

COMPETITION IN ENERGY MARKETS

An Assessment Of Restructuring Of Energy Markets In The Lac Region

Project: Competition in Energy Markets

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EXECUTIVE SUMMARY

With the sponsorship of the Canadian International Development Agency, the Sustainable Energy Program is being developed by OLADE and the University of Calgary. Its primary purpose is to improve public sector reforms and support energy and environmental sector administration, so as to contribute to poverty reduction and sustainable development.

The first phase of the “Energy Market Competition” project, implemented within the framework of this program, is being completed with this report. A second phase will deepen on the initial findings, based on case studies in four countries of the region.

The first project phase reviews the level of competition achieved and experiences operating the energy markets established in the region, as part of a world-wide movement towards liberalizing energy trade.

All countries of Latin America and the Caribbean implemented structural reforms in the energy sector, primarily during the ‘90s, and adopted a broad range of models with regard to the degree of market openness and the share of private investment. This report offers a table reflecting OLADE’s effort to place all structures adopted by the countries on a single graphic summary.

The structural reform of the Latin American and Caribbean energy sector occurred very rapidly. In some cases, this haste even resulted in going ahead with privatizations without first establishing a legal framework in accordance with the substantial transformations required. This differs significantly from the case in industrialized countries. In the United States, there is no federal law that creates a common legal basis for opening energy markets, and at February 2003, 18 states were operating under reforms, 5 states had stalled their reforms, and 1 state had suspended the process. The European Union, with a greater number of power interconnections and a harmonious legal framework, established rules for gradual power market integration, opening them to non-residential customers by July 2004 and to all customers by July 2007.

Chile, the country pioneering these reforms in 1982, was the first in the world to deregulate its power sector, followed from 1992 to 1996 by a group of countries that used the lessons learned to implement other models. Noteworthy among these was Argentina, whose structure has been able to remain in operation despite the acute macroeconomic crisis experienced by that country. Another group of countries established reforms up to 2000, while pioneering countries began reviewing their experience for the purpose of implementing second generation reforms.¹ Brazil is a notable case, having made a reform in 1996 and established a second deep reform in 2004 in response to signs of a lack of generation expansion, seeking to promote and support the development of its hydro-electric potential.

¹ Second generation reforms: adjustments deriving from experience with sectoral restructuring.

This report presents the current power sector structure in each of OLADE's Member Countries, with comments on individual experiences in their energy markets, as well as special circumstances affecting the sector. OLADE's statistical data base, with 30 years of energy information, was used to show the evolution of several indicators in the 26 Member Countries before and after the reforms, and to make regional conclusions as summarized below.

Two groups of countries reflect success with these reforms. On the one hand, those having broad demand and space for competition, which chose a free market model and implemented it until the goal was met, showed satisfactory results in terms of tariffs, losses and enhanced reliability, causing a substantial improvement of the sector's public image. On the other hand, countries with a small demand that does not justify a competitive market, which chose a single purchaser structure, also reflected satisfactory results for the indicators under review and in capturing private investment.

An important observation arose from supply expansion, because results were especially satisfactory for attracting private investments while the region was on the foreign capital agenda, more or less until the year 2000. Likewise, a business that has been consolidated is that of independent producers with small-capacity power plants when negotiating directly with large customers, because purchasers benefit from lower prices and vendors benefit from guaranteeing payment for their production, which is not always the case when distribution companies are state owned.

Most investments in supply expansion were for thermal plants, to such an extent that over the past 8 years, all countries of the region reversed formerly observed trends when hydro generation was not only predominant but also had the highest growth rate. Over the past years, thermal generation has grown more rapidly, ratifying a position that was foreseeable from the viewpoint of private investors, as these plants represent lower investments per installed kW. Although operating costs are higher, recovery times are shorter and construction is quicker, with fewer financial risks. In extreme cases, there is also the possibility of moving the plant, which in the case of a hydroelectric plant is impracticable.

The number of large regional players is still limited to some ten companies, particularly from Spain, the United States and France, with investments in several countries of the region, while several small local investors have limited energy production. This has two variants. Integration should be facilitated, as the same large private players are present in almost all countries of the region, and power or gas linkages would unite the investments of the same players beyond the borders of their countries. However, competition levels would not improve through inter-connection and regional market integration, because the number of large players would be the same as is already seen in countries with the greatest demand.

Exploitation of regional natural gas reserves has gained momentum through the example of Trinidad & Tobago's liquefaction plant for exporting to the markets of North America and Europe. Furthermore, the Camisea – Lima gas pipeline began operations in 2004, forcing Lima to renew and modernize its thermal plant combustion systems. South America's Southern Cone uses natural gas produced by Bolivia, and there are plans to extend the gas pipeline system with Brazil and Argentina.

Additionally, with all its difficulties for importing natural gas from Argentina, Chile is seeking fuel alternatives for its gas plants.

Experience shows that structural reforms should be proposed taking into account the energy resources of each country, in order to privilege them accordingly, without thereby limiting competition.

On the other hand, Brazil's experience in expanding its transmission system should be taken as an example by other countries of the region, because the difficulties experienced throughout the world due to limited investments in this power sector activity require creative solutions such as the one implemented by this country.

Regardless of the model adopted, the task of regulating this sector in terms of strengthening, independence, staff training, and autonomy remains pending. Note that regulations come from Anglo-Saxon legislation and not the Greco-Roman law that informs the legal structures of most countries in the region. Consequently, operational experience in the countries of Latin America is recent and requires preparation and consolidation to work on a par with the challenges posed by the new models currently experienced by the sector.

Power losses are still an issue in Latin America and the Caribbean, although loss-reduction regulations included in reforms have produced the expected results in most countries with open markets and predominant private participation. In countries with open markets and mixed private and state ownership, loss regulation did not achieve the results sought due to persistent political pressures. This situation is worse in countries with predominant state ownership. The success achieved comes from controlling non-technical losses, but technical losses are still to be dealt with. The few countries that have begun this work have reached figures below 10%, which at one time would have been considered outside the range of possibility for the countries of the region.

