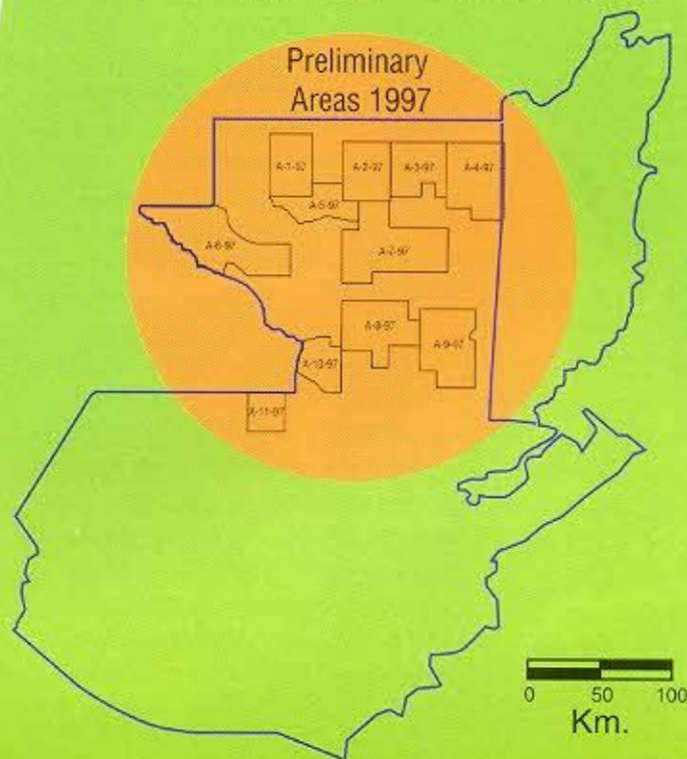
Please contact the Director General of Hydrocarbons, Francisco Arévalo, and Carlos Mazariegos, Advisor. Phones: (502) 476-2044, 476-3091, 477-0743 to 5, and 477-0901 to 3.

Address: Diagonal 17, 29-78, zona 11, Guatemala, Central America
E-mail: unimem1@pronet.net.gt.



PRELIMINARY AREAS FOR BIDDING IN 1997

AREA	TYPE OF CONTRACT	Basin	HORIZON PRODUCERS	NEARBY WELLS	SURFACE (ha.)
A-1-97	SHARE IN PRODUCTION	PETEN NORTE	COBAN "B" "C" & "D"	GUAYACAN & STAAMELIA	120689.90
A-2-97	SEISMIC	PETEN NORTE	COBAN "B" "C" & "D"		115004.70
A-3-97	SEISMIC	PETEN NORTE	COBAN "B" "C" & "D"		137096.70
A-4-97	SEISMIC	PETEN NORTE	COBAN "B" "C" & "D"		179376.60
A-5-97	SEISMIC	PETEN NORTE	COBAN "B" "C" & "D"		102364.60
A-6-97	SEISMIC	PETEN NORTE	COBAN "B" "C" & "D"	LAPITA	217026.20
A-7-97	SEISMIC	PETEN NORTE	COBAN "B" "C" & "D"	SAN FRANCISCO	256964.70
A-8-97	SEISMIC	PETEN SUR	COBAN "C" & "D"	MACHAQUILA	157338.30
A-9-97	SEISMIC	PETEN SUR	COBAN "C" & "D"	CANCHACAN	129399.40
A-10-97	PRODUCTION	PETEN SUR	COBAN "C" & "D"	SAN ROMAN SOLEDAD	78344.18
A-11-97	PRODUCTION	PETEN SUR	COBAN "C" & "D"	ATZAM TORTUGAS	57547.28





Energy Efficiency in the Electric Power Sector:

Experiences in Central America and Prospects

Mentor Poveda Almeida

Introduction

Energy efficiency has been a constant concern of OLADE since its establishment, one that has persisted with more recent studies. The Lima Agreement, OLADE's charter subscribed on November 2, 1973, includes among its objectives the priority mission of ensuring the rational use of energy resources of its member countries. Afterwards, throughout OLADE's existence, various studies have demonstrated the advisability of disseminating energy efficiency and the need to promote energy efficiency programs in Latin America and the Caribbean. The central topic of the XXII Meeting of Ministers of OLADE in October 1991 classified energy

efficiency as an environmentally sound development strategy and determined that the efforts aimed at improving efficiency of energy use will be the region's major contribution to environmental conservation. In a study conducted by the Permanent Secretariat and issued in 1993, economic and energy efficiency, along with private-sector participation, was viewed as a key aspect for the recovery of the region's electric power sector. At present, the studies carried out within the framework of the OLADE-ECLAC-GTZ Project, Energy and Sustainable Development in Latin America and the Caribbean, are proposing a systemic approach that goes beyond energy sector policy, where energy efficiency becomes

an integral part of macroeconomic policy, with higher objectives involving increased productivity, improved accessibility, and environmental impact mitigation.

