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Latin American Energy Organization
Ave. Antonio José de Sucre N58-63 & Fernández Salvador, OLADE Bldg., San Carlos Sector • P.O. Box 17-11-6413
Quito, Ecuador • Phones: (593-2) 2597-995/2598-122
Fax: (593-2) 2531-691 • E-mail: olade@olade.org.ec

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This edition is being published at the end of July in order to offer our readers information on the II Meeting of Presidents of South America held on the 26th and 27th of this month with the active participation of OLADE.

Editorial

Integration of South America: Proposals

The Heads of State and Government of South America, gathering together for the Summit of Brasilia on August 31 and September 1, 2000, indicated that 'borders within South America should no longer serve as an element of isolation and separation; they should rather be a connecting link for the circulation of goods and individuals and thus circumscribe a privileged area for cooperation". They added that "in the energy sector, the integration and complementation of the South American continent's energy resources provide an axis for approximation among the countries of the region. This axis should be expanded and improved, in parallel with environmental preservation and the elimination of unjustifiable barriers arising from restrictions and regulation in this sector".

In this context, the Ministry of Foreign Affairs of Ecuador requested that the Latin American Energy Organization prepare a study on energy security in South America as technical support for the *Consensus of Guayaquil on Integration, Security and Infrastructure for Development* issued from the II Meeting of Presidents of South America, held in Guayaquil, Ecuador, on July 26 and 27, 2002.
OLADE carried out this request by turning in a document prepared in collaboration with UNCTAD and the IADB consultant, economist Ramón Espinasa.

Likewise, the Special Meeting of the Andean Presidential Council, held on January 28-30, 2002 in Santa Cruz de la Sierra, Bolivia, in view of the growing importance of energy issues in the hemisphere, requested OLADE, CAF, IADB and UNCTAD to prepare a study on subregional energy potential as a strategic factor for regional and hemispheric security.

In fulfillment of this mandate, OLADE, CAF, IADB and UNCTAD, with the collaboration of the Andean Community of Nations (CAN) and the Economic Commission for Latin America and the Caribbean (CEPAL), presented a study on the topic for the consideration of the Meeting of Andean Ministers held within the framework of the Presidents' Summit in Guayaquil.

The two documents revealed that the region has a wide variety and abundance of energy sources that have not been totally tapped. Once these resources are developed, however, they will enable the region to achieve a new economic, political, and social reality. Energy security begins with the development of current sources of energy and those that will be discovered and produced in the future, culminating with the creation of markets for energy products and the enlargement of those currently existing, in a framework of sustainability.

The paper's clearest proposals focus on various aspects linked to security and development of the region's energy sector:

It is imperative to attract and facilitate investments aimed at the energy sector in South America.

The purpose of promoting regional or foreign investments should be to optimize their impact for the benefit of the development of the region's countries, as part of the guidelines for energy integration and security. The goal should be to keep up or surpass, in the present decade, the inflow of investments obtained in the nineties, when the region received 42% of world energy investment, which enabled the governments of our countries to allocate more resources for other sectors such as education, health, housing, and social security.

In this context, the conditions to attract investments for sector development, one that builds up productive capacity and, at the same time, maximizes added value in the region, have to be promoted.

Furthermore, in South America the political decision has been taken to promote the integration of the region's energy sector, as a goal that will contribute decisively to achieving the equitable development of the countries and shall reinforce regional eco-

nomic growth. It is therefore necessary to overcome the principal obstacles to integration, namely, the lack of compatibility of technical and legal regulatory frameworks, as well as customs duties and tariffs, consolidating the State's regulatory activities at the same time.

The volatility of oil prices triggers problems that have to be dealt with by the region's countries. That is why it is indispensable to attract new investments to increase oil and natural gas production by conducting permanent exploratory activities, which will help to strike a balance between supply and demand. Also the marketing of oil has to be promoted by drawing up long-term contracts so as to ensure supply security and price stabilization.

Although electric power service coverage in the countries of South America is uneven, with major shortages in rural and marginal urban areas, the region has a vast hydropower potential that is as yet untapped.

Regarding this, it is necessary to adopt political decisions that promote new functional mechanisms to expand electric power coverage and design regional strategies that stimulate the development of hydropower resources and remove the pressure on fossil resources.

As for energy-related services, it can be asserted that trade of these services has grown recently owing to higher demand for energy over the last few years and market liberalization, including privatization and the introduction of new technologies. Although South America has been the stage for these processes, however, it continues to be noteworthy as a primary exporter of energy and an importer of energy services, technology, capital goods, and specialized inputs.

In South America, some countries have developed specialized skills and are competing in certain service areas. On the basis of these experiences, the region benefits from conditions to propose a conscious energy integration strategy that takes into account international energy business trends, as well as actions aimed at establishing rules to govern energy trade and investment. At present, multilateral and hemispheric negotiations are being conducted with the World Trade Organization (WTO) and the Free Trade Agreement of the Americas (FTAA) regarding international trade and investment rules that will exert a direct impact on the trade of energy goods and services.

As energy is an essential element for the population's economic and social progress and South America has all types of energy sources on its territory, which have ensured the region's self-sufficiency in terms of resources available to meet domestic demand, it is proposed that the development of these resources be supported by a political strategy that permits criteria and activities to be coordinated between the sectors of foreign policy, economic policy, and energy policy, both nationally and regionally, to consolidate common interests.

To do this, the elaboration of a South American Energy Charter is being proposed. It would set forth political decisions aimed at developing the region's energy to promote the joint growth of our countries and their energy integration.

The political decision will contribute to ensuring that natural resources are used adequately in a framework of sustainability for the region's energy development.

Dr. JULIO HERRERA
Executive Secretary

II Meeting of Presidents Emphasized Importance of Energy Strategy in Processes of Regional Development

The Presidents of the South American countries reiterated the basic principles of regional integration at the II Presidents' Summit in Guayaquil, Ecuador, on July 26 and 27, 2002.

At their II Meeting held in Guayaquil on July 26 and 27, the South American heads of state reiterated their willingness to continue encouraging actions involving coordination and cooperation as a way of creating a common opportunity for South American, thereby reaffirming the group of basic principles established by previous presidential summits.

The Presidents' Meeting reaffirmed the strategic role of energy in economic and social development in South America and emphasized the need to expand the levels of the security, reliability and quality of energy supply.

In this context and in response to a request made by the State Department of Ecuador where the Presidential Summit was held, OLADE prepared a document on Energy Security in South America, which constituted the technical support for the contents of the *Consensus of Guayaquil on Integration, Security, and Infrastructure for Development* adopted by the

Presidents of the region. This document was prepared with the collaboration of UNCTAD and the IADB consultant, economist Ramón Espinasa.

The Executive Secretary of OLADE, Dr. Julio Herrera, and the personal representative of the General Director of UNCTAD, Dr. Reinaldo Figueredo, made a presentation at the Meeting of State Secretaries of the Andean Community of Nations held within the framework of the Presidential Summit on July 25 this year. This document on *The Energy Potential of the Andean Subregion as a Strategic Factor for Regional and Hemispheric Energy Security* was prepared by IADB, CAF, CAN, CEPAL, OLADE and UNCTAD.

It was the response of these organizations to a request made by the Extraordinary Meeting of the Andean Presidential Council held in Santa Cruz de la Sierra, Bolivia in January this year.

The Consensus of Guayaquil on Integration, Security and Infrastructure for Development

At the end of the II Meeting of Presidents of South America, the heads of state signed the *Consensus of Guayaquil on Integration, Security, and Infrastructure for Development.*

The document reiterates the willingness of the presidents of the region to continue encouraging actions involving coordination and cooperation that can lead to creating a common opportunity for South American and their commitment to strengthen democracy, human rights, solidary cooperation among countries in the region, and integration and security, while at the same time it reaffirms their willingness to coordinate actions focused on efficiently combating such scourges as terrorism, drug traffic and corruption.

The presidents emphasized the importance of promoting the creation of a mechanism to provide for financial solidarity with democracy and governability, and they also paid special interest to a proposal for the creation of an International Humanitarian Fund that would not compromise the fiscal resources of countries in development.

The adopted Consensus stresses the strengthening of the regional infrastructure as a factor for coordinating the creation of an integrated opportunity in South America under the principle of open regionalism, and takes into account the following basic guidelines: geoeconomic perspective, social sustainability, economic efficiency, environmental sustainability and institutional development. One of its purposes is to mitigate poverty and incorporate the most vulnerable sectors into the benefits of modern society.

The presidents evaluated and emphasized the progress achieved within the framework of the Initiative for Integration of the Regional Infrastructure of South America (IIRSA) approved by the I Meet-

Integration and Energy Security

The presidents reaffirmed the strategic role of energy in the economic and social development of South America. Within the framework of the process of the integration of regional infrastructure, they emphasized these areas: increasing levels of security, reliability and quality in the supply of energy; energy interconnection and exchange, the development of energy markets; policies of sustainable development that include adopting mechanisms to facilitate cooperation in emergency energy situations; encouraging activities centered on searching for, exploring and diversifying alternative sources; strengthening the energy services sector; the harmonization of legal and technical structures in this setting.

The *Consensus of Guayaquil* takes into account the Presidents' decision to coordinate actions in order to contribute to an ample and progressive type of energy integration for South America that would result in an agenda aimed at a study of the bases and the posterior creation of an eventual energy regulation for South America.

ing of South American Presidents in Brasilia, which included the identification of 162 transportation, energy and telecommunication projects.

They also called attention to the priority of the so-called "axes of integration and development," one being the multi-modal axis of the Amazon with its two branches, which would benefit the Amazonian countries in an integrated manner.

Emphasis was placed on public, private and multilateral credit-organization work carried out jointly, which would permit the financing of capital contributions by state governments, the financing of private investment and the study of innovating methods that would allow for a new orientation of policies regarding debt for multinational projects..

Science and Technology

The development of science and technology received particular attention, especially in the field of information and communication.

Declaration Regarding the South American Zone of Peace

Based on the initiative taken at the I Meeting in Brasilia and on other regional instruments, South America was declared a Zone of Peace and Cooperation. The Declaration rejects the use or threat of force between states as well as the summoning, developing, fabrication, possession, deployment, transit, experimentation and utilization of any type of arms used for mass destruction, including nuclear, chemical, biological or toxic weapons. It also establishes the commitment to continue the gradual application of the elimination of land mines and to strive for their total eradication in the shortest time possible.

Initiatives directed at promoting efforts regarding the gradual limiting of defense spending in order to focus more resources on the struggle to eradicate poverty were also highlighted.

CAN – MERCOSUR Negotiations

The Council emphasized the importance of CAN – MERCOSUR negotiations, reiterating that it is imperative to conclude them this year in order to use them to strengthen their negotiating

"Based on the initiative taken at the I Meeting in Brasilia and on other regional instruments, South America was declared a Zone of Peace and Cooperation"

capacity in other processes, especially with FTAA.

FTAA Negotiations

It was decided to take into account the individual features of countries having small economies in relation to negotiations carried out to create the Free Trade Area of the Americas (FTAA).

For this, importance was given to the need to find appropriate methods aimed at strengthening the capacity of these countries so they can participate in the negotiating process of FTAA and fully and effectively implement the results achieved by these negotiations.

Action Plan Regarding International Migration

The Presidents determined that the Third South American Conference on Migration to be held in Quito this August 15 and 16 adopt an action plan regarding international migration in South America that establishes coordinated guidelines for the worldwide protection of the fundamental rights of South American migrants as one of its objectives.

World Summit on Sustainable Development

The Presidents adopted a declaration in which they committed themselves to coordinate positions in the region at the World Summit on Sustainable Development to be held in Johannesburg this November. This task was assigned to the Presidents of Ecuador, Gustavo Noboa, and Brazil, Fernando Henrique Cardoso.

Sustainable Development of Tourism

The initiative begun in May 2002 by authorities working in tourism and environment in Latin American and Caribbean countries received support in regard to the need to promote Sustainable Development of Tourism (Ministers' Meeting in Galapagos).

Solidarity with Argentina

The Presidents reiterated their support and solidarity with the people and government of Argentina and recognized the efforts made to surpass the adverse conjuncture. The Presidents urged to the International Financial Community to extend the support that this country needs for its economic reactivation.

Solidarity with Colombia

In relation to the internal conflict Colombia is facing, the Presidents expressed their solidarity with the people and the Government of that country in their efforts to defend democracy. They rejected terrorist actions and violations of international humanitarian rights committed by groups functioning outside the law.

Homage Paid to Bolivar and San Martin

The II Meeting of Presidents was held on the 180th anniversary of the historical encounter of the Liberators, Simon Bolivar and Jose de San Martin, in Guayaquil on July 26, 1822, making it a truly honorable occasion.

"The presidents emphasized the importance of promoting the creation of a mechanism to provide for financial solidarity with democracy and governability, and they also paid special interest to a proposal for the creation of an International Humanitarian Fund that would not compromise the fiscal resources of countries in development."

Toward Sustainable Energy Development in Jamaica

A series of seminars - workshops were held in different countries of the region within the framework of the Project on Energy and Sustainable Development in Latin America and the Caribbean, sponsored by OLADE-ECLAC and the GTZ of Germany.

As a result of the workshop held in Kingston in June 2000, the Government of Jamaica (GOJ), through the Ministry of Mining and Energy (MME), requested the implementation of a technical assistance program for the development of an energy policy aimed at supporting Sustainable Development.

The request was the result of a rising concern by the Government of Jamaica of the need to formulate an adequate energy policy against a rising dependence on imports and the high consumption growth rate while having a modest evolution of the economic activity level.

OLADE, with the technical and economic support of United Nations Environmental Program Collaborating Centre on Energy and Environment and RISO National Laboratory of Denmark (UNEP-RISØ), accepted the request to assist the Government of Jamaica. For this purpose, a report was prepared with the cooperation of experts who took part in missions to Jamaica, and after an intense interchange of ideas with the authorities from the above-mentioned Ministry, relevant sector agents, authorities from other Ministries and representatives from Civil Society.

As already mentioned, the conceptual framework is characterised by sustainability, one of the key objectives of the present study being the evaluation of the contribution of energy policy to the improvement of conditions towards sustainable development.

The analysis and evaluation of objectives, strategies, instruments and regulatory frameworks under the special national circumstances represented one of the key items of the study, considering that the challenges bought forth by the new approach of the integration of sustainability criteria into the energy policy calls for new views and strategies.

The study had the following general objectives:

- Drafting of a diagnosis to identify the main problems of the sector's policy
- Specification of the strengths and weaknesses of the policy in practice
- Evaluation of the way in which the objectives are formulated and adapted and their consistency with the identified problems
- Strategy proposals as regards institutional responsibilities, aims and priorities
- Translation of objectives and priorities into concrete policy actions
- Proposal of certain lines of action, strategies and measures aimed at solving the problems of highest priority and meeting the most urgent objectives

Following is an Executive Summary of main aspects and findings of the study.

The Jamaican Energy Consumption

The 1990-2000 period registers a sustained final energy consumption growth rate. The annual accrued rate during this period reached 3.1%, fuelled by a strong rise in Oil Product consumption.