The development of energy sector structural reforms meant an opportunity in the region to organize and in some cases implement certain environmental conservation policies. Provisions that were spread out under different state agencies were centralized, and certain environmental requirements were established for granting concessions and licenses for energy infrastructure works.

Renewable energy source development received new impetus when reforms incorporated special incentives for renewable production, naturally privileging development of the region's hydroelectric potential despite difficulties in attracting the needed investments. In this field, success is expected from the approach that links renewable energy development to contributions for solving fundamental social issues in the region, such as promoting crops for energy production with bio-diesel and ethanol, using biomass in depressed zones, or the creation of jobs through local industry's contribution to building energy system elements.

The region had an incipient energy efficiency development before the reforms. Opening power markets and vertically disaggregating the sector has brought positive and negative consequences. Including commercial generating companies has sparked a natural interest in enhancing energy production efficiency. With the reform, subsidies tended to disappear, meaning that consumers received the right price signals to interest

and encourage them to adopt energy efficiency. These signals were necessary, but insufficient. On the other hand, the sector's new structure is characterized by a greater number of players, resulting in spreading out the responsibility for developing energy efficiency. Furthermore, the benefits of efficiency for vertically integrated companies are not clear for private generating and transmission companies. Particularly, improving demand efficiency that could defer new investments benefits society and not individual generators. Distribution companies that changed ownership have had to consolidate their position and face urgent issues for their shareholders, such as improving collection and reducing technical and non-technical losses, among others, where demand-side energy efficiency has low priority, if any, in company plans.

We conclude that the level of competition achieved in the countries of the region has been limited by the small number of private players participating, as determined by the size of investments required, more so considering that perceived financial risks in the region are still high. This factor has also privileged thermal plant development, sacrificing the use of large undeveloped hydro resources remaining in the region, and limiting available fossil fuel exports that could enhance world energy supply security.

Additionally, the results from reforms implemented in the countries of the region are satisfactory in some cases, while in others there is much left to achieve. In particular, several state-owned or mixed power distribution companies have not been able to honor their obligations to generating companies due to low tariffs and because losses are still a significant issue. This is even a barrier to generation expansion in order to meet the growing demand.

The reforms made it possible to organize environmental protection provisions, which before then were spread out among different legal bodies and under the responsibility of several institutions. Likewise, incentives were installed for developing renewable energy, while leaving market forces to determine expansion. Energy efficiency was mentioned in several new laws, unfortunately with few concrete provisions for implementation and development.

Introduction

The principal objective of the project is to develop energy policy strategies and guidelines to strengthen and maintain the competitive environment that was achieved by the sector through the structural reforms implemented over the past two decades; the analysis involves a wider context, however, to ensure the reliability of the recommendations that the project is to provide.

For some time OLADE has exhibited justifiable concern about the future of its Member Countries' energy sectors in studies that were carried out over a period of years, which provide valuable background information that needs to be taken into account.

In 1991, with the assistance of the World Bank, it prepared the study called "Evolution, Situation and Perspectives for the Electrical Sector in the Countries of Latin America and the Caribbean," a detailed analysis of the problems faced by the sector at that time, principally the financial problems. In late 1992, it published a book, "The Role of the State in the Energy Sector", an analysis of expected structural reforms and their consequences particularly for the State, whose management of energy companies up to that time had shown few satisfactory results. The 1998 study "Energy Sector Modernization in Latin America and the Caribbean: Regulatory Framework, Divestiture and Free Trade" studied the results achieved by the reforms, and notwithstanding the short duration of the experience, some interesting conclusions are drawn.

Some preliminary considerations must be born in mind and are offered as guidance regarding the context of the study.

The world undertakes energy sector reforms to bring competition to traditionally monopolistic sub-sectors.

In the electrical sub-sector, competition in generation involves direct commercial relationships between generators and customers. Energy transportation (transmission and distribution) involves tolls that are regulated by current laws. An agent that is in charge of dispatch regulates the operation of the electrical system, and commercial transactions are carried out independently of technical matters.

The motivation for reform at the global level is the expectation that competition will invigorate an activity that has become excessively conservative due to the need for high reliability, preventing the entry of new technologies.

The recent development of distributed generation is due in part to the forced opening of electrical companies' networks to other producers with new technologies (micro-turbines, fuel cells and others).

For Latin America and the Caribbean, in addition to the above, a fundamental reason for reform was the need to attract external and internal investment capital, because the financing of expansion projects had become a grave difficulty for inefficient state companies.

Private participation was the answer to the sector's problems and the international financial world looked very favorably on investment in emerging markets, among which Latin America held a prominent position.

Open markets brought discipline to energy policy, particularly in the area of prices, which underpinned development over the past decade.

Private investment, especially in Argentina and Chile, exceeded the needs of internal supply and was oriented toward export.

With an energy sector that was operating satisfactorily according to clear rules and competition that favored growth, the Argentine economy crashed and left sector without a foundation. Investors are now in a difficult situation because the regulated rates for retail customers cannot be readjusted to the high level required by the devaluation of the currency as quickly as investors would like, because the economy of the country could not withstand it.

In Brazil the private sector controls 23% of generating capacity and 65% of distribution. Most is foreign capital and the remainder is local capital. US\$23 billion was invested with the expectation that large profits would be obtained. The American company, AES, is the one with the biggest problems. It invested US\$ 3.9 billion to purchase assets and borrowed US\$ 2 billion from BNDES, of which it still owes US\$ 1.2 billion. It earned only 311 million in 2000 and 2001, and has received nothing since. It may forfeit assets through default if it does not reach an agreement with Banco Nacional de Desarrollo Económico y Social (Economic and Social Development Bank) (BNDES). EDF (Electricite de France) does not rule out the sale of LIGTH and has abandoned the construction of two hydroelectric plants for which it has a concession. Electricidade de Portugal, EDP stopped construction of a 425 MW power plant in association with the REDE group.

Chile seems to be sustaining the current model; however, investment in expanding the supply of energy is limited. The problems of 1999 due to the lack of electrical generation capacity do not seem to have disappeared altogether.