More recently, OLADE has been involved in the implementation of concrete programs, ranging from studies to demonstration, with the OLADE-European Commission (EC) PIER Project on Demand-Side Management in the Central American Isthmus. In this project, it was demonstrated that only OLADE, as the region's preeminent energy organization with an overview of the energy sector and no specific stakes in any of the subsectors, is able to establish plans of action with a comprehensive approach, focusing on the rational use of all resources, proposing fuel substitution, for example. In addition, on the basis of a detailed cost-benefit analysis for each one of the players of the electric power subsector, the above-mentioned project has managed to select programs that provide benefits for each one of the participants and earnings for those that are making investments.

The success of the energy efficiency project of Central America has been recognized by the European Commission, which has extended funding in order to work in the three countries of the isthmus that had not been included in the first phase. The project's tangible results, however, are not the only results. Probably the most important achievement, one that should be highlighted, is OLADE's approach to the project's implementation. The work of the project was conducted by the staff of the power utilities of the countries. The Latin American and European consultants provided technical assistance to support local counterparts, thus ensuring that the experience was broadly shared between the power utilities and OLADE and that the project's short-term objective was achieved: develop national and regional engineering capabilities in this area. Only hands-on experience in



Advertising campaign to promote the efficient use of energy.

project implementation is able to ensure training in a determined activity.

In addition, the European Commission, in March 1997, undertook a mission to identify three countries from the Andean Group for a project on demand-side management with OLADE, taking advantage of the experience acquired in Central America.

Experience developed and results obtained

The electric power subsector only uses a fraction of the primary energy in all the member countries of OLADE; this means that the improvements in efficiency that can be introduced in this subsector apparently do not have the importance they deserve. Nevertheless, the subsector is a driving force behind energy efficiency

due to its widespread presence in the entire population, especially at the decision-making level. Education and training activities started by the electric power subsector can easily be extended to other energy subsectors. Because of that, electric power subsector programs should not be measured solely in terms of the savings that can be achieved in the subsector itself but rather for their true value of extension to the rest of the energy sector.

In its first phase, the OLADE-EC Project Demand-Side Management in the Central American Isthmus was implemented to obtain a subregional assessment of the electric power systems of the Isthmus. The second phase developed long-term plans and started the implementation of the programs that were given priority in

"...our most sincere appreciation to the European Commission (EC) and the Latin American Energy Organization (OLADE) for the funding and support we received during the Project's implementation..."

**National Power and Light Company,
San José, Costa Rica**

Costa Rica, El Salvador, and Nicaragua.

The plans were developed on the basis of a detailed study of load characterization, which was appropriately researched by means of surveys and load curve measurements to deter-

mine the participation of end-uses in energy consumption and in peak demand of the power system. The information obtained helped to easily identify the best opportunities for energy conservation and demand management.

The programs initially proposed are analyzed by quantifying the costs and benefits for each one of the subsector's players: customers who participate in the efficiency program, customers who do not participate, electric power distribution utilities, power generation utilities, and the society as a whole. This analysis, which is conducted by a computerized model, enables different conditions, equipment, and possible evolutions to be checked in order to determine the most suitable methodology for their implementation. The constraint that was imposed to select the programs was that none of the players be adversely affected, that is, the results of the analysis will prioritize the programs that will become part of the plan.

Checking the profitability of the energy efficiency programs for the power utilities helps to support the interest in these programs, regardless of the ownership scheme of the utilities, whether public or private.

After determining the most suitable form of combining the selected and prioritized programs to shape a plan, taking into consideration that success depends on a series of factors that are outside the normal sphere of action of the power utilities, such as the integration of suppliers of efficient equipment, educating children, training technicians, legislation and standardization that contributes to overcoming current barriers, information to the community, technical assistance to customers, financial assistance, among others, it has been concluded that the experience presented by EPRI¹ regarding the DSM programs that were implemented in the United States should be taken into account for our case. In other words, a comprehensive plan that focuses not only on the implementation of programs but also on actions in the environment aimed at each one of the above-mentioned aspects is most likely to succeed.