As regards the Energy – Economy relationship, we notice a significant rise in energy intensity during the 1990s. In fact, against a modest GDP hike (a.a.1.4%) – actually a drop from 1995 onwards – energy consumption has registered a sustained and constant increase (a.a.6.2% between two ends of the series).

As a result of this disparity between rates, energy intensity grew 73% and elasticity indicators show negative values from 1996 onwards.

Taking into 1987 as the base year, we notice that while the GDP grows 18.6%, energy consumption rises 105.7%. In other words, there is a clear disconnection between the economic activity level and energy consumption. Moreover, as from 1997, oil registers a higher growth rate than the rest of the energy products.

As a corollary, we may conclude that Jamaica is a nation that has *energized* itself during the last 12/14 years, with a sustained growth in energy intensity.

Such energizing was most noticeable *during the second half of the 1990s*, when, against a drop in the economic activity level, energy consumption kept its growth rate, aggravating the situation even further.

Key Issues and Main Problems

The government recognizes that the long-term sustainability of the system is threatened by a complex pattern of negative conditions whose causes and effects are defined in the social, economic, environmental and political dimensions.

In terms of physical characteristics, the Jamaica energy system exhibits an overwhelming predominance on costly options that have produced in the country a consistently unfavorable energy situation.

The share of oil products in the energy mix is rising relative to crude oil whose share has fallen from over 42% (in volume) in 1990 to below 14% by 1999. This transformation has in the meantime resulted in a higher importation of added value and consequent under-utilization of the installed refining capacity.

As currently structured and operated, the Jamaican energy system cannot support sustainable improvements in living standards. Analyses of the relationship between energy and the macro-economy reinforces what is increasingly obvious to energy and development officials—the productive capacity of the economy is generally unresponsive to rising energy consumption..

The Transportation and Residential sectors are the two major contributors to the increase in energy intensity. Statistical analysis of the rate of growth of gasoline vs. diesel consumption points to significant movement towards less efficient modes of travel, in particular, the strong rise in the consumption of gasoline. This in turn impliesæin the road transport sector at leastæ the displacement of diesel-powered mass-transit buses, for relatively less efficient gasoline powered passenger cars. In absolute terms, over 250,000 passenger cars have been imported since 1990.

The residential sector is another major area where energy intensities are on the rise. The household sector is responsible for the bulk of the increase in energy consumption (55%) over the last 5 years. During the period 1994 – 1999, the growth rate reached 6.6%, representing well over 70% of the

increase over the entire decade 1990 - 2000.

At the same time, expenditure on imported crude oil represents a high and rising economic cost to the country. In a context where the trade balance deficit rose 4000% in the last 14 years, it is clear that further increases in energy intensity cannot be supported in the long run without restricting the importation of other vital economic needs. The long-term sustainability of current energy production and use patterns is very much in doubt.

Though there is widespread recognition of the need for energy conservation, the necessary policy instruments have been difficult to either design or implement or both. Occasional public awareness programs on energy conservation have not been sustained and Jamaica has never been able to secure the active participation of consumers in an energy conservation effort.

The current pattern of energy production and consumption in Jamaica is environmentally unsound. This observation applies to the production and consumption sides of the national energy equation.. Whether viewed from the local, regional or global standpoints, it is impossible to deny that the environmental objectives of sustainability cannot be realized by the existing system.

In the non-commercial/rural sector, the continued dependence of a significant proportion of the population on firewood results in their significant exposure to health risks associated with traditional forms of utilization.

The development of Jamaica's current energy regime was based on an implicit, pervasive, and simple formula undergirding similar energy systems worldwide. This formula comprises a two-part 'social contractual' statement: (a) producers of energy agree to supply safe, reliable, abundant energy at a reasonable price to the society. (2) The rest of society agrees to pay the going rate and let producers go about their business without social interference in their technical and economic affairs.

Consistent with these basic criteria, the evolutionary trajectory of the Jamaican energy sector demonstrates an unmistakable trend towards dominance by large, complex, centralized and non-transparent energy producers.

Most players in government, the private sector and civil society agree that the ultimate political, social and environmental costs of retaining the current energy governance structure outweigh the presumed benefits.

An institutional-political challenge confronting the government is how to introduce long-term and social signals into the energy market place without hampering the full exploitation of the potential of market mechanisms for optimization of resource allocation in the energy sector. (UNDP, 2000).

Apart from the pressing energy governance challenges it confronts on the domestic front, the political maneuverability of the government on major global energy issues, in which Jamaica may have an interest, is very much in doubt. The dependence of the energy system on international trade agreements for oil, drastically restricts the political options available to the Jamaican government in international negotiations on sustainable energy and sustainable development.

Current Energy Policy Objectives

The GOJ Energy Policy objectives may be schematically summarized in the following items:

- Guarantee a stable and adequate energy supply
- Diversify the energy base
- Develop indigenous energy resources
- Promote energy efficiency to bring down the economy's energy intensity
- Complement the nation's industrial policy

- Minimize the environmental effects of pollution

Energy Policy Results

There are several pending issues in the progress towards the objectives of the energy policy. Although any reference to temporal horizons was made in only a few cases, after five years we should be able to identify that certain indicators at least fell in line with the objectives. Such indicators should be the indexes of a trend in which –although the goal may not have been reached – we could observe a direction and a purpose that would allow us to conclude that we are on the right track in accordance with the expected results. Reality does not show such positive evidence.

The following table incorporates certain indicators to "measure" the changes produced between 1993 (base year for the definition of the policy) and the most recent dates on which information is available (1999/2000). The table was made up using some sustainability guidelines for the energy sector.

Only certain quantifiable ones were selected from the list of sustainability indicators included in the Guide to Energy Policy Formulation published by the OLADE/ECLAC/GTZ Project on Energy and Sustainable Development. An indicator was chosen where it reflects the "spirit" of the objective and could be used as a measure of its progress. With reference to the last column, it is aimed at being a summarized index on the improvement or worsening of the situation with respect to 1993.

Policy achievements were partial, pending issues are significant and the system registers a low sustainability level.

Different reasons have been identified and are related to the methodological approach to the analysis, existing information, the hypotheses on the scenarios, the optimism about certain institutional and regulatory changes, the definition of objectives and coherence with the problems, the strategies designed to achieve the objectives, the lack of adequate measures and instruments, over optimism with regard to certain goals, the non-implementation of contemplated actions and strategies and the implementation of actions that were not originally contemplated.

Recommendations

The foregoing diagnoses of Jamaica's energy condition reveals a highly unstable sector that is unsustainable from the political, economic, social and environmental perspectives. Of paramount concern is the excessive growth in non-bauxite energy consumption—exceeding growth in GDP and population. While this growth in energy consumption might be interpreted, from a 'purely' political perspective, as 'good' (the 'welfare' of Jamaican citizens is increasing), a multidimensional outlook renders a less favorable judgement.

SPHERE OF ACTION FOR POLICY

A fundamental assumption governs the design and scope of the recommendations presented here: the sphere of action for government energy policy does not include bauxite industry consumption and the bunker (jet fuel) sec-

Dimension	Objective	Indicator	1993	1999/ 2000	Relative Index
Economic	External supply diversification	Oil with respect to energy imports (%)	98.2	99.4	101.2
	Degree of self-sufficiency	Imported energy with respect to total energy (%)	89.0	92.2	103.7
	Energy import quota	Imported energy with respect to total imports (%)	14.8	21.6	145.9
	Weight in the balance of payments	Oil bill (US$ 10^6)	323	688	213.0
	Energy intensity	Energy/GDP (index)	100	120	120.0
	Production efficiency in energy supply	Electricity system losses (%)	19.7	16.9	85.8
	Value added of the energy chain	Oil products with respect to oil imports (%)	72.4	86.1	118.9
	Supply costs	Evolution of mean costs of the oil import mix (index)	100	104.4	104.4
	Diversification of the energy mix	Oil with respect to total consumption (%)	88.0	91.2	103.6
Social	Access to modern energy products	Number of household consumers (in thousands)	312	409	76.3
Environmental	Local and global impacts	Specific emissions (index)	100	102.3	102.3
	Sustainable firewood management	Firewood with respect to total consumption (%)	3.7	3.6	97.3

Summary of Recommendations on Supply and Demand

Demand Side	Supply Side
Household/commercial buildings and industrial operations Implement energy efficiency measures in electricity consumption For commercial and residential buildings • Operationalise building codes and regulations at parish level • Preferential financing • Information programs • Government procurement • Tax credits For industrial operations: • Voluntary agreements for industrial energy efficiency • Information programs • Investment enabling programs • Industrial energy efficiency research	Cogeneration (combined heat and power) • Derive working definitions of cogeneration • Establish fair and transparent conditions for grid access • Establish binding targets for CHP market share • Formulate and implement National CHP Action Plan Diversify imported sources • Develop strategic international partnerships and negotiate San José-type Accord for LNG imports (possibly with Trinidad and Tobago as one of the main suppliers)
Transportation • Promote the use of more efficient modes of travel by: improving the quality of public transport services; targeted tax of gasoline; tax incentives for fuel-efficient private vehicles; disincentives for use of inefficient pre-owned vehicles. • Sustain ongoing public transport upgrading program and harmonize with sustainable energy agenda • Implement regime of vehicle tax credits • Implement a politically sound targeted fuel taxation (variabilization) scheme • Develop, test and elaborate forward-looking transportation DSM program	Renewable energy • Develop feasible capacity and output subsidies for renewable-based electricity • Implement bidding system • Implement, where feasible, Green Pricing scheme • Implement fiscal incentive instruments for clearly defined technologies • Develop appropriate regulations on physical access and pricing of renewable

Summary of Transversal (Cross-cutting) Recommendations

Capacity of Existing Stakeholder Institutions

- Rationalize roles and responsibilities
- Articulate capacity building around the following themes: a) enhancing the benefits of competition; b) environmental standards setting, enforcement and monitoring; c) defining, ensuring and monitoring trends in social equity and environmental justice; and d) negotiating international agreements to secure security of supply.

Status of Sustainable Energy (renewable energy and energy efficiency)

Set up Sustainable Energy Center as semi-autonomous unit within MME or other appropriate agency with the following specialist functions:

- Specifying sustainable development objectives, criteria and implementation strategies and policies
- Uncovering technical, managerial and organizational barriers that hinder continuity of sustainable energy initiatives
- Identifying and analyzing unintended consequences and negative effects of ongoing programs and developing solutions consistent with sustainability criteria
- Clarifying roles and responsibilities of different institutions and recommending appropriate roles for action by GOJ
- Improving the performance and effectiveness of existing energy and energy efficiency projects

Information: Continuous Flow of Data, Analyses and Syntheses for Sustainable Energy Decision Support

Design and implement a Sustainable Energy Information Plan (possibly as project around which the SEC is built/resourced).

Intersectoral Coordination for Sustainable Energy and Development

Use budgetary mechanisms to pressure/guarantee intersectoral coordination on targeted sustainable energy (including energy efficiency) projects/initiatives.

tor. This implies that the recommendations put forward here apply only to 55-58% of total consumption. Of the portion of total consumption that can realistically be targeted, nearly half comprises road transport while approximately 40% is consumed in power generation. In focusing on these segments of total consumption, we have addressed demand, supply and cross-cutting matters arising from the preceding analysis. A summary of principal recommendations is presented in following tables.

As a Mode of Conclusion

The study has explored multiple responses of the sort that seem most likely to neutralise specific barriers to the achievement of key sustainable energy objectives. In several cases, it is obvious that more detailed knowledge is needed to enhance effectiveness of the measures proposed, or to develop others.

The recommendations presented are based on a combination of the facts at hand and professional judgements gathered from within and outside of Jamaica. The considerable human and material resources in the country – currently spread across disconnected centers—need to be linked into a coherent pattern of productive stake-holder networks. The operation of such networks can considerably facilitate the task of specifying and matching sustainable energy challenges to domestic and international resources for implementation of specific actions. The proposed Sustainable Energy Centre could provide the initial services required to define the components and linkages of such a network for the sustainable energy development.

Drawn from the Final Report of the technical assistance to Jamaica for revision of its energy policy.

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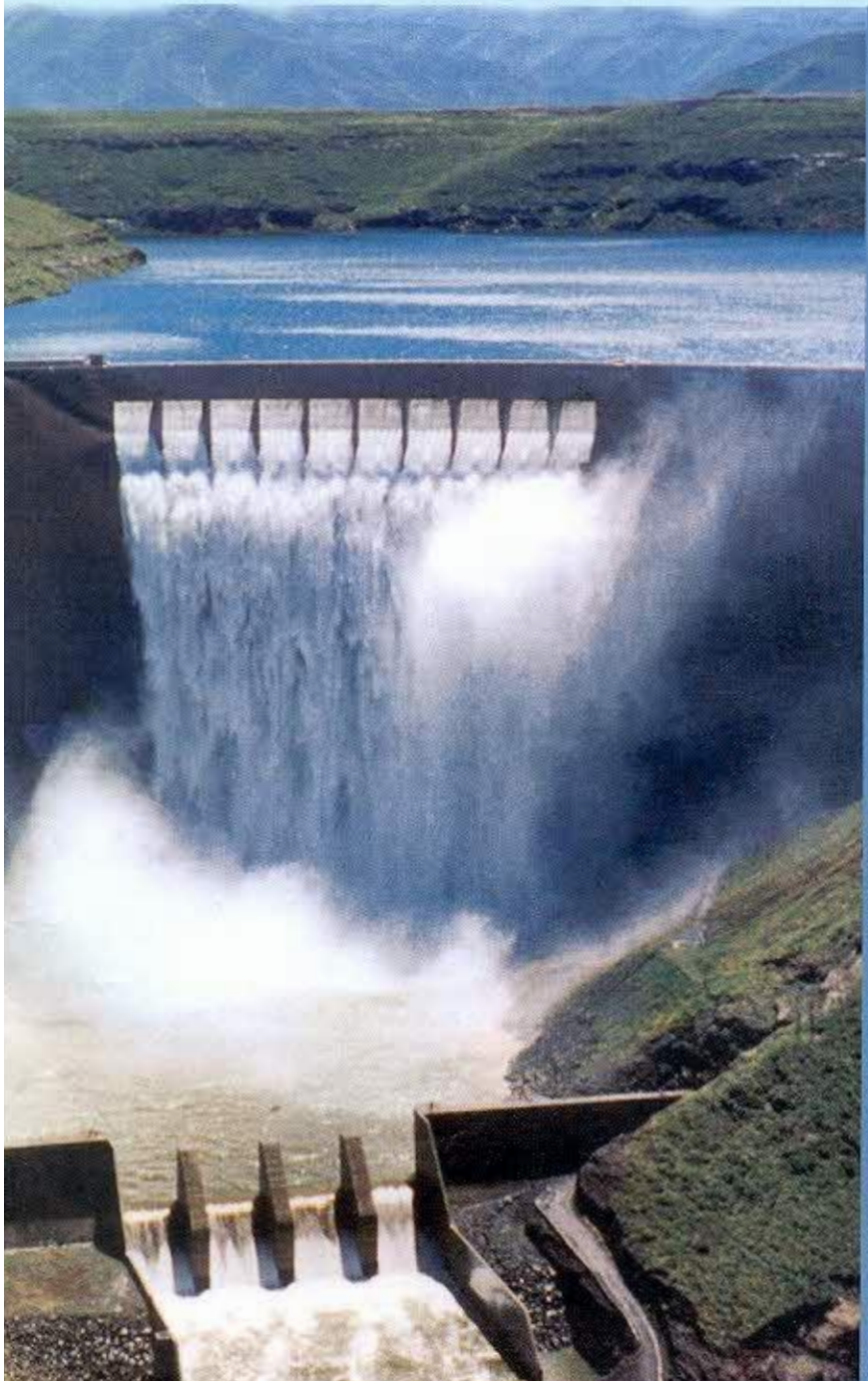

- Investment
- Hydrothermal dispatch
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Phones: (593-2) 2531-672 / 2598-280
Fax: (593-2) 2539-684
E-mail: olade@olade.org.ec / super@olade.org.ec

OLADE's Report:

Hydropower Opportunities in Latin America and the Caribbean

Hydropower development and potential

The rapid development of hydropower in the world during the first decades of the past century declined afterwards owing to various factors, among which the following are noteworthy: the decline or depletion of hydropower resources that were economically exploitable in many developed countries, the appearance of oil and then natural gas as economically attractive energy resources, technological breakthroughs in the design and operation of thermoelectric units, the advent of nuclear fuel, and the rapid growth of electric power demand. These factors led to an increase in thermoelectric production compared to hydropower.