In summary, the model of attracting private investment is suffering from investor distrust, and is not sustainable unless solutions are found to the present situation, in which emerging markets have lost their validity.

It is particularly clear that the most serious challenge is expanding the supply, at least until alternative solutions are found for attracting the financing necessary for the enormous investments that will be required. There is an obvious need to search for new solutions for financing the increased supply required to cover a growing demand.

The study proposed by the project must not be limited to competition and the restoration of monopolies, because the lack of financing could cause grave problems in the sector that will not only jeopardize competition but also affect its operation.

The solidity of the legal framework will also have to be studied to ensure that it reflects stability, and based on the experience gained from its application, to determine what conditions need to be improved. The adaptation of the legal framework to the size and

characteristics of the different markets of the region needs to be studied, including the possibility of establishing larger markets to allow a greater number of actors to participate, or the impossibility of expanding the market in the case of the Caribbean countries.

1. Regional Overview of Latin America and the Caribbean¹

1.1 Hydrocarbons Sector

The regional petroleum reserves have registered an increase of 0.29% in comparison of the previous year, while the natural gas reserves have decrease in 0.02%.

The energy sector leadership was by the production of natural gas which registered an increase of 3.21% and the important increase of the charcoal with 12.67%, while the production of petroleum has decrease in about 1.85% compared with the previous year.

Venezuela, a member of OPEC has remained among the ten producers in the world, despite the setbacks it endured in 2003, because of civil unrests. The country is, therefore, important to world energy markets, with its proven oil reserves estimated at over 77 billion barrels. Venezuela's natural gas reserves are the highest in the region, estimated at some 147tcf. Mexico also has substantial crude oil reserves at over 14 billion barrels, while its natural gas proven reserves are estimated at approximately 15tcf. Argentina, with around 3.2 billion barrels of proven oil reserves, is also a significant player in the Latin American oil market. Its exports go primarily to Chile, Brazil, Uruguay and Paraguay, with small amounts also bound for the U.S. Gulf Coast. The country's proven natural gas reserves are estimated at approximately 27tcf.

Based on a study undertaken by the U.S.-based consulting firm DeGolyer & MacNaughton in April 2003, which audited Bolivia's natural gas reserves at 54.9 Tcf, the country was described as having the second largest natural gas reserves in South America, after Venezuela, and is poised to be a natural gas hub for the Southern Cone. Colombia is also regarded as an important oil producer, but political unrest and untapped reserves have led to decreased exports in recent years. Nevertheless, Colombia aims to boost hydrocarbon exploration in order to preserve its status as a net oil exporter in the longer term. Its neighboring State, Ecuador is also one of Latin America's largest crude oil exporters. The country recently completed a second oil pipeline, which has doubled Ecuador's oil transport capacity. Peru is showing signs as a potential market for the U.S. and other foreign energy companies with its Camisea natural gas field project in its final stages.

Another major energy player among OLADE's member countries is the small twin island Republic of Trinidad and Tobago in the Caribbean sub-region, which has gained worldwide recognition for its downstream initiatives as the world's largest producer and exporter of fertilizers, such as urea, methanol and ammonia. Upon completion of a fourth LNG train, the country will also be the 6th largest producer of LNG, globally. The country's proven natural gas reserves stand at 21tcf. Trinidad and Tobago, a country with a population of approximately 1.3 million persons and energy reserves, which are modest by world standards, is testimony that smallness in size is not a deterrent in making bold and giant steps

1.2 Electricity Sector

The installed electrical generation capacity of the region totals approximately 253,420 MW, an increase of 5% over 2002. Of this amount, 233,153 MW are facilities for public

service and the rest are self-generators. Brazil, Mexico, and Argentina are the countries with the greatest installed power for producing electricity. 52 percent of the installed power is hydroelectric, 45% is thermoelectric, 2% is nuclear, and 1% utilizes sources such as geothermal, wind, solar and biomass. (Annexes 6.3, 6.4 and 6.5)

Many power resources in the region are yet to be developed, especially hydroelectric resources, and the countries with the greatest potential in this area are Brazil, Colombia, Peru, Mexico, and Venezuela.

In addition to the local generating plants in each country, more and more countries are becoming interconnected with others, allowing them to make the best use of the reserves and complementarities of the supply, as well as the non-simultaneities of the demand.

Electrical production in the 26 countries was 1,020,737 GWh, an average increase of 4.3%, a confirmation that the regional electricity market is growing at a steady rate and offers excellent opportunities for investment. Approximately 56% of the electricity produced in the 26 member countries of OLADE comes from hydro power; 40% from fuels, 3% from nuclear power plants and 1% from geothermal, wind and photovoltaic sources. The electrical power produced by self-generators was 10% of the total production. (Annexes 6.1, 6.2 and 10.21)

In recent years, international transactions in the region (including those involving Mexico and United States) have been in the order of 49,000 GWh / year. The largest exporter of electrical power in 2003 was Paraguay with 45,173 GWh, and the country that imported most was Brazil, with 37,141 GWh. It is hoped that new interconnections that are being implemented or under study will increase electrical power transactions between the Central American and South American countries. (Annexes 11.1 and 11.2)

Many countries moved toward integration, including the Central Americans through the implementation of the SIEPAC (System for Electric Interconnection of Central American Countries) project and the creation of the Regional Electricity Market, after having established regional entities over a period of several years such as CEAC (Central American Electrification Commission), Regional Commission for Electrical Interconnection (CRIE), Regional Operator Entity (EOR), and Electric Grid Owner Company (EPR). Another important achievement in 2003 was the regulatory harmonization between Colombia and Ecuador that permitted the interconnection and synchronous operation of their national electrical systems.

Electrical consumption in Latin America and the Caribbean was 820,706 GWh, an increase of 3.6% over 2002. This confirms the existence of opportunities for new ventures in the regional electrical sector. (Annex 11.3)

Per capita electricity consumption in 2003 was 1,529 kWh, an increase from 1,498 kWh/person in 2002. Residential consumption per capita increased to 403 kWh, demonstrating a positive trend. (Annexes 6.6 and 10.9).