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There are many energy efficiency options

A comprehensive plan cannot be implemented solely by the power utility itself. It requires the intervention of policymaking institutions and the other energy sector players. OLADE's relations with energy sector institutions have facilitated involving in the project's local counterparts, the energy ministries, the regulatory agencies of the electric power subsector, and the power generation utilities, thus supporting the distribution utility that was the project's direct implementing institution. Each institution contributed something to the project and, in turn, had something to benefit from the project.

The Latin American experts of OLADE, thanks to funding from the European Commission, brought the experience of some of the countries of South America and provided technical assistance. In other words, the technical staff of the power utilities of the isthmus was in charge of implementing the project. The European consultants played a very important

role in employing experts in each one of the specific activities that were entrusted to them, thus using the experience of the countries of the European Union in local implementation, without neglecting the specific characteristics of the cities where the project was carried out.

The plan that was developed envisages 10 years of implementation with a growing penetration of the programs that were proposed and, of course, an increasingly larger volume of operations in each program. On the basis of the above, the estimates of the results to be obtained from the plan by the tenth year of implementation for each one of the three first countries of the isthmus are as follows: in San José, Costa Rica, 250 GWh in energy savings and 101 MW of peak demand displaced, with an investment of US\$24 million and net benefits of US\$230 million for the power sector; in Managua, Nicaragua, 66 GWh in energy savings and 20 MW of peak demand displaced, with an

investment of US\$4 million and net benefits of US\$39 million for the power sector; and in San Salvador, El Salvador, 92 GWh in energy savings and 38 MW of peak demand displaced, with an investment of US\$9 million and net benefits of US\$177 million for the power sector.

The last activity planned by the project consists of the initial application of low-cost measures. Since the implementation involves a long-term comprehensive plan and project funds are limited, it was necessary to establish a limited scope that would serve to start up these activities.

The selected area should comply with several criteria that would test the work in terms of its environment. Thus, support of community organizations and the effectiveness of their previous activities were a determining factor to select the sector. As a result, the dissemination of the plan and information on the programs being made available to the customers of the power utilities was supported by community leaders, who received detailed explanations and attended a previous discussion session in order to have their queries answered. This activity involves difficulties, because, for the power utilities, approaching their customers to explain to them energy savings possibilities was a completely new activity. This is an area where much needs to be learned. Fortunately, the message that was being transmitted aroused the interest of the customers.

Current outlook

The experience that has been acquired is being disseminated, and thus Phase III of the PIER Project is beginning activities in Guatemala City, Guatemala; San Pedro Sula, Honduras, and Panama City, Panama. The objectives have not changed with respect to the previous phase; only the results that are obtained should modify the project's implementation,

especially with respect to the allocation of time.


In order to extend the initial implementation period, the project's new phase expects to start implementation starting with the first year of implementation. Therefore, the programs that were developed in the previous phase and proved to be profitable for the end-uses common to all the countries of Central America will be adopted, with attempts to reach the household sector, which is the most difficult sector due to the large number of customers involved and the dissemination effort that is needed. In addition, the energy audits that have been conducted with support from European consultants will also begin during the first year, in order to have a sufficient margin of time to insist on the implementation of the recommendations that were made and to adequately measure the impacts.

But OLADE's energy-efficiency activities are not only focusing on Central America. Many years ago steps were taken to obtain funding for a demand-side management program in the electric power sector of the Andean Group. The European Commission, in March 1997, conducted its first

mission to identify those power utilities interested in this topic to determine funding that would permit the selection of three power utilities and work with them in a project similar to the one implemented in the Central American Isthmus. There are various

power utilities interested in implementing the project, and the European Commission will have to select them taking into account various criteria. In this case, the power utilities of the subregion display different degrees of development in this area and different approaches will have to be used for each one of them. Another important factor to be taken into account in the new phases of the project involves restructuring the power sector, which has progressed in different degrees in the countries where the project will be implemented.

Finally, the current development of energy-efficiency activities in the power sector is defined by the restructuring that various member countries have undertaken. There is a change of mentality to orient the utilities towards profitability and earnings for their shareholders. The activities that OLADE has been developing in this area are based on two concepts that

continue to be valid despite the sector's structural modifications and the change of ownership of the utilities. The first concept consists of defining programs that benefit all the players, with a sufficient return on the investments made, and improving the net benefits for the power utilities. The second is the definition of a comprehensive plan that ensures the participation of all the energy institutions to overcome barriers and create a suitable environment for efficiency. Both concepts remain valid even within a scheme of free access in the power sector and may involve a different approach to customers by the power utility in order to offer efficiency activities as additional services within a competitive framework among utilities supplying electricity. 