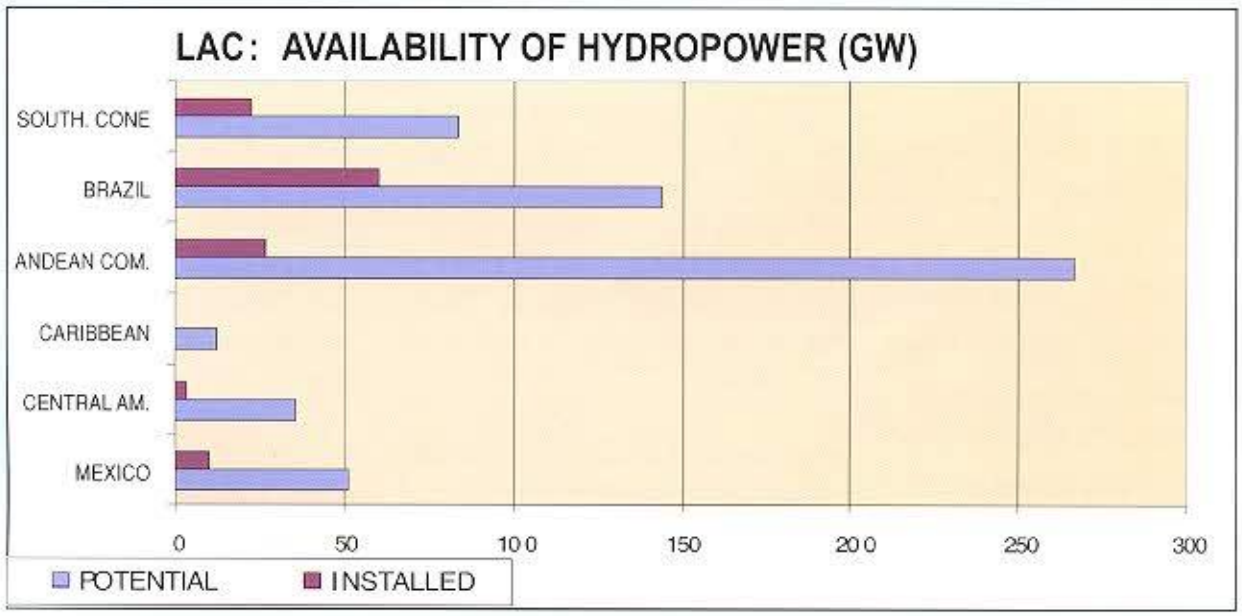
The above does not apply to countries or regions that have an abundance of hydraulic resources, which because of the countries' economic development, have not as yet been tapped, as is the case for Latin America. As long as a country or region has renewable sources of energy that are abundant, economically attractive, and environmentally clean, it can be concluded that they should be used for generating electricity.

Latin America has large amounts of hydraulic resources that are economically attractive, which can ensure the stability of supply for meeting future electric power demand. The region's hydropower supply is estimated at about 594 GW, which accounts for 22.7% of the world's total, of which only 20.8% has been tapped. Most of this potential can be found in the countries that are members of the Andean Community of Nations (44.9%), Brazil (24.1%) and the Southern Cone (14.2%), as indicated in Figure 1.

The countries of Latin America have a high component of installed hydraulic energy, and fortunately there is still much more to be tapped. Brazil has the highest available potential (143.4GW), and its electric power system is already comprised of a high share of hydropower (84.5%). By contrast, some of the Caribbean countries do not have any potential for expanding their electric power system with hydraulic stations and have had to focus their efforts on other types of fuels, preferably fossil fuels. In the region, 55% of installed capacity in the year 2000 corresponds to hydropower stations (see Figure 2).

Hydropower, as a general baseline energy producer, accounted for about 63% of total electric power supply in the region in the year 2000; 34% of generation is thermoelectric, basically using as feedstock oil, natural gas, and coal, as well as nuclear energy (2%) and geothermal energy (1%), as indicated in Figure 3. These last two sources of energy have only been developed to a very limited extent in the region, although they are important for countries

Figure 1



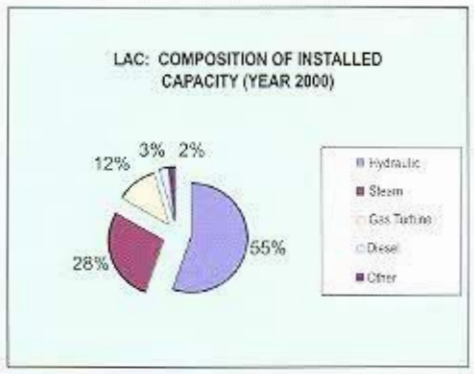


Figure 2

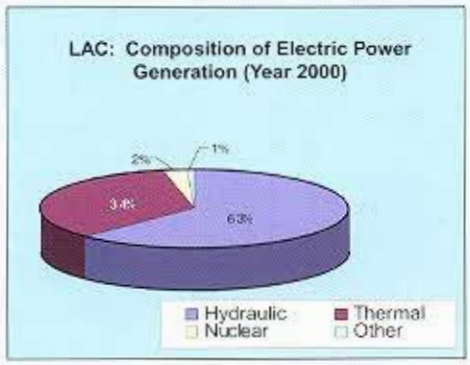


Figure 3

like Argentina, Brazil, Mexico, and the Central American countries.

In the case of Brazil, it can be observed that hydropower resources are the most important sources of electricity, as they accounted for a share of more than 90% of generation in the year 2000 (see Figure 4).

In Figure 5, it can be observed for the period 1970-2000 that the growth of hydropower continues to be very high, although over the last few years its pace has declined as a result of the incorporation of thermoelectric stations that use natural gas as feedstock. When analyzing the composition of the region's electric power installations, it can be observed that, by 1970, hydropower accounted for a share of 47.5%, then in 1993 its share had risen to 59.3%, and finally it declined to 55% in the year 2000.

New structure of the electric power sector

In the previous vertical structure of the electric power subsector, the State was in charge of electric power planning, financing, construction, administration, and operation, and of course all the risks inherent to these activities as well.

With the change in the role of the State, private-sector investors have taken over the building of new stations to meet demand efficiently, on a continuous basis, and with the timeliness required, so as to promote industrial development and avoid electricity rationing, which has already caused much damage to the economy of the countries.

Efforts should be made to ensure that the changes stemming from the reforms in generation structures and new financing mechanisms are technically, economically, and ecologically suitable and do not trigger adverse impacts for the economy of the countries and society as a whole.

Growth expectations

Although there are enough water resources that can be developed economically and although, in the majority of the region's countries, fuel has to be imported to operate thermoelectric stations, which contribute to the greenhouse gas effect, the trend over the next few years is to install this thermoelectric stations, because their lead times are shorter, investment requirements smaller, and investment return periods shorter.

Private-sector investors need returns on their investment over shorter periods of time. The long lead time and useful time of hydropower stations require periods of over 30 years to ensure investment recovery. To address this situation, new financing schemes need to be created by multilateral credit institutions and international banks to stimulate the development of hydropower resources.

According to OLADE projections based on information provided by its member countries, up until the year 2010 the composi-

tion of electric power facilities in Latin America and the Caribbean will continue to be characterized by the predominance of hydropower resources (53%) over other types of resources (see Figure 6). By the year 2020, however, the share of thermoelectric stations using natural gas and oil products as feedstock will predominate (53%) (see Figure 7). Nevertheless, if the overall share of thermoelectric generation facilities is broken down, it is apparent that hydropower continues to predominate. In the next two decades, the construction of close to 50,000 MW of hydraulic origin is expected in the region, of which 60% will be installed in Brazil.

Regional integration

In the new scheme, the formulation of suitable regulatory frameworks and the establishment of institutions in charge of their enforcement have turned out to be a highly complex task. The decisions taken in the region have exerted a major incidence on the efficiency of the subsector and the economic prosperity of the countries. In the framework of the specific circumstances of each country, strategies are required to match the interests and objectives of society and the economy with those of public and/or private companies in charge of developing the electric power industry, which will help to ensure the fluidity of both the process and trade of electrical energy, not only in the countries themselves but also with their neighbors and, in the immediate future, in the region as a whole.

In this regional framework, energy integration processes require the development of projects with a subregional and regional perspective that can ensure long-term supply security. The political orientation should lead to the creation of efficient markets based on the optimization of national systems. Thus, governments will have better fulfilled their responsibility to guarantee public service delivery to the neediest socioeconomic sectors, as a result of declining prices.

Environmental impact

The position of environmentalists who believe that the development of hydraulic resources damages the biological ecosystems of the rivers where dams are to be built should be studied. Along with these impacts, there are those stemming from human settlements and the destruction of forests as a result of road building. Despite all of these criticisms, the development of hydropower projects exerts the least amount of environmental impact.

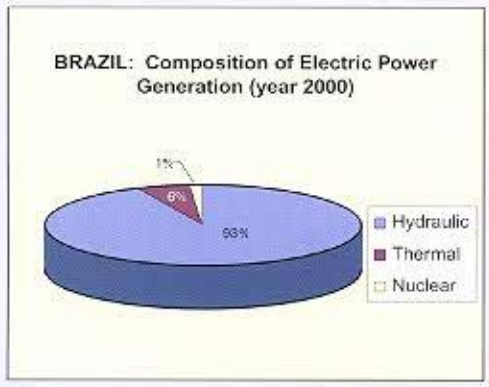


Figure 4

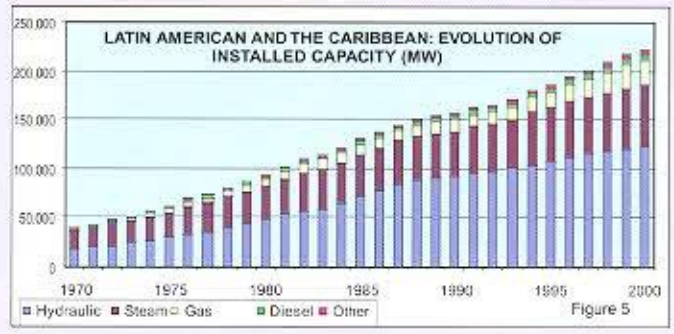


Figure 5

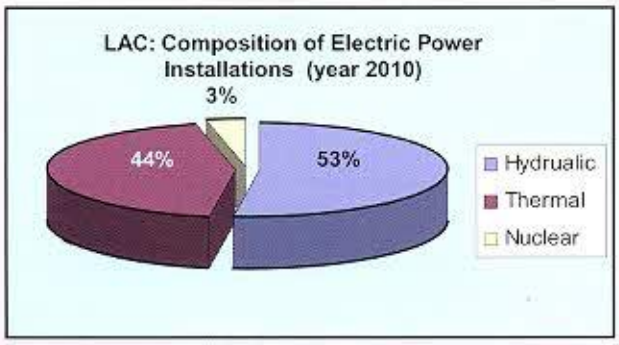


Figure 6

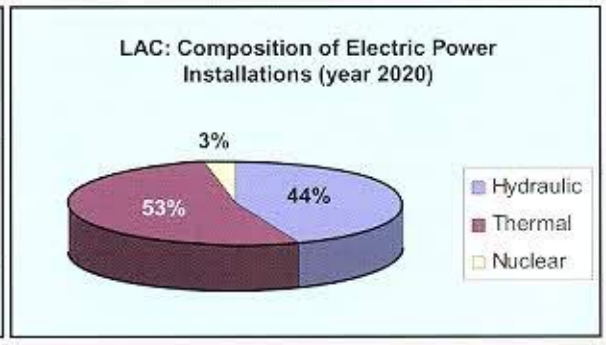


Figure 7

The construction of electric power stations that use new cleaner technologies that tap geothermal, wind, and solar resources may contribute to meeting demand but unfortunately they cannot cover all the needs for the development of the region's electric power market and as yet they are not competitive.

The oil/gas bias of power generation projects that are financed by the private sector will produce higher levels of emissions as a result of power generation, especially CO_2, than the emissions that would come from a growing share of hydropower in the traditional model.

The impact of this bias is difficult to estimate; nevertheless, it is evident that the share of hydropower in electric power production is being reduced in Latin America for the benefit of thermoelectric generation and that production from gas turbines (using natural gas or oil products as feedstock) or combined cycle plants (using natural gas) will be increasing considerably.

The future of hydropower stations

On the basis of the economic assessment studies for the projects that are included in the catalogue of new stations in each one of the region's countries, it can be concluded that hydropower stations are in general the most economical on the market over the long term. Their long maturity period, until operation starts up, and the high investment costs involved require that decisions on their construction be taken very much in advance.

For the immediate future, it is important that multilateral institutions help governments create a suitable environment for optimal decisions to be taken so as to encourage the construction of new hydropower stations. When taking decisions to build hydropower projects, the following should be kept in mind:

- The stations are far from consumption centers.
- The impossibility of "moving" the station.
- Long lead time.
- Long useful life.

One advantage of hydropower stations is that they contribute considerably to reducing the greenhouse gas problem, which is major problem for our modern world, one that is increasingly severe.

Furthermore, the building of hydropower stations will make fossil energy sources that would otherwise have been used available for other sectors of the economy and exports.

Oil and oil products in Mexico

Luis Alberto Vásquez Meléndez

Introduction

This article first of all contains a description of the principal legal statutes applicable to oil and gas, which can be identified at three different levels, starting with the precepts contained in the Political Constitution of the United Mexican States, as well as the principal laws applicable to the sector. Some of the governing principles of energy policy contained in the Energy Sector Program for 2001-2006 are also considered.

Second, the article focuses on the crude oil reserves at January 1, 2002 and the regional location of these reserves , as well as the evolution of production and the destination of crude oil for the period 1999-2001.