Electricity's share of the total power demand of the industrial, residential, and commercial sectors was 22.2 %, 22.9 % and 66.3 %, respectively, as can be seen in

annexes 7.5, 7.6 and 7.7. There was a small percentage increase for the business and services sector.

One of the critical problems in many countries of the region are high levels of electrical power losses, and as a group it stands at 19% approximately; this is high compared to the reasonable value, which is in the order of 10%, due to non-avoidable technical losses in lines, transformers and other equipments. There are countries below the referential value and others where electricity losses are over 30 %.

It is difficult to compare average electricity prices among the countries of the region because of diverse rate systems, variable exchange rates, and increased participation of self-generators, co-generators and unregulated users, whose prices are not always available. In order to provide a reference, they have been converted into US Dollars the average monthly prices that are reported in local currency.

On that basis and assuming that the average prices for May 2003 are representative for the year, the average consumption figures for each country were used to calculate the weighted prices for the region. The following are the approximate average electricity prices in Latin America and the Caribbean, including taxes, in cents per kWh: 8.1 for commercial users, 4.8 for industrial users, and 7.7 for residential users. The differences among the countries are large, as can be seen in the country-by-country analyses. (Annexes 9.1.1, 9.2.1 and 9.4.1)

The countries with the lowest electricity prices, less than 5 cents per kWh, were Trinidad and Tobago, Argentina, Honduras and Venezuela; those with average prices higher than 14 cents per kWh were Grenada, Barbados, Nicaragua and Suriname. Much of this, as noted above, is distorted by variations in the exchange rate.

Electrical coverage was one of the most difficult aspects to evaluate due to the lack of information in many countries on the percentage of homes that have electrical service. There are countries like Barbados and Costa Rica that have reported coverage in the order of 98%, and others such as Haiti, Nicaragua, Honduras and Bolivia that report figures of 34%, 55%, 62% and 65% respectively. It was even more difficult to break down this indicator in order to estimate electrical coverage in rural areas.

Using the latest coverage figures available and the total population of each country, the number of inhabitants per home was estimated, and on that basis, it was concluded that approximately 91% of the homes in the region have electricity. It would be important in the future for the countries, to break down more accurately the coverage for urban and rural zones, and include homes that have a precarious or illegal electrical supply, because even in those cases they require investments for a proper supply. (Annex 10.13)

1.3 Renewable Energy and the Environment

The Region increased the utilization of renewable energy in its energy matrix, especially with regard to wind energy use, the potential for which several countries are studying at specific sites. By the end of 2003, the Region had an installed capacity of 128 MW, with an important presence in Costa Rica, Brazil and Argentina. In geothermal generation, a total installed capacity of 1,249 MW was reported.

One aspect that has resulted in enhanced renewable energy source use is the cost competitiveness of some such as wind energy, given the incentives adopted by certain countries and the application of the Kyoto Protocol's Clean Development Mechanism (CDM) through projects such as hydropower, wind-driven power plants and urban solid waste treatment.

With regard to activities that seek to strengthen strategy provisions for promoting and using renewable energy, in October 2003 a regional conference was held in Brasilia, Brazil, to follow up on commitments made in the World Summit on Sustainable Development in Johannesburg in 2002, and to prepare the position of Latin America and the Caribbean before the International Conference on Renewable Energy to be held in Bonn, Germany, in June, 2004. At this meeting, the 21 participating countries agreed on a series of guidelines in a document called the "Brazilian Platform on Renewable energy", which highlighted one of the commitments: "To promote the goal of the Latin American and Caribbean Initiative for Sustainable Development (ILACDS from the Spanish) of ensuring that by 2010 the Region will use at least 10% renewable energy in its total energy consumption, on the basis of voluntary efforts...". This initiative may be fundamental in order to include a greater percentage of these energies in the Regional energy matrix.

As for rural energy, it is imperative to mention the World Bank initiative called the Global Village Energy Partnership (GVEP), a worldwide program aimed at energy use to overcome poverty. For this purpose, in 2003 it began to formulate national programs contemplating the use of renewable energy. Under this initiative, a Regional Conference was held on June 2003 in Santa Cruz, Bolivia, for Latin America and the Caribbean.

In terms of the environmental, it is worth mentioning that during 2003, the Region consolidated its participation in the CDM by forming National CDM Agencies, most of which are related to the climate change offices in the Ministries of the Environment or are under inter-ministerial commissions.

2. Reform Processes in Latin America and the Caribbean

Structural reform in the Latin American and Caribbean energy sector has had its own particular characteristics, especially the speed at which it took place.

It differs substantially from what is occurring in industrialized countries even today.

No Federal law in United States promotes common rules for opening up energy markets; each State undertook the process over a different pace according to its own characteristics. As of February 2003², 18 States have implemented reforms, 5 States are in the process, and 1 State has suspended the process.

In the European Union, where there is more electrical interconnection and a harmonious legal framework, laws were established for the gradual integration of the electrical markets that open electrical markets to non-resident customers by July 2004, and to all by July 2007.

Structural changes were implemented hastily in Latin America and the Caribbean, and this led in some cases to privatization without the prior establishment of a legal framework appropriate for the substantial transformation that was taking place.

This chapter of the report is an overview of the reform process that seeks to provide a better understanding of what occurred and the current situation of energy markets in the region, and highlights the lessons that lead the sector to undertake substantial reforms.

2.1 Current Status of Energy Sector Reform in LAC

Each of the countries of the region selected its own scheme, and since the contexts were different, the experiences have been different. Countries with structures having similar characteristics will be grouped together, but first the sectoral organization³ will be presented briefly based on the analysis of several documents, and in 4 cases, Argentina, Brazil, Chile and Peru, specific visits and conversations with authorities from the sector.

The most important aspects of the current institutional structure are highlighted, particularly the institutions involved in the electricity and gas sub-sectors. The operating conditions have been described in each case.

The description of the institutional structure and operating conditions of the sectors emphasizes countries having the most open markets, which are sufficiently mature for analysis by this study.