* OLADE Consultant, in charge of the OLADE-EC PIER Project

Notes

1. Rabl, Veronica and Gellings, Clark, "Demand-Side Management in the U.S.A.: A Situation Analysis," *1992 International Efficiency and DSM Conference*, Toronto, Canada, October 1992.

Conclusions

The energy efficiency project in the power sector that OLADE is carrying out in the Central American Isthmus has demonstrated that the results of actions in this subsector should be measured in terms of the influence they exert on the entire energy sector, not merely the conservation of primary energy that they can generate for the subsector. The activities being promoted by the power utilities generally reach the country's leaders and executive decision makers, who inside their own homes receive awareness raising and information on electricity saving. As a result, the way is paved to extend efficiency activities to other sub-

sectors managed by smaller and, in some cases, specialized groups.

Undoubtedly, the most satisfactory experience for OLADE and the European Commission is seeing that the staff of the power utilities of the isthmus are continuing the programs that were part of the plan developed in the OLADE-EC Project on the basis of the experience achieved by the project and that the interest displayed when implementing the plan's programs has reached high-ranking executives of the utilities, as indicated by the decisive support that they are providing.

BASIC RESOURCES

A tall, dark silhouette of an oil derrick stands against a vibrant sunset sky. The sky transitions from a deep orange at the horizon to a pale blue at the top. The derrick's structure is intricate, with various beams and platforms visible. At the base of the derrick, a small flag is visible on the left, and a bright orange light source, likely the setting sun, is partially obscured by the derrick's base.

**Weaves each
rising sun of
Guatemala's
oil history**

Basic Resources International (Bahamas) Limited
6a. Av. 0-28 zona 10 Guatemala, Centroamérica
Tels. PBX 334-7827 360-1330 332-5616 331-2367



Colombia: oil bonds on the market

The Colombia state oil company, Empresa Colombiana de Petróleo (ECOPETROL), will be issuing bonds on the domestic market in the amount of US\$300 million in September and October 1997. In early 1998, it will also be placing securities on international markets in the amount of US\$240 million.

48% of the Bogotá power utility is sold

Private-sector companies of Chile and Spain purchased 48% of the power utility of Bogotá, Empresa de Energía de Bogotá. The authorities of the utility company designed a plan for covering its US\$1.5 billion debt by auctioning off its shares. The auction was far more successful than expected: the base price determined for the 48% shareholding was set at US\$890 million but by the end of the auction, which took place in mid-September, the company had received US\$2,178,000,000.



Brazil's new energy frontier is the bottom of the sea

The Brazilian state oil company Petróleo Brasileiro S.A. (PETROBRAS) has just broken one of the most important oil industry records. The company's

Marlim Sul 3B well has set a record producing 7,000 barrels per day at a depth of 1,709 meters. A large part of Brazil's energy solution can be found at the bottom of the sea; studies have confirmed that more than 70% of its sea reserves are located at depths of more than 400 meters.



Mexico expands refinery

The state oil company of Mexico Petróleos de México (PEMEX), extended to October 10, 1997 the deadline for submitting bids aimed at enlarging the CADEREYTA Refinery. The expansion project of this industrial center located in northern Mexico requires an investment of US\$1,157,000,000.



Mobil's new plans in Venezuela

Mobil has appointed Joel Maness President of its Venezuelan subsidiary, Mobil de Venezuela C.A., with his responsibilities covering exploration, production, and marketing activities. The company said the appointment formed part of its long-term strategy to create a solid and integrated organizational structure for

the management of production and marketing projects in Venezuela. Mobil is planning on investing some US\$3 billion in Venezuela over the next five years in several upstream and downstream projects, under the so-called oil opening policy of the state oil corporation Petróleos de Venezuela S.A. (PDVSA), which opens the door to private oil investment.



Barbados: oil and gas exploration projects

Barbados has entered into an upstream joint venture with a U.S. oil company, Waggoner Exploration Inc., to boost onshore production of oil and gas. Barbados's reserves of oil and gas are presently estimated at 2.4 million bbls and 7.0 billion cubic feet, respectively. The company will invest approximately US\$50.0 million in capital and technology over the 25-year period of the contract. It is expected that production of oil will increase from 1,000 bbls/day to 10,000 bbls/day and gas from 2.3 million to 15.0 million cubic feet daily. In addition, Barbados has recently granted a concession license to another U.S. company, Continental Oil Company, to explore for, develop and produce oil and gas from its entire Exclusive Economic Zone.