Third, the article provides a description of the National Refining System, as well as the importance of its reconfiguration, which started up in 1997, and the impacts it is expected to exert as of 2006.

The fourth factor being considered is the domestic sale of some oil products for the period 1998-2001 and, especially, the external dependence on motor vehicle gasoline.

The fifth section addresses future investment requirements to meet the demand for oil products and oil exploration and production.

Regulatory framework

The first tier of the regulatory framework for oil and gas in Mexico consists of Articles 25, 27, and 28 of the Political Constitution of the United Mexican States and, in the case of Article 27, its respective Regulatory Law. The second tier of this framework is comprised of the General Law on National Assets and the Organic Law of the Federal Public Administration. The third tier involves the Organic Law of Petróleos Mexicanos and its respective Regulations.

Article 25 of the Constitution indicates that "the public sector will have exclusive responsibility over the strategic areas pointed out by the fourth paragraph of Article 28 of the Constitution, with the Federal Government maintaining ownership and control over the organizations that are established in this case." Among the strategic areas referred to in this article, there are oil and solid, liquid, and gas hydrogen carbons, among others.

Article 27 provides that "in the Nation is vested the direct ownership of all natural resources of the continental shelf or underwater insular shelves, of all minerals or substances, which in veins, ledges, masses or ore pockets, form deposits distinct from the components of the earth itself, such as the minerals from which industrial metals and metalloids are extracted; deposits of precious stones, rock-salt and the deposits of salt formed by sea water; products derived from the decomposition of rocks, when subterranean works are required for their extraction; mineral or organic deposits of materials susceptible of utilization as fertilizers; solid mineral fuels; petroleum and all solid, liquid, and gaseous hydrogen carbons; and the space located on the national territory in the extent and terms set by international law."

The Regulatory Law of Article 27 of the Constitution regarding the oil sector provides for the following principles, among others:

1. The Nation has direct, inalienable and imprescriptible ownership over all hydrogen carbons located on the national territory, including the continental shelf, in ledges or ore pockets, whatever may be their physical state, including intermediate states, and that make up crude mineral oil, what accompanies it or what is derived from it.

2. Only the Nation will be able to carry out different activities for exploiting hydrocarbons, which constitute the oil industry, in accordance with the following terms:

   a. First-hand exploration, exploitation, refining, transport, storage, distribution, and sale of oil and the products stemming from its refining.

   b. First-hand exploration, production, elaboration and sale of gas, as well as the transport and storage that are indispensable and necessary for interconnecting their production and elaboration.

   c. First-hand elaboration, transport, storage, distribution and sale of those oil and gas products that are susceptible to serve as basic industrial raw materials and that constitute basic petrochemicals such as ethane, propane, butane, pentanes, hexane, heptane, raw material for lamp black, naphthas and methane, when they come from hydrogen carbons, obtained from deposits located on the national territory and are used as raw material in petrochemical industrial processes.

3. The Energy Secretariat will assign to the state oil company Petróleos Mexicanos the land that this institution requests or that the Federal Executive Branch of Governments deems advisable to assign for the purpose of oil exploration and production.

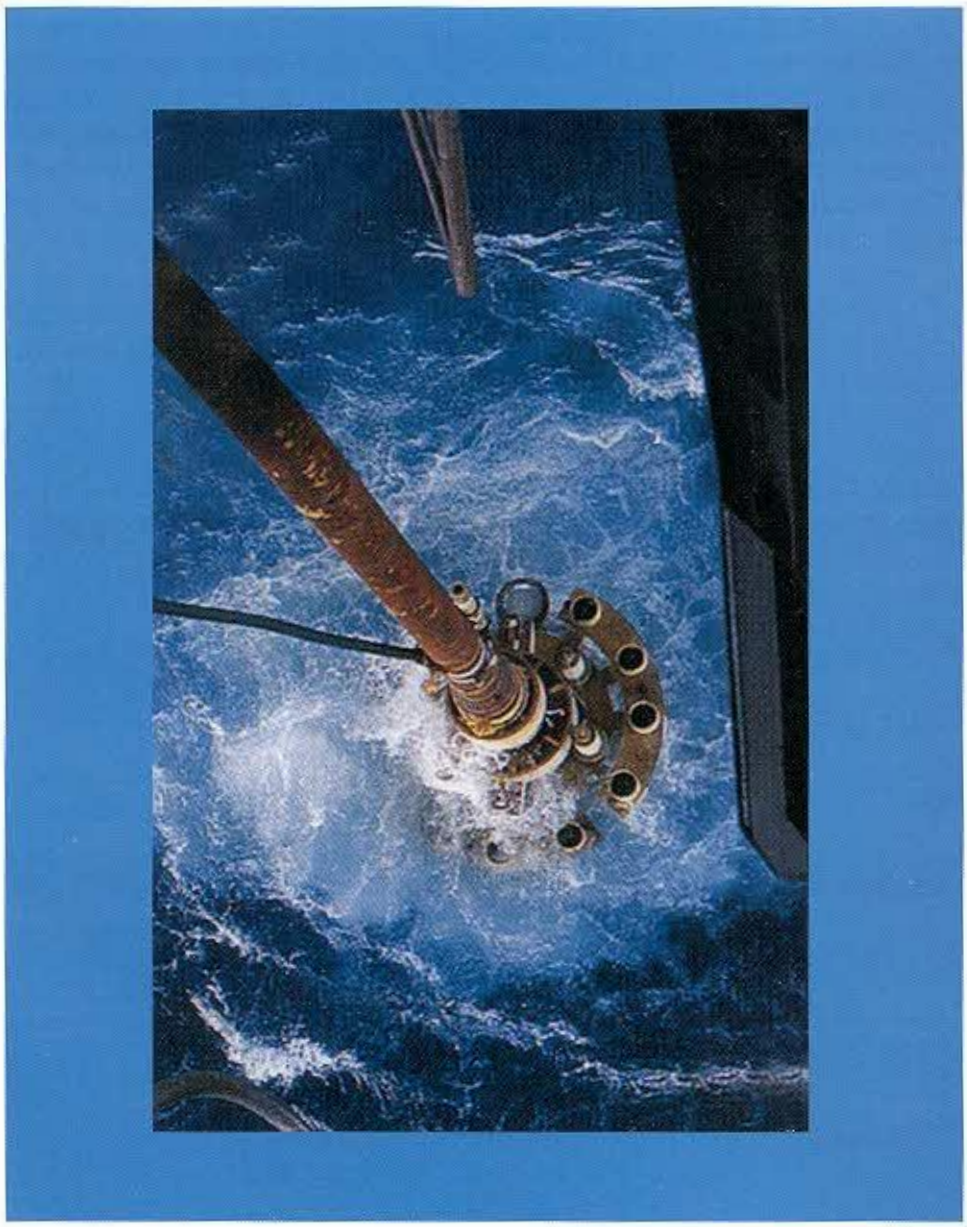
4. The Federal Executive Branch shall establish oil reserve zones on land that, because of its oil potential, merits to be set apart in order to guarantee the country's future supply.

The first tier of the regulatory framework for oil and gas in Mexico consists of Articles 25, 27, and 28 of the Political Constitution of the United Mexican States and, in the case of Article 27, its respective Regulatory Law. The second tier of this framework is comprised of the General Law on National Assets and the Organic Law of the Federal Public Administration. The third tier involves the Organic Law of Petróleos Mexicanos and its respective Regulations.

5. The oil industry is of public usefulness, with priority over any development of the surface or ground of the land, including even the ownership by districts or communities, and provisional or definitive occupation or expropriation of this land shall be permitted, subject to legal compensation, in all those cases where the Nation or the oil industry requires it.

Article 28 of the Political Constitution of the United Mexican States refers to the delimitation of the Nation's strategic areas and provides that: "the functions exclusively discharged by the State shall not constitute a monopoly." Among other areas, the Constitution mentions oil and the other hydrocarbons, basic petrochemical industry, the generation of nuclear energy and electricity. It also provides that the State shall have the organizations and companies it requires for the effective management of the strategic areas entrusted to it and in the priority activities where, according to law, it participates by itself or with social and private sectors.

The Law of National Assets specifies that national assets are comprised of: a) publicly owned assets of the Federation and b) the privately owned assets of the Federation. The same Law refers to the specifications of assets provided for in Article 27 of the Constitution.



The Organic Law of the Federal Public Administration grants to the Energy Secretariat responsibility for conducting the country's energy policy.

The Organic Law of the state oil company Petróleos Mexicanos provides, among other principles, that the State shall carry out the activities pertaining to it exclusively in the strategic areas of oil, other hydrocarbons, and basic petrochemical activities, through Petróleos Mexicanos and decentralized subsidiary organizations.

The same Organic Law quoted above provides for the creation of decentralized technical, industrial, and commercial institutions, with their own legal status and assets, namely: Pemex-Exploration and Production, Pemex-Refining, Pemex-Gas and Basic Petrochemicals, and Pemex-Petrochemicals.

The purposes entrusted principally to the first institutions are:

Pemex-Exploration and Production: Oil and natural gas exploration and production; oil transport, storage in terminals, and marketing.

Pemex-Refining: Industrial processes for the refining and elaboration of oil products and byproducts that can be used as basic industrial raw materials, storage, transport, distribution, and marketing of the above-mentioned products and byproducts.

It can be observed that Mexico has a wide-ranging regulatory framework that defines the meaning of the ownership of natural resources such as hydrocarbons, which are safeguarded by the Political Constitution. Now that the legal elements of the sector have been mentioned, the composition of energy supply has to be specified.

In the year 2000, Mexico's energy supply was comprised of 64% oil and condensates, 18% natural gas, 5% electricity, 3% biomass, 2% coal, and 8% energy imports.

Energy is an essential input for the country's development. Because of this, it is of interest to mention some of the governing principles for its development in the future, which are included in the Energy Sector Program for 2001-2006

- *Energy sovereignty:* For both historical and economic reasons, Mexico will continue to control the ownership, production, management, and regulation of national energy resources. The public character of the state-owned energy companies, namely, the state oil company Petróleos Mexicanos, the Federal Electricity Commission (Comisión Federal de Electricidad_CFE), and power utility Light and Power of the Center (Luz y Fuerza del Centro) will remain unchanged.

- *Supply security:* Both the economic development and international competitiveness of the entire modern nation require supply security for its energy inputs, at competitive conditions, not only in terms of quality but also in terms of price. A country with energy is a country with a future.

- *Sector modernization:* The national infrastructure of the energy sector has to be adjusted to address the new trends of energy markets, characterized by the worldwide rise of new technologies, corporate mergers, convergence of many industries, and deregulation processes aimed at boosting competitiveness. The energy sector will have to be transformed to continue to be a driving force behind economic growth and to give all Mexicans access to inputs that guarantee a higher standard of living.

- *Greater private-sector participation:* The Government of the Republic is committed to guaranteeing the long-term viability of the energy sector, which will be supported by a greater participation of the public, social, and private sectors in some oil and electric power industry activities.

- *Commitment with future generations:* The Mexicans of today are responsible for ensuring the efficient production of the energy resources they use and are morally bound to invest effectively the resources stemming from this production not only to achieve a higher standard of living, but also to carry out the exploration that is needed to expand available reserves and create the infrastructure that ensures the supply of energy products to future generations. The country's oil wealth is an asset of the nation, whose production must be for the benefit not only of the present generation but also for future generations.

Now that the governing principles have been mentioned, the crude oil reserves at January 1, 2002 will be indicated.

Oil reserves and production

Crude oil reserves in Mexico, at January 1, 2002, amounted to 279,557.8 million barrels (MMb), of which 204,614.4 MMb were classified as proven, 32,879.5 MMb as probable, and 42,064.0 MMb as possible. Total reserves are distributed in the regions as follows: 54,139.9 MMb northwestern offshore; 18,934.6 MMb southeastern offshore; 38,427.2 south; and 168,056.1 MMb north.

The regions where the reserves are located are distributed as follows:

Crude oil reserves at January 1, 2002 (Figures in MMb)

Reserves	Proven	Probable	Possible
Total	279,557.8	204,614.4	42,064.0
Marina Noreste	54,139.9	51,141.7	2,239.4
Marina Suroeste	18,934.6	15,603.8	1,337.8
Sur	38,427.2	36,969.3	441.3
Norte	168,056.1	100,899.6	38,045.5

Source: Annual statistics report of Petróleos Mexicanos

The regions where the reserves are located are distributed as follows

Región Marina Noreste	Región Marina Suroeste	Región Sur	Regón Norte
Cantarell	Abkatún	Bellota – Chinchorro	Altamira
Ek-Balam	Litoral de Tabasco	Chilapilla – José	Burgos
Ku-Maloob-Zaap	Pol-Chuc	Colomo	Poza Rica
		Jujo – Tecominoacán	Veracruz
		Luna	
		Muspac	
		Samaria – Sitio Grande	

Crude oil production rose from 1999 to 2001 by 221,000 barrels per day, so that whereas 2,906,000 barrels per day were being produced in 1999, 3,127,000 barrels per day were produced in 2001. The distribution of production by region over the last few years shows the following evolution:

Crude oil production (Figures in thousand barrels per day)			
Production	1999	2000	2001
Total	2,906	3,012	3,127
Marina Noreste	1,554	1,763	1,986
Marina Suroeste	683	622	554
Sur	587	550	509
Norte	82	77	78

Source: Annual Statistical Report of Petróleos Mexicanos

In 2001, 54% of oil production was exported, 40% was sent to the National Refining System, and 6% was used in the petrochemical plants and for others purposes of Petróleos Mexicanos. It can be observed that the highest share of crude oil production in Mexico is aimed for export, first because of the Federal Government's growing needs for cash flows and its export commitments, but also because of the constraints imposed on the sector by limited installed capacity for refining and other processes. With reference to the average export price for Mexican crude oil, it can be mentioned that, for 1998, the price was US$10.20 per barrel (the lowest in the last eight years), in 1999 the price was US$15.60 per barrel, in 2000 the price was US$24.60 per barrel, and in 2001 the price was US$18.57 per barrel. Price variations affect the rises in production platforms and exports.

In view of the limited installed capacity for oil refining, in 1997 Mexico started a Refinery Reconfiguration Program, one of whose objectives is to increase the use of Mexico's heavy crude.

National Refining System

Mexico has five refineries located in Cadereyta in Nuevo León, Ciudad Madero in Tamaulipas, Salamanca in Guanajuato, Tula en Hidalgo, Minatitlán en Veracruz, and Salina Cruz in Oaxaca.

The production of oil products depends, among other factors, on technological capacity for processing and the volume and type of crude oil coming into the refineries. Mexico produces heavy, light, and superlight oil. In 2001, of total crude oil production in Mexico, 64% corresponded to the heavy kind, 21% to the light kind, and 15% to the superlight kind.

The refining capacity by process from 1995 to 2000 presents the following evolution:

The forecasting exercise for oil production from 2001 to 2010, published by the Energy Secretariat, indicates that the Refinery Reconfiguration Program started up in 1997 and has an eight-year horizon, with the following objectives:

a. Transforming the National Refining System to renew the production structure toward products that have a higher added value.

b. Meeting the expected growth of demand.

c. Processing a higher volume of Maya crude.

d. Raising the economic benefits of the refineries.

e. Changing the composition of the products.