The countries are organized into four geographically defined groups, each of which is at a different stage in the integration process that is occurring in the region: Mexico and Central America; Brazil and the South Cone; the Andean Region, and the Caribbean.

2.2 MEXICO AND CENTRAL AMERICA

The experience to date of the six OLADE Member Countries in Central America with energy integration has been positive. Central America's experience with electrical interconnection began in 1976 with a line between Honduras and Nicaragua. That interconnection was extended to Panama in 1986 and currently operates at 230 kV with an intermediate 138 kV link in Costa Rica.

As a result of that experience, the six countries first implemented the SIEPAC Project (Electric Interconnection System of the Central American Countries) to strengthen the existing interconnection, and then built a second 230 kV circuit.

What is most interesting about this project is that it resulted from a regional integration decision based on the Framework Agreement of the Central American Electrical Market signed in December 1996 and ratified by the congresses of the countries in 1998; its objective is the gradual formation and development of a regional competitive electrical market based on reciprocal non discriminatory treatment that will contribute to the sustainable development of the region within a framework of respect for and protection of the environment.

The treaty called for the creation of two international corporations: the Regional Electric Interconnection Commission, CRIE (Comisión Regional de Interconexión Eléctrica), the market regulator; and the Regional Operation Entity, EOR (Ente Operador Regional), responsible for dispatching electrical energy. Later, in early 1999, the Network Owner Utility, EPR (Empresa Propietaria de la Red) was established as a limited company whose shareholders are the state electrical companies of the area served by the transmission.

There is another aspect of the experience that serves as a model for other subregions; the countries adopted different models for the structure of their electrical sectors; Costa Rica and Honduras have integrated companies, and the other four have different types of open markets; despite the differences, integration continues.

The sub-region is also beginning to integrate with Mexico through exiting interconnections with Guatemala, and a commitment to increase transfer capacity by building a high tension transmission line.

A brief description of the institutional structure of each country in the group demonstrates the differences and similarities in the operation of their energy markets at the time this report was prepared. Information on the names of private companies and their participation in generation and distribution companies, were obtained from the Web Page of the Energy Information Administration⁴ (EIA) of the United States Department of Energy.

MEXICO

This is the country with the largest oil exports outside of the OPEC group. Most of its exports go to the United States due to its vicinity to that country.

The **Ministry of Energy** is the State secretariat with the duty of defining and directing national energy policy. It also coordinates the sector, where public companies are decisive, the largest companies in the country being *Petróleos Mexicanos* (Pemex) (Mexican Petroleum Company) and its subsidiary bodies, the *Comisión Federal de Electricidad* (CFE) (National Electric Utility) and *Luz y Fuerza del Centro* (LFC) (Capital City Utility). We should mention that Pemex has been named one of the 10 major companies in the world due to its assets and revenues.

The Regulatory Commission, CRE (**Comisión Reguladora de Energía**) is a de-concentrated body of the Ministry of Energy, with technical and operational autonomy, whose decisions are made jointly among the five commissioners it consists of, in charge of regulating natural gas and electric power. Its responsibilities include granting permits, authorizing prices and tariffs, approving terms and conditions for service provision, issuing general administrative provisions (directives), solving disputes, requesting information, and applying sanctions. Tariffs are approved by the Treasury Department.

Power Sector

Reforms began with the Public Power Utility Law of 1992, which contemplates special treatment for independent production companies, cogeneration, self-supply, small producers, and imports and exports. Also, the CRE was established. Since the reform, the institutional organization is as explained below.

The state companies **CFE** and **LFC** vertically integrated utilities are in charge of all the activities of the sector.

Gas sector

Petróleos Mexicanos (PEMEX) is responsible for the oil and gas sector, which includes natural gas. Exploration and highly specialized technical services are done by the Mexican Exploration Company (Compañía Mexicana de Exploraciones S.A.).

Oil and gas marketing, done internationally by *PMI Comercio Internacional, S.A. de C.V.*, is a decisive factor for the generation of foreign currencies and tax contributions for the federal government.

COSTA RICA

The Energy Sectoral Direction of the **Ministry of Energy and Environment (MINAE)**, is responsible for the country's energy policy. The MINAE is the strategic institution for sustainable development. In environmental matters it promotes and supports research, conservation and the rational use of natural resources, hydrocarbons, mining and energy development.

Electrical Sector

Electrical sector reforms were introduced in 1990 with the approval of a law authorizing private companies to participate in generation. In 1996, a law was passed that transformed the Electricity Regulator (Servicio Nacional de Electricidad - SNE) into the

Public Services Regulator (Autoridad Reguladora de los Servicios Públicos - ARESEP). After these changes the institutions of the sector had the following functions.

The **Public Services Regulator (ARESEP)** is the autonomous regulatory body for all public services. It is in charge of drafting regulations, defining rates and monitoring compliance with regulations.

The **Electricity Costa Rican Institute** (Instituto Costarricense de Electricidad - ICE) is a corporate group of state companies that includes the ICE (Electricity and Telecommunications Sectors) itself and its companies: Radiográfica Costarricense S.A. (RACSA) and Power and Light San Jose Distribution Utility (Compañía Nacional de Fuerza y Luz S.A. - CNFL). It is responsible for state-owned power plants and energy transmission and distribution involving approximately half of the electrical energy demand of the country through CNFL.

In addition to CNFL, 2 municipal companies and 4 rural electrification cooperatives are involved in **electrical energy distribution**.

Gas Sector

The Costa Rican Oil Refining Co. (Refinadora Costarricense de Petróleo - RECOPE) is a state-owned company responsible for crude oil purchases, the refinery and wholesale sales. Distribution is carried out by private companies, and involves both liquid fuels and liquefied petroleum gas.

EL SALVADOR

Electrical Sector

The General Electricity Law issued in 1996 reformed the structure of the sector so that a free market could operate; unlike other countries of the region, from the very beginning it established retail negotiation, that is, all customers, even the smallest, can negotiate directly with generators for their supply of electrical energy. The institutions and actors of the sector are as listed below and their functions are as described.