Argentine-Brazilian cooperation

The firm Capex of Argentina signed a contract with the Brazilian firm El Paso Energía Amazonas to build a power generation plant in Manaus for US\$100 million. The energy produced will be supplied through ELETRONORTE, a power utility of Brazil.



Chile: sale of shares

29% of the shares of the Chilean electric power utility company ENERSIS will be bought by the Spanish company ENDESA for about US\$1.5 billion. ENERSIS, which holds assets of US\$10.5 billion, controls a large part of the power sector of Chile and power utilities in Argentina, Brazil, Colombia, and Peru.



Partnership agreements between Brazil and Uruguay

The President of the Brazilian state oil company Petróleo Brasileiro S.A. (PETROBRAS), Joel Mendes Rennó, and the President of the Board of Directors of Uruguay's National Fuel, Alcohol, and

Portland Administration (ANCAP) signed in Brazil, on August 25, four partnership agreements to extend the gas pipeline of southern Brazil to Porto Alegre, to install various oil and lubricant manufacturing plants in Uruguay, and to examine the possibility of using ANCAP's installed capacity to refine oil products aimed at supplying the State of Rio Grande del Sur.



Cooperation between Chile and Colombia

The Chilean power utility company CHILGENER, which is a power generator, will be building a 650-MW thermal plant in the region of Magdalena in Colombia. The works of TERMOBERRIOS will begin in 1998 with a US\$400 million investment.



Reforms are being planned for the energy sector of Nicaragua

The Nicaraguan Energy Institute (INE), as the regulatory and planning entity of the energy sector, submitted to the executive branch various draft bills in order to increase and

enhance the quality and reliability of energy supply and to promote private-sector investment in electric power generation and distribution. These draft bills are on the agenda for analysis and discussion by the plenary sessions of the country's legislature, and it is expected that they will be approved by the end of 1997. The bills are:

- Electric Power Industry Law.
- Oil Exploration and Production Law.
- Hydrocarbons Supply Law.
- Organizational Law of the Nicaraguan Energy Institute



Peru will be building a 500-kilometer gas pipeline

A consortium comprised of the U.S. company Bechtel, the Brazilian company Odebrecht, and the Peruvian company Cosapi was awarded the contract to design the construction of the gas pipeline that will join the gas reservoirs of Camisea to Lima. The construction of the 500-kilometer gas line will cost about US\$2 billion.

Energy

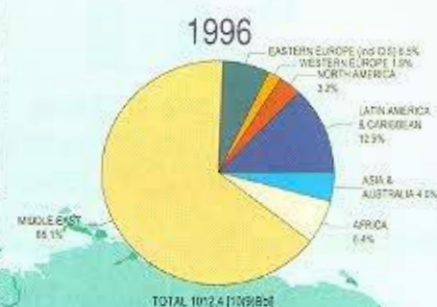
OIL

PROVEN WORLD RESERVES

[10(9)Bbl]

REGIONS	1975	1985	1990	1994	1995	1996	GROWTH RATE
LATIN AMERICA & CARIBBEAN	29.3	93.4	120.5	128.9	128.9	130.3	1.1 %
NORTH AMERICA	43.6	42.8	42.0	37.5	33.1	32.4	-2.1 %
WESTERN EUROPE	25.9	26.4	14.4	16.5	16.5	19.4	17.6 %
EASTERN EUROPE (Incl. CIS)	91.8	63.0	58.9	59.2	56.1	65.5	16.8 %
MIDDLE EAST	403.4	398.0	662.6	660.3	641.8	659.0	2.7 %
AFRICA	68.3	58.7	59.9	62.2	70.5	64.8	-8.1 %
ASIA AND AUSTRALIA	41.0	37.3	50.4	44.5	43.9	41.0	-6.6 %
WORLD	703.3	717.6	1008.7	1009.1	990.8	1012.4	2.2 %

Source: Latin America and the Caribbean; OLADE-EC, Energy-Economic Information System (SIEE)
Energy Statistics Sourcebook 1996, Oil & Gas Journal, years 1989-1996
BP Statistical Review of World Energy 1997



WORLD REFINING CAPACITY

[10(3)Bbl/day]