The Program is divided into three phases:

First phase: It corresponds to the Cadereyta Project, which started being built in 1997. To date 11 new plants, among which one for manufacturing coke, have been built and 9 other existing plants have been upgraded. The main purpose of this project is to con-

Refinery capacity by process 1995-2000 (Figures in thousand barrels per day)						
Process	1995	1996	1997	1998	1999	2000
Atmospheric distillation (primary capacity)	1,520.0	1,520.0	1.525.0	1,525.0	1,525.0	1,560.0
Catalytic and thermal cracking	372.0	377.0	368.0	368.0	368.0	393.0
Reduction of viscosity	141.0	141.0	141.0	141.0	141.0	141.0
Naphtha reformation	222.8	227.8	227.8	226.0	226.0	258.0
Liquid fractioning	71.0	71.0	71.0	-	-	-

Source: Energy Secretariat, Forecasting of Oil Products, 2001-2010

vert fuel oil into gasoline and diesel, as well as to process a higher volume of heavy crude.

Second phase: It started up in 1999 at the Madero refinery, where a combined plant and a coke processing plant are noteworthy among a total of 10 new plants, in addition to three that will be upgraded. In the case of Tula, the construction work started in mid-2000 for the addition of two new plants, a gasoil hydrodesulfurizing plant and a butane isomerization plant, while two existing plants will be upgraded. Regarding Salamanca, the work started in mid-2000, with the planning of the incorporation of two new plants, a reforming plant and a naphtha hydrodesulfurizing plant.

Third phase: This phase will be comprised of the refineries of Minatitlán and Salina Cruz, for which there is only the basic engineering and the bidding document packages available for publication, with expectation that the work will finish in 2005.

coke. Consumption is broken down by region, as indicated below:

The northwestern region includes the following federal districts: Baja California, Baja California Sur, Sinaloa, and Sonora.

The northeastern region includes: Chihuahua, Coahuila, Durango, Nuevo León, and Tamaulipas.

The midwestern region includes: Aguascalientes, Colima, Guanajuato, Jalisco, Michoacán, Nayarit, Querétaro, San Luis Potosí, and Zacatecas.

The central region includes: the Federal District, Hidalgo, the State of Mexico, Morelos, Puebla, and Tlaxcala.

The south-southeastern region includes: Campeche, Chiapas, Guerrero, Oaxaca, Quintana Roo, Tabasco, Veracruz, and Yucatán.

demand amounted to 511,700 barrels per day (bpd), in 1999 to 511,000 bpd, in 2000 to 531,400 bpd, and in 2001 to 536,000 bpd, according to data drawn from the Annual Statistical Report of Petróleos Mexicanos. To complement national supply and meet demand, the country imports gasoline, amounting to 137,600 bpd in 1998, 103,400 bpd in 1999, 89,800 bpd in 2000 and 135,000 bpd in 2001.

The increase in the consumption of gasoline is due to the growing level of demand of the country's central zone, which accounts for 33.3% of national consumption, since this area accounts for 39% of the country's total motor vehicle fleet.

The domestic sales of fuel oil in Mexico amounted to 489,100 bpd in 1999, 471,000 bpd in 1999, 492,000 bpd in 2000, and 475,000 bpd in 2001. As a complement to the national supply of fuel oil, Mexico imported 91,100 bpd in 1998, 93,100 bpd in 1999, 116,500 bpd in 2000, and 85,000 bpd in 2001. The integration of consumption is due to the fact that the price of fuel oil gives it a margin of preference over other fuels, with the electric power sector accounting for the highest part of sales, that is, 77% for the period from 1998 to 2001. This is due to the fact that the majority of the plants of the Federal Electricity Commission record intense consumption of this fuel, mainly in the south-southeastern region, where 18% of the infrastructure for conventional thermoelectric generation is concentrated.

There are at present other major oil products to complement national supply, but which are not as significant as those mentioned above.

Primary distillation on the basis of the reconfiguration

Refinery	Situation	Start-up	Termination	Capacity before the reconfiguration (mbd)	Capacity after the reconfiguration (mbd)	Zone of influence
Cadereyta	Reconfigured	1997	2000	235	270	North
Cd. Madero	Underway	1999	2002	195	190	Center & Gulf
Salamanca	Underway	2000	2002	245	245	Center & West
Tula	Underway	2000	2002	320	320	Mexico City
Minatitlán	To be authorized	Not available	2005	200	200	Yucatan Peninsula & south
Salina Cruz	To be authorized	Not available	2005	330	340	Pacific seaboard

Source: Energy Secretariat, Forecasting of oil products, 2001-2010

The Reconfiguration Program will have an important impact on the refining capacity, specifically primary distilling. The following table provides an overview of its scope:

The oil products produced and marketed in Mexico are motor vehicle gasoline, turbosine, fuel oil, and petroleum

External dependence on oil products

Despite the installed capacity for the production of oil products and the reconfiguration of the Refining System, Mexico is a country that imports some of its oil products, mainly motor vehicle gasoline, owing to the growing consumption of this product. In 1998,

Now that a brief description of the situation of oil products in Mexico has been provided, the future conditions for these oil products will be described below.

Future

According to the prospects for oil products for 2001-2010 published by Energy Secretariat of Mexico, it is expected that refining capacity by type of process will increase as follows:

Primary distillation will amount to 1,555.0 bpd in 2002 and 1,715.0 bpd in 2006. Catalytic and thermal cracking will amount to 403,000 bpd in 2002 and 530,000 bpd in 2006. Hydrodesulfurization will amount to 921,500 bpd in 2002 and 1,214,600 barrel per day in 2006. To reach the above-mentioned capacities in Mexico, the configuration of the National Refining System has to be finished and an additional new refining train has to be incorporated.

Despite the increase in national supply stemming from the elements that were considered and the expected improvement in refining processes that will permit higher yields in obtaining gasoline, which will rise from 31 to 42 barrels for each 100 barrels, the country will have to continue importing gasoline. Since it is expected that domestic sales of gasoline will be growing at a rate of 3.6% per year, by the year 2010 national consumption will amount to 754,500 barrels per day. Assuming that domestic production will amount to 660,300 barrels per day in the year 2010, the difference in absolute terms amounts to 94,200 barrels per day.

Regarding the other oil products, smaller amounts will continue to be exported.

As for investment requirements for the period from 2000 to 2009, it is envisaged that US$40 billion will be needed for crude oil exploration and production and US$19 billion for refining, according to estimates contained in the Energy Sector Program for 2002-2006, which implies a total investment of US$59 billion. The behavior of project investment spending indicates that the origin of the resources is comprised as follows: 41% of programmable expenditure coming from the Federation's Budget of Outlays and 59% from extra-budgetary resources as in the case of the scheme for Projects with a Deferred Impact on the Spending Register, stemming from the financial constraints that occurred in Mexico in 1994-1995.

Despite the increase in national supply stemming from the elements that were considered and the expected improvement in refining processes that will permit higher yields in obtaining gasoline, which will rise from 31 to 42 barrels for each 100 barrels, the country will have to continue importing gasoline.

The possible financing alternatives to meet the above-mentioned investment needs involve exploring fiscal reforms for Petróleos Mexicanos, which would lead to a modification of the special fiscal regime applied to the oil company, as a result of which it currently accounts for more than 35% of Mexico's public revenues.

In short, the following can be said:

1. Mexico has a regulatory framework defined, at the first tier, by the principal tenets set forth in the Political Constitution; the second tier consists of the Laws of the Federal Public Administration and the Law of National Assets; and the third tier is comprised of the Organic Law for Petróleos Mexicanos and its Regulations.

2. Of Mexico's oil production, 54% is for export, owing to the Government's cash flow needs and also because of constraints on refining capacity, which paradoxically led the company to depend on imports for its oil products, especially motor vehicle gasoline.

3. As of 1997, Mexico has been implementing the Refinery Reconfiguration Program, whereby it intends to refine higher volumes of heavy crude and increase the supply of oil products.

4. Despite the impact of the Refinery Reconfiguration Program and the incorporation of a new refinery train after 2006, Mexico will continue to import oil products, owing to future increases in domestic sales.

5. The huge investment requirements for exploration and production, as well as for refining, to increase supply and meet future demand are an interesting challenge that has to be addressed by Mexico. Possible solutions range from the instrumentation of a reform of the special fiscal regime applied to Petróleos Mexicanos or the creation of innovative investment instruments, which will surely take place thanks to the creativity of Mexicans, to the total liberalization of the industry permitting private-sector investment. Of course, any of these possible alternatives will have to consider Mexico's legal traditions embodied in its Political Constitution, as well as the governing principles envisaged in its Energy Program for 2001-2006. There is no doubt that this challenge is not simple and will require political agreements and the consensus of a large part of Mexican society.

OLADE, ARPEL AND THE WORLD BANK HOLD INTERNATIONAL SEMINAR ON DEVELOPMENT OF OIL SECTOR

The seminar on "Downstreaming" in Latin America and the Caribbean analyzed the perspectives this sector has for the next 15 years.

On Monday and Tuesday, June 22 and 23, 2002, the International Seminar/Workshop on the Downstream Sector of Latin America and the Caribbean was held in Quito, Ecuador. Executives responsible for the refining of oil and for the transportation and marketing of refined products in the region analyzed the perspectives for development these activities will have during the next 15 years in regard to their technical, regulatory and financial aspects.

This seminar finalized a study that had been carried out over the last two years by the Latin American Energy Organization (OLADE), the Regional Association of Oil and Natural Gas Enterprises of Latin America and the Caribbean (ARPEL), and the World Bank in response to a request made by the governments of Latin America and the Caribbean. The study also received the cooperation and active participation of the largest refinery enterprises in the region such as Petróleos de Venezuela S.A. (PDVSA), Petróleos Mexicanos (PEMEX), Petróleo Brasileiro S.A. (PETROBRAS), the Oil Enterprise of Trinidad and Tobago (PETROTRIN) and REPSOL YPF.

The part of the study analyzed in the seminar that was related to the downstream sector presents a general vision of the regulations and policies that are applied to the refining, transportation, and marketing of refined oil products and focuses on the possibilities of financing larger investments that will be needed for their development in the region. The study also revises tendencies in the financing of projects that materialize as the consequence of difficulties associated with the growth of the public debt and the role of financial institutions play.

Situation and outlook of natural gas trade in Latin America and the Caribbean

Francisco Figueroa de la Vega*

Introduction

The past decade witnessed the transition to a new regional energy context in which gas has gained special importance and which involves a series of factors affecting the region's countries with different intensity.

Among these factors, the most noteworthy are: lags in investments in hydropower generation due to financing constraints; technological breakthroughs leading to economies in the generation of electricity (combined cycle, gas turbines) compared to conventional thermoelectric systems; competition between gas pipelines and electric power transmission; competition between gas and gas carried by pipelines and ships; the need to guarantee supply over the long term by means of a supplier diversification strategy which, along with growing environmental concerns, is tending to expand gas markets inside the region, not only on the basis of its own resources but also by resorting to imports from neighboring countries or overseas.

Furthermore, the need to adjust the role of the natural gas industry to the new conditions that have emerged has led to institutional changes in the industry.

These transformations include: the liberalization of activities, to a greater or lesser extent, to enable new players to participate, as a result of the privatization of assets; the vertical and horizontal breakup of the links of the gas chain as part of a restructuring process or to facilitate opportunities for new players; market segmentation identifying suppliers and consumers of products and services and the introduction of free trade mechanisms in the first case; finally, the installation of regulatory frameworks not only as a result of separating the State's business activities from its administrative activities, but also as a result of the incorporation of new players in activities characterized as a natural monopoly or for the existence of emerging markets where it was necessary to limit dominant positions.

On the basis of this context, the groundwork was laid for the establishment of a regional market, more highly developed in some subregions, whereas in others major advances will surely be made in the present decade. Nevertheless, this is not enough, as the future development of a regional market will depend on the identification of recoverable potential in keeping with the growing needs of the market, the application of state-of-the-art exploration technologies, the harmonization of regulatory frameworks, and the dismantling of obstacles to trade, and above all legal security for investments in interconnection and for sale agreements between consumers and suppli-

ers. The present paper will focus on the first aspect, that is, the scope of recoverable potential of natural and possible trade relations between the countries.

Framework of reference

Revenues and ownership: A preliminary study of the classification of the countries, using as a reference the links of the natural gas chain and the trends of their policy regarding the degree of openness to private-sector players, highlights certain preferences of the countries regarding the role that their companies should play in retaining and controlling gas earnings. While some countries attribute special importance to the role of state-owned companies to retain earnings and expand supply, others have opted for a growing share of privately held stock in companies that were originally owned by the state and for the free play of market forces to improve the industry's performance. In this case, it is customary for revenue to be taken by means of taxes, with an effective monitoring system to avoid tax evasion. These approaches to the ownership scheme of natural gas and related assets mean, that as part of these activities, there are typologies ranging from countries with predominantly state systems to countries with predominantly private systems. Between these two opposite situations, there are variations of limited openness, which in general are different among the countries.

Restructuring of activity: The ownership scheme adopted by each country, between or within each phase of gas activity (production, transport, and distribution), has led to the configuration of systems with different degrees of vertical and horizontal integration, with open or closed access.

In the production phase, the free availability of the product has favored, in some cases, the establishment of markets, which depended on the degree of dispersal of supplies, transparency, and free access to promote competitive conditions.

"Competition in wholesale gas markets also depends on the fragmentation of supply, transparency, free access, and the density of the interconnections of the transport and distribution networks. Thus, only on very large markets can an atomized competition that has properties similar to the ones observed on mature markets become effective"

In the transport and distribution phases, the degree of integration also depends on the ownership scheme adopted by the countries. The natural monopoly characteristics of these phases, in any case, require legal monopolies that are regulated when they are owned by the private sector or supervised when they are state-owned. The purpose of monitoring these monopolies is to ensure that the product will reach its destination without any obstacles (free access) and to guarantee product quality, security, and volume as required by the product's consumers and at competitive prices.

It should be observed that reform processes in the region have focused special interest on the latter phases of the activity and oftentimes neglected the objective of long-term supply, which is linked to the first phase. Likewise, the establishment of conditions of contestability (effective or potential competition) on natural gas markets obligatorily requires, in addition to the vertical and horizontal breakup of activities, the adoption of the principle of free access by third parties to transport and distribution networks. Even in those cases where these conditions effectively prevail, it is presumed that contestability will only valid in respect to wholesale supply (producers) and the liberalized segment of consumers (large users) although this does not necessarily hold true if there are no legal frameworks aimed at avoiding collusion between companies. The markets for transport and distribution services are non-contestable natural monopolies, owing to the presence of major sunk costs. In these cases, competition mechanisms can only be introduced among suppliers by means of bidding processes up to the moment of awarding the corresponding licenses.