The **Electricity Regulator** (Superintendencia General de Electricidad y Telecomunicaciones - SIGET) was established in 1996; it regulates sector activities, applies treaties, laws and regulations, approves electrical rates, regulates charges for the use of networks, regulates Transactions Unity (UT) charges, issues regulations and technical standards, grants concessions for hydraulic and geothermal resources, settles conflicts between operators, and publishes statistical information on the sector.

The **Wholesale Electrical Market** includes two components, the contract market that is composed of dispatch that is scheduled between suppliers and consumers, as well as free transactions, which do not require that financial conditions be reported. It also operates the regulating market for the system that uses opportunity prices to balance supply and demand.

The **Transactions Unity** is a limited company owned by the operators that guarantees neutrality. It operates the transmission system and the Wholesale Electrical Market, and coordinates generating unit and transmission equipment maintenance.

There are five **Generating Companies** that operate in El Salvador in free competition with unregulated prices; they can freely contract supply with distributors and all users. The old vertically integrated state company, Comisión Ejecutiva Hidroeléctrica del Río Lempa (CEL), still operates the hydroelectric plants, but the two geothermal power plants were separated to form a state company called LAGEO; as of 2002, it became a State-Private company with ENEL of Italy holding a small portion of shares.

The **El Salvador Electric Transmission Co.** (Empresa de Transmisión de El Salvador - ETESAL), which was split off from CEL, is still under state ownership and is responsible for transporting electrical energy inside the country and through international interconnections.

The five **Distributing Companies** are privately owned; AES Energy Corporation controls four of them: Compañía de Luz Eléctrica de Santa Ana; Compañía de Alumbrado Eléctrico de San Salvador; Empresa Eléctrica del Oriente; and Distribuidora Eléctrica de Usulután Sociedad de Economía Mixta. Emel de Chile, a subsidiary of Pennsylvania Power and Light Global, operates a fifth electrical distribution company in El Salvador, Distribuidora de Electricidad. Vertical integration is permitted and one of the distributors has a generation component.

There is an independent **Trader**, though since the distributors can also sell energy, its share of sales is still small.

GUATEMALA

The Energy General Direction of the **Ministry of Energy and Mines (MEM)** formulates and coordinates policies, State plans, indicative programs to promote the use of renewable energies and the efficient use of natural resources.

Electrical Sector

The reform process began in 1995 by opening electrical generation to the private sector and requiring that the functions be separate. The transformation was completed by late 1997 when the activities of the sector were split off from the vertically integrated company, **Instituto Nacional de Electrificación (INDE)**.

The **Electrical Energy National Commission** (Comisión Nacional de Energía Eléctrica - CNEE) supervises electrical sector, it is a technical agency of MEM. The new regulations that were adopted establish an electrical market with power plants that are dispatched according to the increasing generating costs plus transmission costs; the transmission cost is calculated from the location of the power plants; electrical rates are regulated and have an hourly and binomial structure. Generators review them every three months and distributors, every six months.

Hydroelectric generation and transmission are still under INDE. Private companies operate all thermal plants.

The Empresa Eléctrica de Guatemala S. A. (EEGSA), which is the country's principal **Distribution Company**, is 80% owned by a consortium that includes a Spanish company, Iberdrola, TECO Power Services from the United States, and Eletricidade de Portugal; part of the distribution outside the metropolitan area was purchased by another Spanish company, Unión FENOSA.

The law calls for **Trade Companies**, so EEGSA established its own trade company (COMEGSA) to give priority to major clients.

Large Users, which are defined as those that exceed a demand of 100 kW, are allowed to negotiate directly with generators or marketers for the energy they require.

HONDURAS

Reforms were introduced in 1994 and defined the model of a single buyer, and maintained the National Electrical Energy Utility (Empresa Nacional de Energía Eléctrica - ENEE), which integrates all the activities of the sector and allows the inclusion of independent producers, which, in 2003, provided 50% of electrical production.

The Energy General Direction of the **Natural Resources Secretary** governs the sector.

The **National Electrical Energy Utility (ENEE)** has operated as an autonomous entity since 1957 in charge of the production, transmission, distribution and trade of electrical energy throughout the country. It also dispatches power plants, operates the transmission system and carries out planning for the sector.

The **National Electrical Energy Commission** (Comisión Nacional de Energía Eléctrica - CNEE) regulates the sector, but the **National Public Services Supervisory Commission** (Comisión Nacional Supervisora de los Servicios Públicos - CNSSP) set rates. All activities are considered to be public service. Private participation is allowed in all activities except transmission, where free access is obligatory following payment of the respective tolls.

Several private generating companies operate in the Honduran system, including the following: ENERSA, with 85 MW in operation and 115 MW committed for 2005; LUFUSSA, that operates 80 MW based on diesel; 39.5 MW with gas turbines and 210 MW promised. There are also several small private power plants.

NICARAGUA

The Electric Industry Law governs the electrical subsector. The agency that regulates it and sets rates is the **Nicaraguan Energy Institute** (Instituto Nicaragüense de Energía - INE). Policy and planning are the responsibility of the **National Energy Commission** (Comisión Nacional de Energía - CNE) and INE implements the energy policies that are defined.

The structure of the sector is broken down into different companies involved in producing, transmitting and distributing electricity; generators are prohibited from

providing transmission and/or distribution, and distributors are prohibited from generating and/or transmitting energy. Electrical transmission and distribution are considered to be a public service. Private participation is allowed in all activities except transmission, where free access is obligatory upon payment of the corresponding tolls.

The Spanish company, Unión Fenosa, purchased most of the shares of the two distributing companies, Disnorte and Dissur. Only a small portion of distribution located on the Caribbean coast and in isolated areas is still controlled by the state company, Empresa Nicaragüense de Electricidad (ENEL).

Two of ENEL's generating plants were privatized; the geothermal plant, Momotombo, was purchased by ORMAT in June 1999, and Generadora Eléctrica Occidental was purchased by Coastal Power, a subsidiary of El Paso Energy Corporation, in February 2002. The government established the National Electric Transmission Co. (Empresa Nacional de Transmisión Eléctrica - ENTRESA), which is responsible for the national transmission system and international interconnections.