REGIONS	1975	1985	1990	1994	1995	1996	GROWTH RATE
LATIN AMERICA & CARIBBEAN	5244	5981	6640	6468	6533	6509	-0.4 %
NORTH AMERICA	17315	17535	17555	17100	18590	17220	-7.4 %
WESTERN EUROPE	20745	15005	13970	14370	16595	16425	-1.0 %
EASTERN EUROPE (Incl. CIS)	10895	14435	15275	12850	10325	10340	0.1 %
MIDDLE EAST	2750	3810	5025	5270	5315	5520	3.9 %
AFRICA	1270	2555	2860	2855	2860	2880	0.7 %
ASIA AND AUSTRALIA	10705	12615	13220	15385	16505	17595	6.6 %
WORLD	68924	71936	74545	74298	76723	76489	-0.3 %

Source: Latin America and the Caribbean; OLADE-EC, Energy-Economic Information System (SIEE)
BP Statistical Review of World Energy 1997



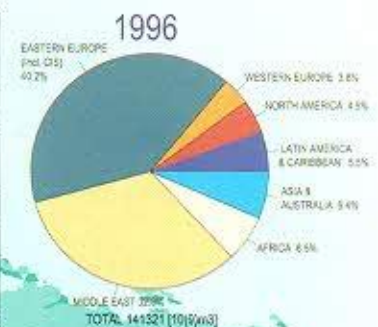
Statistics

NATURAL GAS

PROVEN WORLD RESERVES

[10(9)m3]

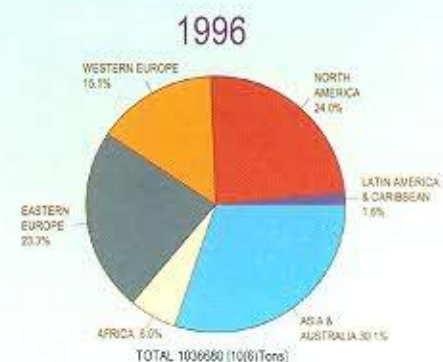
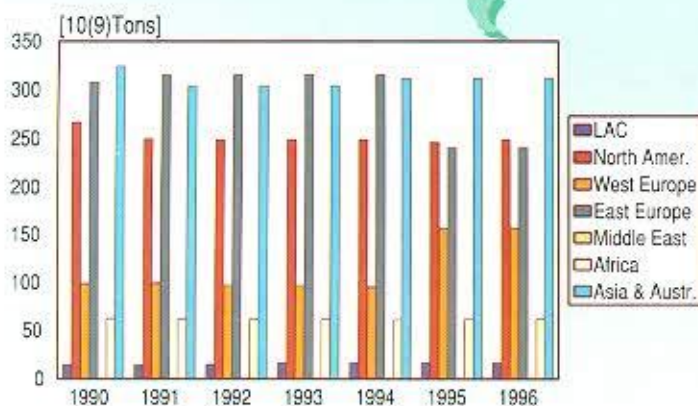
REGIONS	1975	1985	1990	1994	1995	1996	GROWTH RATE
LATIN AMERICA & CARIBBEAN	2379	5344	6970	7407	7606	7801	2.6 %
NORTH AMERICA	8196	8300	7470	8800	6500	6610	1.7 %
WESTERN EUROPE	5691	6411	4964	5400	5500	5420	-1.5 %
EASTERN EUROPE (Incl. CIS)	23998	42928	45800	56700	56000	57280	2.3 %
MIDDLE EAST	19029	24236	37503	45200	45200	45790	1.3 %
AFRICA	8915	5615	8076	9600	9400	9310	-1.0 %
ASIA AND AUSTRALIA	3280	5706	8453	9900	9500	9110	-4.1 %
WORLD	71488	98540	119236	141007	139706	141321	-1.2 %



Source: Latin America and the Caribbean; OLADE-EC, Energy-Economic Information System (SIEE)
Energy Statistics Sourcebook 1996, Oil & Gas Journal, years 1989-1996
BP Statistical Review of World Energy 1997