Markets: Competition in wholesale gas markets also depends on the fragmentation of supply, transparency, free access, and the density of the interconnections of the transport and distribution networks. Thus, only on very large markets can an atomized competition that has properties similar to the ones observed on mature markets become effective. The natural gas markets of LAC countries are still small or, at the best, medium-sized and are in the process of being developed. The amount of producers is usually small and transport systems are barely interconnected. As a result, the gas markets of the region's countries are characterized by oligopolistic structures, although the limit to the exercise of dominant positions can be determined by how natural gas competes in end-

use markets with other energy products that can substitute it in different uses or with imported gas to the extent that this is possible.

The large gas line interconnection projects that have been implemented in MERCOSUR and neighboring countries, as well as the interconnections that Mexico has installed with the United States and may eventually build with Central America and the development of the industry in the Andean Community and Central America, suggest that there are potentially large markets for natural gas with prices that are compatible with greater international competitiveness of the domestic industry, lower energy costs for users, and better local and environmental conditions.

Subregions

South America: Because of the notable dimension of South America's territorial area, its growing urban population, its relative cultural homogeneity with linguistic affinities, and its economic potential, the growing integration of natural gas markets may well serve as a bridge between the energy sources of the 20th century and those of the 21st. Although there is still a great hydraulic potential apt for transformation into operable hydropower capacity, the financial difficulties of the countries will not make it easy for investments of this scale for some time to come. The other renewable sources of energy, such as wind and solar energy, seem to be more suitable for remote stand-alone systems, since they will be unable to displace natural gas and liquid fuels, which are noteworthy for being abundant, low-cost resources, in which South America is self-sufficient. Nevertheless, remote areas will benefit from these renewable sources of energy because the high cost of carrying electricity or gas does not justify building the necessary installations in view of the small volume of consumption and the population's limited paying capacity. There is no doubt that the development of these areas will be favored by a suitably promoted energy supply policy.

In this vast territory, the **Andean Community** and **MERCOSUR plus Chile** have been identified as important subregions, which differ significantly in terms of available gas resources and market development.

The Andean Community with the region's most abundant gas resources has remote and isolated domestic markets at differing levels of development. Although it has already conducted various studies for interconnection between countries, no concrete project has yet been implemented.

MERCOSUR plus Chile, albeit with relatively more modest resources, also has domestic markets at different levels of development but they are interconnected. Although Paraguay is the only country without any gas interconnection, it shares large-scale hydropower stations with Argentina and Brazil and exports its electric power surpluses to both countries. Therefore, it is not a country whose electric power generation needs are the underlying reason for implement-

ing gas interconnection projects; there are other reasons behind these projects.

It would be wrong to assume that natural gas markets would be able to arise spontaneously, not only in each subregion but also between the subregions, simply because there are gas resources or because they have developing domestic markets or because the parties have show much good will in these efforts.

The availability of resources has to face up to possible supply horizons, and they are different for each country. Their availability cannot be quantified in terms of the present stock but rather in terms of the volumes required by the market and the time needed to ensure compliance with future supply commitments. It is therefore naive to think that the reserves horizon is determined by the usual ratio between reserves and production.

When resources are overly abundant, as in Venezuela, which has a high gas-to-oil ratio, production techniques oblige large volumes to be reinjected, while the oil export quotas agreed upon by OPEC to keep international oil prices within a range that its members deem acceptable prevent it from producing the volume of gas needed to make export commitments. It may even decide to import gas from Colombia, which has relatively few resources, if the studies being conducted by both countries lead to project implementation. In the case of Bolivia and Peru, which also have an abundance of resources for their domestic markets, the prices at which they can offer their gas to neighboring countries do not seem to be attractive for the operators of these countries. As a result, they are examining the possibility of exporting LNG to the rest of the world, on the basis of a partnership to install liquefaction plans on the Peruvian seaboard.

But when analyzing the relative scarcity of resources in MERCOSUR and horizons for the depletion of reserves, there is an apparent contradiction between the neighboring countries' interest in exporting and MERCOSUR's reluctance to import higher volumes.

If according to those who are in charge of energy policymaking it is assumed that the market will resolve any resource shortage problems, then it is possible that by the end of the present decade Argentina will be facing supply problems and that the cost of taking the wrong decisions in the present will have to be paid by society in the future. This would be the outcome of the project-specific approach where each company seeks to optimize market penetration and profitability thanks to a weak regulatory framework and the absence of an active energy policy that coordinates activities and interests to ensure long-term energy supply.

Nevertheless, it is indeed possible to achieve compatibility between the business approach to projects and long-term supply security if there is an energy policy aimed in this direction and if legal frameworks are created simultaneously or modified to avoid perverse derailments away from this goal, such as certain monopolistic, discriminatory or constraining trends that restrict open access to markets. Therefore, it does not seem to be the companies' responsibility to do what the State has to do.

The different sizes of domestic markets lead to restrictions not only for interconnections but also for a balanced negotiation between the parties, except for the limit imposed by the prices for natural gas substitutes. Therefore, in view of this situation, the dominating position of suppliers permits discriminatory acts. In Argentina, where the producers are free to dispose of their products as they choose, a point was reached when prices that were lower than those for the domestic market were being offered to favor penetration in neighboring markets. It was therefore possible to incur in an evident price discrimination that was then remedied by a Resolution issued by the Energy Secretariat. It then seems that the authority for applying energy policy should find the means to avoid these situations. Sale agreement negotiations between the operators of the countries with markets of different dimensions or emerging markets should be transparent and should have as their arbiters the energy policymakers of the parties, if what is being sought is the start-up of process that leads to competition. This would be a function analogous to that exercised by the regulatory agencies for natural gas transport and distribution in the region's countries.

"If according to those who are in charge of energy policymaking it is assumed that the market will resolve any resource shortage problems, then it is possible that by the end of the present decade Argentina will be facing supply problems and that the cost of taking the wrong decisions in the present will have to be paid by society in the future."

Finally, the good will and "afectio societatis" that should be present in all contracts are not the same thing. It is difficult to draw up contracts by a simple act of good will if there is no concrete business benefiting the parties. Nevertheless, it is frequent to observe manifestations of good will without the capacity to put it into practice, which is definitely an impediment to business when the obstacles being facing are never identified and overcome.

What all of this means is that the possibility of achieving a natural gas market for the subregions requires still many efforts over the long term and that the road to this goal has to be built with an ongoing pragmatic approach. Likewise, models that work well in different contexts should be avoided, and ethical rules and standards should be applied to facilitate suitable models. Regarding this, there still are visions that assume that successful models can be transplanted and that if something fails it is the fault of the reality rather than the model. Without any clear conception regarding this, the road that has to be traveled will be a difficult one.

Similarly, it should be underscored that, without investment, no market can be developed and that the principal restriction to private-sector investment is legal insecurity. This raises the costs for users and emboldens those investors who assume the risk of entering the territory to use undesirable practices they would never even consider using in their own countries. When regulatory frameworks are difficult to apply, they end up by fostering dominant trade relations that tend to set oligopolistic or monopolistic prices reducing the breadth of the potential market. Likewise, the periods for amortizing investments are shortened and almost all earnings are repatriated because of the lack of suitable legislation to prevent the remittance of capital to head offices for a given period of time; because of this, earnings from privatized activities are not used for new investments or for the development of new business in the subregions.

Finally, it is worthwhile asking whether the market will be able to resolve the problems of energy resource shortages, as could occur toward the end of the decade with natural gas in Argentina or Colombia. The energy crisis in California stemming from the liberalization of the electric power market or the opening up of the market for liquid hydrocarbons in Argentina, whose prices are in line with international price when it is rising but not when it is falling, or ENDESA's dominant position over other generators in Chile because of its control of transmission have triggered many concerns about this subject and highlighted the need for responsible regulation by the institutions that have been created and those that are to be created in the future.

Therefore, it seems necessary to conduct a suitable assessment of the contexts and roles of all energy players to apply solutions in a coordinated fashion so that markets can function. Because of the above, it does not seem that harmonization alone of regulatory frameworks among the countries, as it is usually argued, is enough to lure investments. At the same time, legal security conditions have to be ensured in each country.

Central America: In contrast to the other subregions that have gas resources, Central America has none, except in Guatemala, which extracts gas with its oil production and does not apply it for intermediate or end uses. The future penetration of natural gas in the subregion therefore depends on three possible nearby sources of supply: South America (Colombia and/or Venezuela), North America (Mexico), or the Caribbean (Trinidad and Tobago). The two first

sources have been studied for transport via gas pipelines and the third source would involve carrying LNG by ship.

From the studies, three types of approach have been envisaged:

The first, such as the OLADE-ECLAC-GTZ subregional interconnection project from the north and south, would involve a distributed generation concept, where the penetration of natural gas is aimed at substituting the more expensive liquid fuels that reflect the dominant power of their importers, producers, and distributors on the market and introducing greater energy efficiency as a result of the use of natural gas in generating local electricity and in the socioeconomic sectors, which would make production activities more competitive. In this case, the SIEPAC Project would have to be reformulated to address the competitiveness between electric power transmission and natural gas transport.

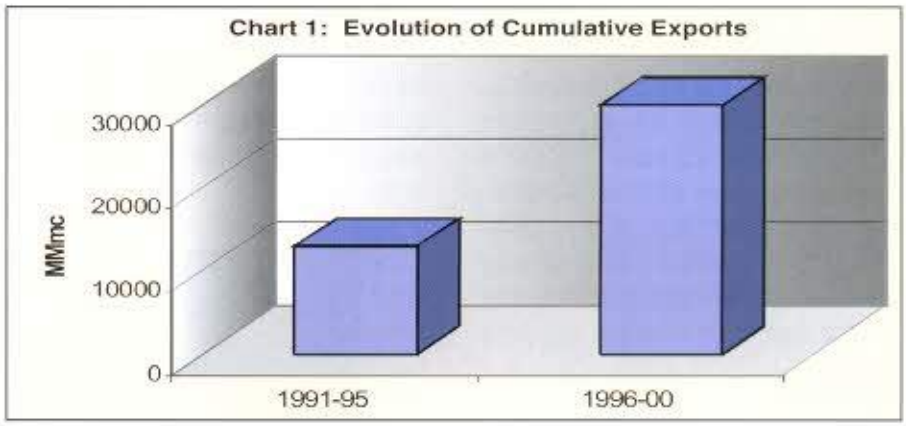
The second approach would be similar to the project IRHE and ENRON have elaborated together in Panama, which involves a typical private-sector approach to projects, of the kind carried out in Argentina and Chile, where the impacts of greater efficiency will lead, in this case, to the generation of electricity based on natural gas. In this alternative, the project is compatible with the SIEPAC Project but limits the penetration of natural gas to the socioeconomic sectors of the subregion.

The third approach is OLADE's LNG supply proposal, which involves a subregional approach using the traditional electric power perspective of optimizing the efficiency of the power generation and transmission system, with possibly lower prices per kWh for the users and with collateral benefits stemming from the distribution of gas, although possibly with a lesser scope than in the first case. Likewise, the proposal is compatible with the SIEPAC Project and the penetration of natural gas in the subregion, although the competition between gas carried by pipeline and gas carried by ship should be taken into consideration.

In all cases, the environmental benefits of the penetration of natural gas would be higher although its impact would depend on the scope of the substitutions of liquid fuels.

The final discussion about what alternative is the most advisable for the subregion would require complementary technical and economic studies that highlight, in each alternative, the advantages for the users, the scope of the environmental benefits, and improved competitiveness of the subregion on the international markets for products. Because of its latitude, access to both the Atlantic and Pacific oceans, and the availability of human resources, the subregion could become a potential hub for the region's industrial and tourist development as a result of the potential availability of natural gas in the subregion. These studies would have to be complemented by the design of specific legal and regulatory frameworks, in each alternative, for the purpose of making investments viable.

Mexico: After the reforms of 1999, which permitted market liberalization and increasing interconnections with the United States, Mexico is tending to become increasingly integrated to NAFTA, granting priority to a trade approach. This has enabled it to rescope its previous perspective on self-sufficiency and schedule imports in keeping with its production and exploration investment possibilities. Thus, the long-term supply of the domestic market can be ensured and an increasingly integrated transport and distribution network can be developed, one that can even consider the possibility of implementing projects for the future import of LNG. Its integration with Central America will enable it to improve its trade balance in gas without jeopardizing its own supply, in view of the limited size of this market.



The Caribbean: Trinidad and Tobago is the subregion's only exporter and has the possibility of supplying the domestic and foreign market over the long term. Barbados and Cuba tend to be self-sufficient and, in view of their production, it does not seem that they

Table 1: Natural gas trade matrix in LAC (2000) (MMcm)

	Andean Community	MERCOSUR and Chile	Central America	The Caribbean	Mexico	Total LAC	Rest of the world	Total
Andean Community		6901				6901		6901
MERCOSUR and Chile		4639				4639		4639
Central America								
The Caribbean							4508	4508
Mexico							246	246
Total LAC		11540				11540	4754	16294
Rest of the world					2922	2922		2922
Total		11540			2922	14462	4754	19216

Source: Own elaboration

will be needing any external supply for some time to come, except for Puerto Rico, which in a few years could be receiving LNG supplies from Trinidad and Tobago. That would leave the Dominican Republic and Jamaica, with markets that are large enough to be included in the market for LNG imports. The remaining countries have such small markets that it would be difficult to justify making investments in terminals for this energy source.

Objectives, approaches, and premises

The principal objectives of the present article are:

- To assess the scope of natural gas resources to ensure long-term supply in the region.
- To determine possible natural gas trade between countries with surpluses and countries with shortages, using as a reference the interconnections that are currently operating and those with the highest probability of being implemented.

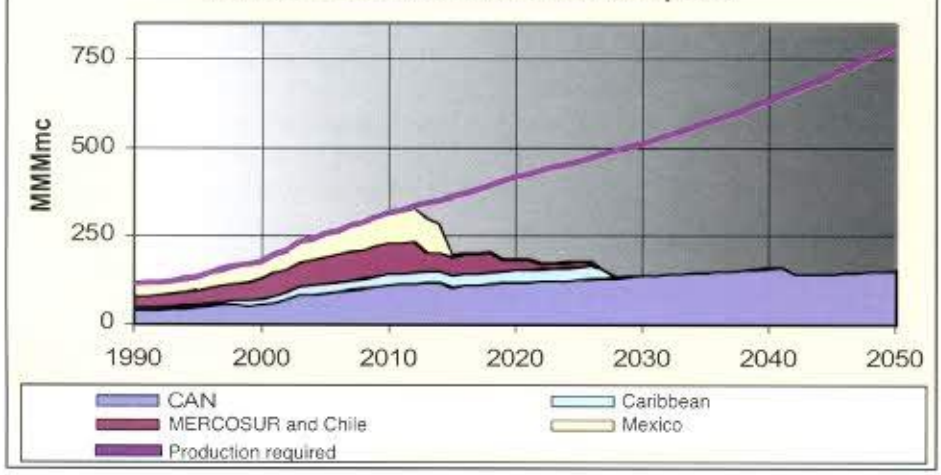
To do this, information on the resources and reference scenarios on natural gas requirements available in the forecasting of some countries has been gathered, whereas in others the information comes from specific studies. Where this information was not available, the business-as-usual approach, based on historical information from OLADE, was adopted.