The National Dispatch Center (Centro Nacional de Despacho de Carga) is responsible for managing Nicaragua's Electrical Market and operating the electrical system.

Large consumers are those that are served at a voltage greater than or equal to 13.8 kV and which have a concentrated load greater than 2.0 MW.

PANAMA

Sector reforms began in 1996 with the creation of a regulating agency and were formalized with the issuance of the law and its regulations in 1997. The institutions and actors of the sector are described below.

The electrical sector is supervised by the **Regulator** (Ente Regulador de los Servicios Públicos), which has a Electricity National Direction. This institution is under the Ministry of Economy and Finances, as is the Energy Policy National Commission, which was created to define the overall strategies for the sector.

The sector is broken down into different companies involved in producing, transmitting and distributing electricity; generators are restricted from getting involved in distribution, and vice versa. Only electrical distribution is considered to be a public service.

Private participation is permitted in all activities except transmission, where free access is obligatory upon payment of the corresponding tolls. The State retains control of the **Panamanian Transmission Company, ETESA**, (Empresa de Transmisión Eléctrica), which is responsible for planning in the sector, as well as load dispatching, managing the spot market, and operating the electrical system through the National Dispatch Center (CND). Large consumers are those with a demand greater than 500 kW.

Four generating plants were partially privatized: Fortuna, 25% by El Paso Energy and 16.3% by HydroQuebec; Chiriquí, 49% by AES; Bayano, 49% by AES; and Bahía Las Minas, 51% by Enron, now managed by PrismaEnergy.

In the case of distributing companies, Unión FENOSA purchased shares of Empresa de Distribución Eléctrica Metro Oeste (Edemet) and Empresa de Distribución Eléctrica Chiriquí (Edechi). An American company, Constellation Energy, purchased the third distributor.

2.3 BRAZIL AND THE SOUTH CONE

Structural reforms in the Chilean energy sector began in 1982, and served as a model for several reforms that were implemented later. When Brazil joined MERCOSUR, the subregion included several of the countries that have the largest energy requirements in the region. The initial push for integrating the subregion came from bi-national projects, which through shared investments, had sponsored the construction of the first interconnections. Later, the need to exchange electrical energy and take advantage of complementarities between predominantly thermal systems and predominantly hydroelectric systems, helped overcome major obstacles such as Brazil's different operating frequency, which is 60 Hz while the South Cone uses 50 Hz.

A summary of the institutional structure of each of the countries in the group is given below, as well as comments on their experiences and current operating conditions, in view of the longer period of operation since reforms were introduced in some of the countries.

ARGENTINA

Argentina is one of the largest countries of Latin America in energy production and consumption. It exports energy to both Brazil and Chile, primarily.

The Energy Secretary defines sectoral policies, establishes rulings for economic dispatch, and regulates the operations of the Wholesale Power Market (WPM), is part of the Ministry of Federal Planning, Public Investment and Utilities.

Power Sector

Law N° 24,065 of December 1991 defines the regulatory framework of the power sector with the support of the following institutions having the duties described below.

The Electric Regulator Agency – ENRE (Ente Regulador de Electricidad), which supervises compliance with the Law and controls the fulfillment of concession contracts, establishes the bases for calculating regulated tariffs and monitors their enforcement.

The Electric Whole Sale Administrator Company - CAMMESA (Compañía Administradora del Mercado Mayorista Eléctrico) controls the technical and economic dispatch of the Argentinean System of Interconnection. Economic dispatch arises from the ordering as per the growing variable declared costs for the units supplied, until demand is covered. The market price is determined hourly, based on the marginal cost of the optimal dispatch. Power payments are also considered an economic signal for generating companies to supply the requirements in times of drought.

There is a vertical separation of activities in generation, transportation and distribution:

Generating companies, which are subject to free competition with no regulated prices (selling at marginal cost on the spot market), may sign freely negotiated supply contracts with distribution companies and large wholesale or retail users (GUMA or GUME, respectively).

Transportation companies are transmission system operators, with regulated prices and qualities, but have no obligation to expand the system. A fund has been created for financing transmission improvement and expansion works. System users – generating companies and consumers – should pay a fixed charge based on transportation capacity for each line they use, defined using a market bar in proportion to flow rate, with the so-called “area of influence” method.

Distribution companies are responsible for operating the network in the area of concession, creating a natural monopoly, and relate directly to regulated customers. Power distribution companies compete for concession contracts and must ensure free access to networks. The ENRE establishes the Distribution Value Added for five-year periods, based on model efficient distribution companies with similar regional and service characteristics. Large consumers may participate directly on the wholesale market, paying a transportation fee to the distribution companies. Concessions are for 95 years, but there are administrative intervals of 10 years, during which the licensee may choose to abandon the contract. Provincial authorities control concession contracts and terms.

Customers are the final users and large users. Large users contract freely for consuming electric power supply, freely negotiating supply prices. There are currently two categories: GUMA and GUME.

There is a **Wholesale Power Market (WPM)** where energy, power and related services are transacted, which is made up of:

- A Term Market: with prices freely negotiated among sellers and buyers.
- Spot (occasional) Market: with prices sanctioned on an hourly basis.

Stabilization Fund. During each quarter, the distribution companies of the WPM pay a seasonal price that is calculated in the respective planning process and approved by the Ministry of Energy based on probabilistic estimates of spot market prices.

The degree of competition achieved by the power sector before the macroeconomic crisis was highly satisfactory, and generation companies were investing in new plants. However, the concentration of property in the distribution activity reduced competition in comparison with what is set forth in the legal framework.⁵

Managing Macroeconomic Problems

For a sector that had achieved an operational market with very favorable results, investments that had raised supply above demand, and better indices than those seen in the period prior to the reforms, the crisis that struck the country’s macro-economy in early 2002 dealt a heavy blow and represented a dire test for an institutional structure that is showing it has achieved a level of maturity that has enabled it to address these adverse situations as we shall see below.