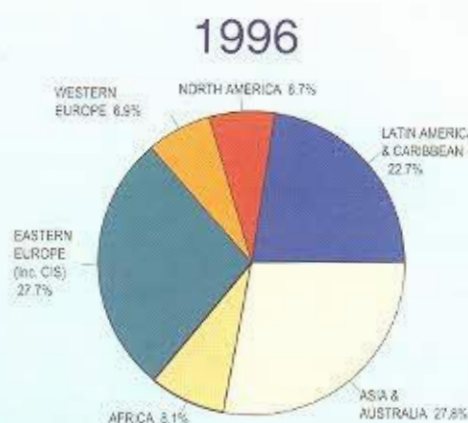
COAL

PROVEN WORLD RESERVES



ELECTRICITY

WORLD HYDROPOWER POTENTIAL

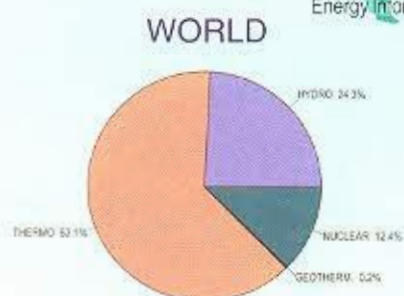
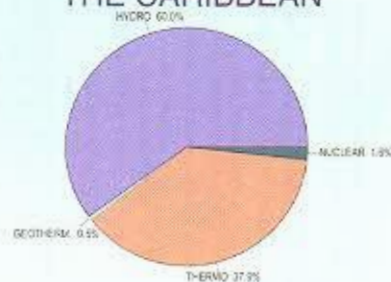
WORLD INSTALLED CAPACITY
1996 [MW]

ELECTRIC POWER STATION BY TYPE OF PLANT

REGIONS	HYDRO	THERMO	GEOTHERM.	NUCLEAR	TOTAL
LATIN AMERICA & CARIB.	111320	70214	984	2984	185502
NORTH AMERICA	151800	532400	1600	115800	801600
WESTERN EUROPE	169000	321000	2200	124500	616700
EAST EUROPE (Incl. CIS)	78400	304000	0	44600	427000
MIDDLE EAST	3100	71500	0	0	74600
AFRICA	19800	53800	0	1900	75500
ASIA AND AUSTRALIA	126100	364000	1600	46500	538200
WORLD	659520	1716914	6384	336284	2719102

Source: Latin America and the Caribbean: OLADE-EC, Energy-Economic Information System (SIEE).

Estimate by OLADE on the basis of the International Energy Annual 1996, Energy Information Administration (EIA).

LATIN AMERICA AND
THE CARIBBEAN

ELECTRICITY

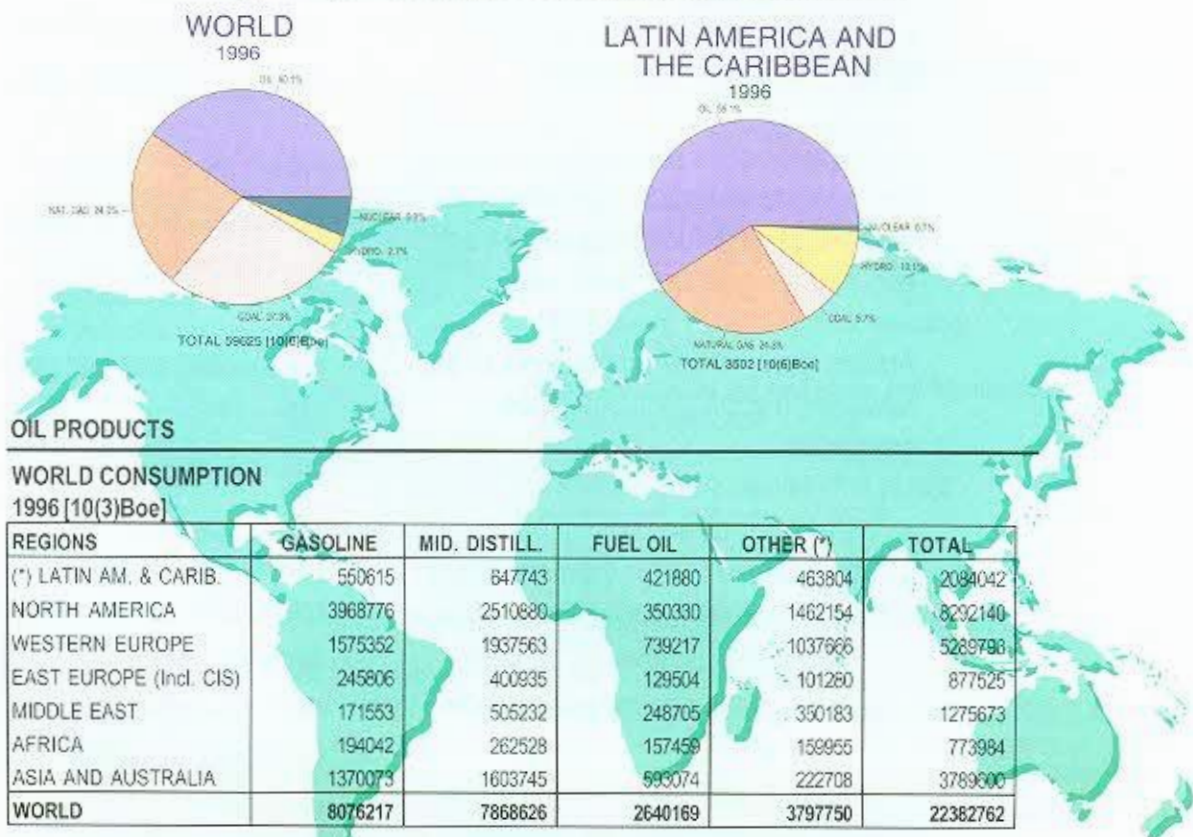
WORLD CONSUMPTION
1996 [10(6)boe]