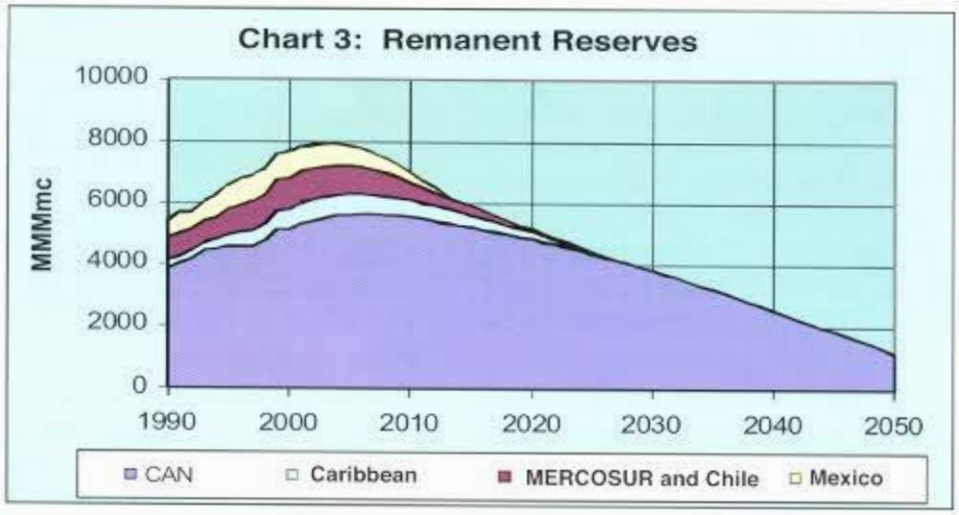
After the reforms, different types of approaches have been observed in the forecasting of some countries. In some cases, they involve project-specific approaches characterized by a passive energy policy that assumes that the market will be allocating resources appropriately, whereas in others the long-term supply approach, with the intervention of an active energy policy aimed at orienting investments, is prevailing.

The assumption is that the region's natural gas requirements will expand considerably between the years 2000 and 2020 not only because of the incorporation of high-yield thermoelectric stations (gas turbines and combined cycle), but also because of the gradual dissemination of gas for other uses. This expansion is already being observed in the majority of the gas-producing countries and in many of their neighbors, which import gas to complement their own production or to incorporate it as an alternative, low-cost and environmentally friendly source of energy.

The domestic and foreign market requirements stemming from this expansion will lead to rises in production and the need for the correspond-

Chart 2: Production and Consumption





ing increase in reserves to sustain long-term supply. Regarding this, export authorizations and contracts that are being concretized in the region have, in the majority of cases, a duration of up to 20 years in order to guarantee interconnections between countries.

A time-limit under 20 years would not make it possible to highlight sufficiently in advance the fact that the future availability of gas resources might limit the export horizon of some countries and therefore jeopardize interconnections that have been projected but which, individually and theoretically assuming the availability of inflows, are justifiable.

Because of this, the forecasting analysis for natural gas suggests the need to consider a horizon of at least 20 years. This analysis will take place without discussing whether the gas pipeline network is optimal for the region since it is estimated that, as reform processes are consolidated in the countries, the transport system will tend to find the best solution, striking a balance by means of its own adjustment mechanisms. In other words, companies will pursue the objectives of profitability and market penetration whereas the energy policy will be aimed at achieving objectives of long-term sustainable supply in an energy context that will set up a strategy for the sector in each country. As a result, solutions that seek to meet the respective expectations in gas activities will surely be found.

Progress and prospects in the region

In the year 2000, major advances stemming from the high increases (134.9%) in natural gas trade in 1996-2000 compared to 1991-1995 (Chart 1) were observed.

Trade flows have been especially intense between the Andean Community, through Bolivia with Brazil and between MERCOSUR and Chile, as well as in Trinidad and Tobago, on the basis of its exports to the rest of the world (Table 1).

The highest possible production accumulated by subregion shows that LAC could ensure long-term supply in some countries, whereas in others the resources would be insufficient to facilitate the coverage of consumption in the domestic and foreign markets, which would be growing annual at an average of about 3% in the reference scenario that has been considered for the region (Chart 2).

The supply via gas pipeline interconnections, both existing and planned, would not encounter any difficulties until the end of 2010.

Nevertheless, as of 2010, supply shortages would become apparent in some countries but they could be resolved by the remanent reserves of Venezuela,

Table 2: Natural gas trade matrix in LAC (2010) (MMcm)

	Andean Community	MERCOSUR and Chile	Central America	The Caribbean	Mexico	Total LAC	Rest of the world	Total
Andean Community	1804	10950	2132			14886		14886
MERCOSUR and Chile		11408				11408		11408
Central America								
The Caribbean							12748	12748
Mexico								
Total LAC	1804	22358	2132			26294	12748	39042
Rest of the world					19820	19820		19820
Total	1804	22358	2132		19820	46114	12748	58862

Source: Own elaboration

Bolivia, Peru, and Trinidad and Tobago (Chart 3). To do this, interconnections with countries that have surpluses will have to be installed with the trunk networks of the countries with shortages.

Until 2010, the growing inter-regional trade of natural gas, which recorded a total rise of 128.6% between 2000 and 2010, will be guaranteed in MERCOSUR and Chile, with contributions from Bolivia and Brazil. The same can be observed in trade between Mexico and the United States and the continuity of exports from Trinidad and Tobago. What is new, however, is the possible incorporation of new trade in the Andean Community between Colombia and Ecuador and exports from Colombia to Central America, which seems to have the highest viability in view of the entrepreneurial spirit of that country, which is striving to open up new markets, albeit with relatively limited resources (Table 2).

A significant increase of natural gas trade with the rest of the world would also take place, especially with the United States and Europe, based on the volumes to be exported by Trinidad and Tobago and Mexico's imports from the United States.

During the same period, 2000-2010, trade flows could be higher since the possible impacts of large interconnections and planned LNG export capacity on regional trade have not been included in Table 2. Among these, there are the following projects: the MERCOSUR gas pipeline, which would depend on a complex financial engineering scheme that would involve drawing up sale agreements between Argentina and Bolivia with Paraguay and Brazil or, as an alternative, the partnership between Bolivia and Peru to export LNG; the Mariscal Sucre Project for exporting LNG from Venezuela and expanding capacity for the export of LNG from Trinidad and Tobago. It is also possible that an interconnection agreement will be eventually be drawn up between Colombia and Venezuela. The interconnections with Central America seem to have been stymied by various factors, among which the lack of a suitable study on the competitiveness between electric power interconnections and gas interconnections or between gas carried by pipeline and LNG, as well as the companies' lack of interest because of the small size of this market, which for its development would have to be promoted decisively by multilateral banks. The possible interconnection between Mexico and Guatemala, which already has the necessary agreements to ensure private-sector interest in this project, should not be discarded either.

"Beyond 2010, the course that will be taken as a result of investment decisions for gas interconnection is highly uncertain in the face of the possible penetration of new energy sources stemming from technological breakthroughs."

Beyond the year 2010, it is quite risky to predict trade flows. There are many unanswered questions regarding new gas resources to be discovered, and the private-sector venture investments that would be needed depend on the legal security prevailing in many of the region's countries, as well as the budgets that the state enterprises have available for this purpose. Nor has it been possible to analyze the evolution of well-head natural gas prices, which will inevitably depend on the growing shortage of resources in each country. The rises in natural gas prices will also exert an impact, but on the other end of the chain, eventually leading to the removal of the product from the market. By this we mean the penetration of new sources of energy, which with technological breakthroughs may affect the energy demand structure, offering energy at lower prices and thus moderating the need for natural gas, with the risk that the countries that do not exploit their reserves on time will simply have to leave them in the ground.

Conclusions

The hypotheses that have been used do not necessarily coincide with those of the governments of the countries of LAC. They have been proposed merely as an exercise in the light of some of the references of the countries and companies working in the region.

Beyond 2010, the course that will be taken as a result of investment decisions for gas interconnection is highly uncertain in the face of the possible penetration of new energy sources stemming from technological breakthroughs. The interplay of both aspects will surely determine alternative scenarios, for which a comprehensive forecasting of the energy sector will be required. What can be predicted with relative certainty is that, up to 2010, the region will be producing liquid fuels equivalent to the substitutions that are made and that these fuels will be available for meeting the needs of the continent's market, especially the United States and Europe. In addition, it should be indicated that the above-mentioned substitutions will contribute significantly to increasing energy efficiency and reducing local and global environmental impacts, offering better conditions not only for the region's inhabitants but also for the rest of the world.

The autor was Planning Manager of Argentina's state oil company Yacimientos Petroliferos Fiscales (YPF), 1978-1984; researcher for Energy-Economics Institute of the Bariloche Fundation (FB), 1984-1991; Consultant for the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), 2001 and external Consultant of OLADE.

The Action of OLADE's Strategy and Programming Committee (SPC)

Julián Villarruel Toro
SPC President 2002

Background

The SPC is a body aimed at evaluating, reviewing, and adjusting the strategies and programs of the Latin American Energy Organization (OLADE). It is part of the new strategic and organizational structure that was adopted as a result of Decision III/EMM/009 of the Third Extraordinary Meeting of Ministers, held in Quito on November 12, 1999.

The Third Extraordinary Meeting of Ministers was convened to consider the role, activities, and future of OLADE in a changing environment for the energy sector of the region and hemisphere. The principal focus for the discussions of this meeting was the proposals prepared by an ad hoc working group that met in Quito on November 8-10, 1999. The working group proposed that the Strategy and Programming Committee (SPC) replace the Follow-up and Monitoring Committee, with a wider range of functions and a more open participation.

General Objective

In line with the Organization's new strategic and organizational character, the objective of the SPC is as follows:

"To update OLADE's mission, vision and strategy, in order to enable the Organization to have a clear view of its actions over the short, medium, and long terms.

"To prepare and follow up on of the implementation of the three-year working program and annual budget proposed by the Permanent Secretariat, as well as to present an annual report to the Meeting of Ministers, containing proposals for strategic programming, projects, budgets, and administrative aspects of the Organization."

Delegates at the meeting of OLADE's Strategy and Programming Committee, in Quito, on June 26, 2002

Membership of the SPC

Formally, the Committee is comprised of six member countries of the Organization, elected by the Meeting of Ministers, with a well-balanced geographical distribution of its members so that at least two of its members are changed each year. Nevertheless, the Committee may be attended by any of the Organization's member countries, with full speaking and voting rights.

Regarding the chair of the SPC, Decision III/EMM/009 initially provided that the Committee would be chaired by the member country that is chairing the Meeting of Ministers, in which case it would be the seventh member. Afterwards, in Article 9 of the Regulations for the SPC, approved by the XXXI Meeting of Ministers, it was determined that the Meeting of Ministers would elect the Member State that would chair the Committee and that the National Coordinator for OLADE of this Member State would be the Committee's chairperson. The XXXII Meeting of Ministers of OLADE, held in Quito, on October 20, 2001, elected Colombia to chair the SPC in 2002. The current members of the SPC are Bolivia, Chile, Guatemala, Jamaica, Mexico, and Trinidad and Tobago.

Meetings of the SPC

Article 5 of the Regulations for the SPC provides that "the Committee shall hold an ordinary meeting at least twice a year, preferably three months after the Meeting of Ministers and three months before the next Meeting of Ministers." Since it was established, the SPC has held five meetings, the last of which took place in Quito on April 4-5, 2002. The next meeting of the Committee is scheduled for June 27-29, 2002.

Fifth Meeting of the SPC

The last meeting of the SPC focused its attention on a review of the progress achieved by the projects of the Three-Year Working Plan for 2001-2003, an analysis of the implementation of the income and expenditure budget for 2002, and an evaluation of the implementation of the Management Evaluation System in OLADE's Permanent Secretariat. The follow-up conducted by this Committee led to the following considerations and recommendations:

Regarding the Three-Year Working Plan:

- Distribute to the Member States and/or install on OLADE's web site the agreements that have been drawn up with different institutions or countries.
- Install on OLADE's web site the papers presented by OLADE at the different forums it has attended.
- Include in the technical project descriptions expected results, clearly defined and differentiated by year, so as to facilitate subsequent follow-up.
- The projects associated to the forums of energy sector regulatory agencies, supervisory entities, and companies should appear as ongoing projects being implemented with the active participation of the Permanent Secretariat for their coordination.
- For the implementation of projects, the SPC recommends that options be analyzed, such as forging strategic alliances with other regional organizations like CIER and ARPEL, establishing working groups, resorting to the cooperation of the Member States, and using other existing regional studies as a point of departure.
- As for the subject of horizontal cooperation, it is recommended

Dr. Julián Villarruel-Toro, Chairman of OLADE's Strategy and Programming Committee for the year 2002

that a cooperation framework linking supply and demand be installed on OLADE's web site for the countries and that the countries be informed of this framework.

- It is recommended that the Permanent Secretariat incorporate on its web site all the reports and publications produced by the Permanent Secretariat and support their dissemination by sending notices via e-mail.

- The Permanent Secretariat was requested to provide additional information on proposals to delete and include projects for consideration at the next meeting.

As for a follow-up of the budget:

- The Permanent Secretariat was requested to elaborate its reports on budget implementation for consideration by the SPC, without including those projects that are being negotiated or assessed.

On the follow-up of the Management Evaluation System.

- It was recommended that the goals by activity and area be revised and adjusted in the light of the experience that has been obtained from the System's implementation.

- As for project indicators, they should be closely linked to the results that are obtained.

- Project indicators should be designed at the same time as each one of them is formulated.

Thoughts on the role of the SPC

The experience of the SPC as OLADE's planning and follow-up body has shown that, after two and a half years since it was established, it has yielded positive results and supported the goal of improving the role and standing of OLADE in the energy sector of Latin America and the Caribbean.

It is undeniable that the Committee is important as an advisory body for the elaboration, review, follow-up and adjustment of the Three-Year Working Plan to be implemented by the Permanent Secretariat. In addition to its follow-up functions, which it inherited from the former Follow-up and Monitoring Committee, in practice the SPC is providing advisory services to the Permanent Secretariat in important aspects such as the adjustment of activities and budgets for the Secretariat and the projects it carries out.

For the development of its activities, the SPC depends largely on timely and complete supply of information by the Permanent Secretariat for analysis and evaluation, as well as on support from the Secretariat for the preparation of its meetings and the dissemination of its results. It is therefore essential to keep up the mutual coordination and collaboration between these two bodies of OLADE. Furthermore, because of its open membership, it is a suitable body for channeling proposals and concerns of the Member States for subsequent consideration by the annual Meeting of Ministers. Nevertheless, it is a channel that is not being fully taken advantage of by OLADE's Members, despite requests for proposals made by the chair when convening Committee meetings.

The current SPC, as chaired by Colombia, has as its fundamental goal to be proactive in achieving the objectives and tasks entrusted to it and in providing its advisory services and support to improve and further the management of OLADE's bodies.