REGIONS	OIL	NATURAL GAS	COAL	HYDROELEC.	NUCLEAR	TOTAL
(*)LATIN AMERICA & CARIBBEAN	2070	852	201	354	25	3502
NORTH AMERICA	6575	4580	3884	426	1493	16958
WESTERN EUROPE	5333	2712	2739	329	746	11859
EASTERN EUROPE (Incl. CIS)	1416	3412	1304	139	380	6651
MIDDLE EAST	1373	924	45	8	0	2350
AFRICA	795	311	646	45	23	1820
ASIA AND AUSTRALIA	6390	1520	7475	307	803	16485
WORLD	23942	14311	16294	1608	3470	59625

Source: Latin America and the Caribbean; OLADE-EC, Energy-Economic Information System (SIEE)

BP Statistical Review of World Energy 1997

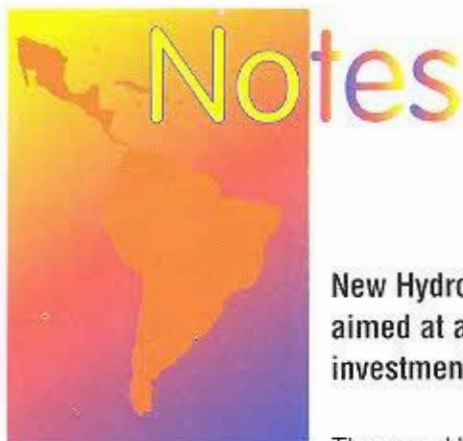
(*) Consumption includes end-use, consumption in transformation centers, and losses.



Source: Latin American and the Caribbean; OLADE-EC, Energy-Economic Information System (SIEE)

BP Statistical Review of World Energy 1997.

(*)OTHERS: Include LPG, gas, coke, other secondary energies and non-energy.



New Hydrocarbons Law of Paraguay is aimed at attracting private-sector investment

The new Hydrocarbons Law of Paraguay provides that the State has exclusive domain over those assets identified as hydrocarbons resources, which are deemed to be inalienable, untransferable, and imprescriptible, as defined by the current National Constitution.

The government's philosophy behind this law is aimed at attracting private-sector investment by reducing capital risk and ensuring a higher and faster return.

Among the most relevant aspects of the new Law, the following should be emphasized:

- Permits for oil and gas prospecting and concessions for exploration and production are granted by the State to physical or legal persons, whether national or foreign, private or public.
- Permit or concession areas: In the case of prospecting, the maximum limit is 2.4 million hectares, which is then reduced to a maximum of 800,000 hectares in the exploration phase. When the concession holder decides to start up the production phase, the maximum area selected can cover up to 50% of the exploration area.
- Duration: The prospecting phase is for one year, with the possibility of extending it for one additional year. For the exploratory phase, the time granted for the concession is 25 years, and the possible extension is up to five additional years.

The new Law is proposing a special tax regime for the oil companies, which can be summarized as follows:

- Prospecting and exploration are exempt from all municipal, district, and/or federal taxes.
- During production, the income tax rate is 30% on the year's net earnings. Moreover, the remittance of earnings or dividends abroad will not be subject to taxation.
- In addition, a tax-free amount, equivalent to 15% of the gross value of marketed oil and gas production, will be deducted from the income tax, for depletion purposes, up to a ceiling of 50% of net earnings.