OLADE Report:

Training and its Importance for the Energy Sector of Latin America and the Caribbean

INTRODUCTION

Continuous professional training is essential on the international stage. Technology and know-how advance rapidly, and a globalized world requires competition, skills, efficiency, and effectiveness. The 21st century is the century of knowledge. Because of that, OLADE deems training to be one of its priority activities and has undertaken various initiatives aimed at providing high-grade training to professionals involved in the energy sector of Latin America and the Caribbean.

In 1996, OLADE and the University of Calgary, Canada, under the auspices of the Canadian International Development Agency (CIDA), signed an agreement for the implementation of the Energy and Environment Project, whose fundamental objective is to support and consolidate efforts being made by the countries of Latin America and the Caribbean to guarantee the sustainable development of its energy industries by using techniques and procedures that are compatible with the clean and efficient use of its resources. The Project believes that it is fundamental to promote, on a permanent and systematic basis, the formation and training of specialized professionals, not only in disciplines specifically pertaining to the energy industry but also to those involved in monitoring and protecting the environment. This project is comprised of three basic components: the Master's Degree in Energy and Environment, the Certificate Program in Energy and Environment, and the Program for Environmental Legislation in the Energy Sector of Latin America and the Caribbean.

MASTER'S DEGREE PROGRAM IN ENERGY AND ENVIRONMENT

The participants in the Program acquire the knowledge and develop the skills they need to administer energy-related projects in line with the principles of sustainable development.

The Program, which is being conducted at the headquarters of OLADE's Permanent Secretariat in Quito, Ecuador, is comprised of courses and seminars that are delivered over a 14-month period of full-time study. The instructors are professors from the University of Calgary, professionals from OLADE, and professors from

OLADE's Executive Secretary, Dr. Julio Herrera, speaking at the graduation ceremony for the fifth graduating class of the Master's Degree Program in Energy and Environment, in Quito, on June 28, 2002

reputable Latin American universities such as the University of Sao Paul of Brazil, the University of San Carlos of Guatemala, the Pontifical University of St. Xavier of Colombia, the National Autonomous University of Mexico, the La Salle University of Colombia, the Santiago de Chile University, the Advanced Technological Institute of Monterrey of Mexico, the Advanced Polytechnic University of the Coast of Ecuador, and the Energy-Economic Institute of the Bariloche Foundation of Argentina.

The courses being given by the Master's Degree Program are as follows:

- Energy Systems I: Nonrenewable Energy
- Energy Systems II: Renewable Energy
- Air Pollution and its Impacts in the Energy Sector
- Energy Policy
- Water Pollution and its Impact in the Energy Sector
- Land Pollution and Waste Management in the Energy Sector
- Energy Systems III: Planning and Energy Economics
- Environmental Impact Assessment in the Energy Sector
- Human Resources and Management in the Energy Sector
- Environmental Management Tools in the Energy Sector
- Environmental Law in the Energy Sector
- Strategic Environmental Management for Energy Organizations
- Interdisciplinary Team Project in Energy and Environment
- Individual Project in Energy and Environment

The seminars that are part of the program are:

- Energy Efficiency and Demand-Side Management
- Project Formulation and Evaluation
- Project and Technology Evaluation Using Life Cycle Assessment (LCVA)
- Environmental Dispute Mechanisms
- Strategies for High-Performance Team Building
- Environment and Cross-Cultural Bridging: Working with Indigenous Peoples in Sustainability
- Cost-Benefit Analysis
- Environmental Chemical Design
- Research Project Methodology
- Earth Processes and the Environment
- Ecology Principles to Manage Energy Impacts
- Renewable Energies in Latin America and the Caribbean
- Environmental Design TBD

The design of courses and seminars is governed by a multidisciplinary approach, where students tackle different aspects of an energy-environmental project from a technical, legal, economic, and social standpoint. This approach involves the dynamic participation of instructors and students from different countries and who are specialists in areas such as engineering, science, economics, administration, law, and other fields related to energy development. The final academic objective is to take full advantage of both Canadian and Latin American knowledge and experience in order to take up the challenges of the energy and environmental sectors of Latin America and the Caribbean, using a comprehensive vision based on the principles of sustainable development.

The courses and seminars are subject to change as a result of recommendations and suggestions made each year by the Program's Academic Council, which evaluates the present academic situation and makes projections for the academic future of the Master's Degree Program.

Once the students have completed and passed the Program's courses and seminars, they will have to take comprehensive oral exams before a review board composed of instructors from the Program and the University of Calgary.

The Certificate Course on Oil and Gas Project Management in Ecuador, addressed to an indigenous audience from the Amazon region of Ecuador, was given in April-June 2002

Finally, the students will have to present, both verbally and in writing, two research projects, an individual project and a team project, where they have to address an energy problem of a country or subregion and propose a solution based on a multi-disciplinary analysis in keeping with the Program's philosophy.

As a complement to the academic training given to the students, there will be field trips to various energy projects in the member countries of OLADE or outside the region. During these visits, the students benefit from first-hand information. In the five Master's Degree Programs that have concluded, the students have toured energy projects in Bolivia, Brazil, Colombia, Costa Rica, Ecuador, Panama, Venezuela, and Canada.

Once they have met all the requirements, the Program's graduates receive an interdisciplinary university master of science degree (M.Sc.) in energy and environment from the Graduate School of the University of Calgary.

Since the Master's Degree Program in Energy and Environment started up in 1996, a total of 90 students from Barbados, Bolivia, Colombia, Ecuador, Guyana, Jamaica, Mexico, Paraguay, Peru, the Dominican Republic, Venezuela, Canada, the United States, and Japan have participated in it. Furthermore, 30 professionals from Argentina, Bolivia, Brazil, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Paraguay, and Canada have attended specific courses and seminars of the Program.

Thanks to the training acquired by the Program's graduates, their professional services have been called upon by major public and private companies and institutions of the countries of Latin America and the Caribbean.

A large number of students has been able to secure support for their participation in the Program in the form of scholarships and financial aid from institutions that provide assistance for graduate studies, such as CONACYT of Mexico, IECE and FUNDACYT of Ecuador, ICETEX and COLCIENCIAS of Colombia, CAREC of Peru, and Canadian and Latin American energy companies. As for OLADE and the University of Calgary, they also provide assis-

tance each year for partially covering the cost of registration/tuition to the most highly qualified applicants.

CERTIFICATE PROGRAM IN ENERGY AND ENVIRONMENT

The Certificate Program is also part of the Energy and Environment Project that OLADE is conducting jointly with the University of Calgary. Its principal objective is to expand the knowledge and skills of professionals involved in the energy and environmental sectors of Latin America and the Caribbean, who for various circumstances cannot gain access to a long-term graduate studies program, such as the Master's Degree Program, and who wish to participate in a medium-length graduate academic program, directly focused on meeting certain specific personal or corporate training needs.

The Certificate Program is designed to be flexible, interesting, intensive, innovative, and up-to-date, and to facilitate the attendance of professionals who are working in institutions and companies. It is delivered in the requesting country over a six- to ten-week period, whether consecutive or not, in collaboration with energy institutions or local universities. Its scope may be national or subregional. The instructors of the Certificate Program are top Canadian or Latin American experts who, in some cases, are also professors of the Master's Degree Program.

The Certificate Program involves the delivery of four courses and two seminars focusing on the general topics designed for the Certificate, plus a research project referring to the subjects of the courses and seminars. It involves a minimum of 240 hours of academic class work. The courses and seminars may or may not be part of the curriculum of the Master's Degree Program. If they are, once the course has been passed, academic credit can be granted and subsequently used for the Master's Degree Program.

The Certificate Program is designed to be flexible, interesting, intensive, innovative, and up-to-date, and to facilitate the attendance of professionals who are working in institutions and companies. It is delivered in the requesting country over a six- to ten-week period, whether consecutive or not, in collaboration with energy institutions or local universities.

The Certificate programs provided by OLADE in the framework of this Project in the different countries of Latin America and the Caribbean are as follows:

- First Certificate in Energy and Environment, developed with the Secretariat of Natural Resources and Environment of Honduras, through the Directorate General for Energy. Tegucigalpa, October 2001-February 2001.
- Second Certificate in Energy Policy and Environment, developed with the Secretariat of Natural Resources and Environment of Honduras, through the Directorate General for Energy. Tegucigalpa, October 2001-February 2002.
- First Certificate in Energy and Environment, developed with the National University of Costa Rica, through the Economic Policy Research Center (CENPES). Heredia, October 2001-December 2001.
- First Certificate in Energy and Environment, developed with the Ministry of Energy and Mines of Ecuador, through the Under-Secretariat of Environmental Protection. Quito, March 2002-August 2002.
- First Certificate in Energy and Environment, developed with the National Energy Skills Center of Trinidad and Tobago. Port-of-Spain, March 2002-July 2002.
- First Certificate in Oil and Gas Project Management, developed with the Inter-American Development Bank and Amazonía Gas (CONFENIAE). Quito, April 2002-July 2002.

At present, Certificates Programs for Bolivia, Colombia, El Salvador, and Mexico are being considered.

ENVIRONMENTAL LEGISLATION PROGRAM IN THE ENERGY SECTOR OF LATIN AMERICA AND THE CARIBBEAN

Another component of the OLADE-University of Calgary Project is the Environmental Legislation Program in the Energy Sector of Latin America and the Caribbean, which concluded in May

2002 and whose primary objective was to conduct an inventory of legal norms for the environment governing the energy sector in the Member States of OLADE. In this framework, regional workshops were held to discuss the preliminary inventories, the way of systematizing, tabulating, and disseminating them, and some specific topics that require further study. Workshops were held for each of the following subregions: for Central America in Copán, Honduras; for the Andean subregion and Mexico in Trujillo, Peru; for the Southern Cone in Santiago de Chile; and for the Caribbean in Port-of-Spain in Trinidad and Tobago. These workshops benefited from the collaboration of the environmental departments and agencies of the Ministries of Energy of the host countries.

Once the inventory of legislation was finalized, the situation of each country was reviewed and a paper gathering all the observations and conclusions stemming from this study was prepared. Afterwards, another document was elaborated providing guidelines and orientations to serve as a reference for environmental management in the energy sector of the Member States of OLADE.

Finally, all the legal environmental information was tabulated in specific categories of environmental law in an information system created for this purpose called the Energy-Environmental Legal Information System (SIEAL), which was installed on line in its initial phase (information for the Andean countries) on OLADE's web site, under the auspices of the Andean Development Corporation (CAF).

OTHER TRAINING PROGRAMS

OLADE views all of its training programs as an activity that cuts across all of its projects. Because of this, many seminars and workshops are organized on specific topics (energy balances, greenhouse gas emissions inventories, advanced energy planning, various aspects of the oil and gas and electric power sectors, new sources of energy, etc.) in various countries, in collaboration with the energy institutions of the Organization's Member States.

Furthermore, OLADE officers and consultants participate permanently as speakers on current subjects for the development of the energy sector of Latin America and the Caribbean at international congresses, courses, and seminars to which the Organization is invited.

Thus, OLADE supports the professionals of its Member States in an ongoing effort to improve their skills with short-, medium-, and long-term initiatives, which in turn contribute to the development of the region's energy sector.

University of Calgary officers and professors, along with the students of the Fifth Master's Degree Program in Energy and Environment at the graduation ceremony on June 28, 2002 in Quito.

Opinion and debate

On financing for oil and gas exploration in Mexico

Mexico, June 28, 2002

Dr. Julio Herrera
Executive Secretary of OLADE

In the article by Luis Alberto Vásquez, "Natural Gas in Mexico and Related Financing" published in the January-March 2002 issue of OLADE's Energy Magazine, we the readers have been provided with an overview of the legal framework governing the ownership scheme in Mexico, the importance of hydrocarbons and natural gas in particular for the country, the problem of private-sector financing for their production, and some recommendations (final summary).

Regarding the first part of the article, the author points out the legal and political background that gave rise to the current Article 27 of the General Constitution of the Republic of 1917, which governs ownership in Mexico.

Suffice it to recall that Mexico was conquered by the army of Hernán Cortés and thus became one of the Spanish Crown's possessions in the new world. Afterwards, various papal bulls issued by Pope Alexander VI recognized Spain's sovereign rights over the land and water of this continent. Later, when Mexico became independent, these provisions, which include national rights, were incorporated into the Code of 1865. Nevertheless, the first regulations focusing specifically on oil were set forth in the Petroleum Act of 1901, complemented by the Decree of Classification and Regime of the Federal State of December 1902, published during the administration of Porfirio Díaz. During the Revolution, the legal situation of oil and gas was regulated by means of decrees and regulations whose contents later became the basis for the text of the present article 27 of Mexico's Magna Carta of 1917, which is currently in force. In this section, the Mexican tradition of vesting land and water ownership in the nation and of characterizing it as inalienable and imprescriptible was kept. The National Assets Law, which classifies assets as either public domain assets or privately owned assets, reasserts this approach and includes hydrocarbons under the first.

At present, in addition to the above-mentioned section, Articles 25 and 28 set forth the primacy of the State of Mexico in this area. Thus it is perfectly clear that in Mexico hydrocarbons and their products belong to the nation, are viewed as strategic assets for the Mexican State, and are administered by a decentralized public institution, that is, Mexico's state oil company Petróleos Mexicanos (PEMEX) and its subsidiaries, namely, PEMEX Exploration and Production, PEMEX Refinery, PEMEX Gas and Basic Petrochemicals, and PEMEX Petrochemicals.

In this framework, private-sector persons or legal entities can participate in natural gas transport, storage, and distribution activities.

Furthermore, the author highlights the importance of natural gas in our country. In this case, it should be indicated that Mexico ranks 21st among the countries with proven natural gas reserves and 9th as gas producer.

Nevertheless, there is a problem in respect to the financing that is needed to build up these activities. Indeed, as we indicated earlier, ownership of hydrocarbons and their products is vested in the nation, and they are also inalienable and imprescriptible, which greatly constrains the involvement of private persons or entities in this sector, although it is imperative that they do participate. Therefore, the major challenge is to harmonize legal provisions with the principles contained in the public policy for energy products and their financing.

In other words, an attempt is being made to ensure the compatibility between the provisions contained in Articles 25, 27, and 28 of the Constitution currently in force and the Mexican State's public energy policy and sector financing in order to build up natural gas production in the country. To achieve this, higher amounts of investments from sources other than public funding have to be found.

In this framework, the author points out expressly that many attempts have been made to ensure this compatibility, among which PIDIREGAS, which is a proposal to reform the current taxation scheme for the para-state company, in order to promote opportunities to obtain enough resources for its expansion and, ultimately, multiple service contracts. On the basis of this instrument, the private sector can intervene in natural gas production, without infringing Mexico's legal provisions and without detriment to national sovereignty over hydrocarbons.

I believe that, with this text, the author provides his readers with an overview of the current situation currently prevailing in Mexico in terms of financing for the production of oil and gas and products, which consists of harmonizing state sovereignty with the participation of individuals in national strategic matters.

Dr. Julio César Sosa Miros.
Full-time researcher for the University of Vera Cruz, Mexico, and founder of the University's doctoral program in public finance.