The fall of the economy meant devaluation from convertibility (1 to 1 parity between the US Dollar and the Argentinean Peso) to an exchange rate of 4 pesos per dollar at the beginning of the difficulties and falling into default, posed at least two immediate problems for the power market. The first was to define the currency for transactions, as

the generating companies demanded that it be the dollar, while the distribution companies demanded that bonds issued by the provinces be used, as they were obliged to receive them by decision of the provincial authorities. The authorities of the sector decided to keep it in pesos, which meant sharing the sacrifice, because the distribution companies had to negotiate the bonds they received at a discount, while for the generating companies it meant financial problems.

The second immediate problem to be solved was how to finance the operations of the sector, since the first months of 2002 had 50% of all traded energy unpaid.

Only by the end of 2002 and beginning of 2003 were payments regularized, although the real value was not covered due to devaluation.

Fortunately, during 2000 and 2001, hydrological surpluses over normal averages meant that seasonal prices⁶ were above the spot market, and the differences accrued to the so-called Stabilization Fund. This fund, whose intention was solely to balance seasonal differences, made it possible to keep up payments to generation companies until June 2003, thus offsetting the deficits caused by frozen seasonal prices.

As of June 2003, a debt has been accruing to generating companies who accepted receiving payment of only operational costs, with the difference complemented by papers which are undated IOUs. The government, in turn, contributed US\$ 1,000 million (by August 2004) to cover the cash amounts committed, that is, the costs.

Supply has sufficient reserve to cover the demand foreseen up to 2006 based on solving the natural gas supply issues, with the strategy laid out by the Energy Secretary, as we shall see below.

In order to set longer periods for adjusting the lower-income sectors, residential and generally regulated demands were segmented into three categories: less than 10 kW, from 10 to 300 kW and more than 300 kW. The first tariff increases were carried out in each segment, by 40%, 80% and 120%, respectively.

To September 2004, work had been done on a proposal to begin progressive increases and governmental contributions, which would make it possible to gradually recover the purchase value of payments to companies, with the condition that part of the new revenue would go to finance a new combined cycle plant in Rosario, in order to meet the demand for 2007.

Furthermore, the default proposed by the government helped by giving the companies of the sector a break in fulfilling their financial obligations on the low income they were receiving, as it enabled them to renegotiate their loans.

Note that transmission worked as planned in the regulations, and no more works were built, as they were not needed. The transportation companies are only the operators of the transmission system and do not have any obligation to attend to expansions. A fund was set up to finance these works.

In summary, as long as the adjustment stage lasts in the power sector, two regulations coexist: one is that of the free market, which is suspended; and the other is transitory, for as long as it takes to return to the former situation.

Gas Sector

In December 1992, Law No. 24,076 was passed establishing the normative framework for natural gas and creating the institutions of the sector. The chain making up the natural gas sector in Argentina is segmented vertically and horizontally, which does not mean the disappearance of natural monopolies for the transportation and distribution of natural gas.

The Ministry of Energy – defines sectoral policies and authorizes gas exports. There is freedom to import natural gas.

The Gas Regulator Agency - ENARGAS (Ente Regulator del Gas) – the autarchic regulator of the gas industry, the arbiter of disputes among players, dictates safety regulations and technical procedures, prevents monopolistic, anti-competition or discriminatory behavior, establishes the bases for calculating and approving tariffs for transportation companies and distribution companies.

Production Companies – hold a hydrocarbons exploitation concession and extract natural gas whose production they can dispose of under a free competition regime at unregulated prices (on the spot market), may sign supply contracts freely with marketing companies, distribution companies and major users.

Marketing Companies – are the players who purchase and sell natural gas on behalf of third parties.

Transportation Companies (Transportadora Gas del Norte and Transportadora Gas del Sur) – are enabled to provide transportation service and can neither buy nor sell natural gas, from the point of entry to the transportation system to the point of delivery to the loaders (distribution companies and consumers who contract directly with production companies and warehouses). They function as natural monopolies in their area of operation and are subject to national concessions, with regulated tariffs and quality. Their expense control is done through accounting systems that have been approved by ENARGAS.

Distribution Companies (nine distribution companies, one per zone) – provide gas supply service to final users who do not contract supply independently, negotiating directly with the producer or marketer. They constitute a natural monopoly, with prices regulated by ENARGAS. Their accounting systems should be approved by ENARGAS in order to control all expenses.

Consumers – are small and large final users. Large users may contract their natural gas supply independently for their own consumption, freely negotiating the transaction conditions, without prejudice to the rights granted to distribution companies for their habilitation.

Managing Macroeconomic Problems

In 2004, the country had difficulties completing the supply required by demand increases, taking into account that 49% of Argentina's energy balance is covered with natural gas, and it was necessary to restrict exports to Chile, rehabilitate an old gas pipeline from Bolivia in northern Argentina, and complete electric generation by operating costly fuel oil power plants.

Work is being done on a gas pipeline that runs parallel to the one operating from Bolivia, which will help increase supply towards the center of the country. Additionally, another one is planned to run through the northeast of Argentina, supplying a zone that lacks gas supply, closing a loop with Brazil, Argentina and Bolivia, and integrating the new Santos fields in Brazil with the Bolivian reservoirs.

Gas prices, which are defined by virtue of electric prices, were also frozen at a third of the price before the crisis, from US\$ 1.2 to 0.40 per million BTU.

As with the power sector, consumption was segmented in order to accelerate price increases to sectors with greater capacity to pay, only that in this case the adjustment in the industrial sector is better represented than in the case of electricity, with a 70% share, and the adjustment in the highest consumption sectors is expected to be completed in 2005.

Conclusion

The country's economic crisis affected the operation of the energy sector by reducing prices to 33% of their previous values. This meant that the institutionality of the sector and its organizations were submitted to a dire test, having suffered from political pressures on the one hand and from agents participating in the market on the other.

The observed facts are that private companies, doubtless with a long-term vision, supported the efforts of the authorities and the agencies, and remain in expectation that in time the adjustments will enable returning to the former situation.

BRAZIL

The country with the largest territorial extension in Latin America is seeing a major growth in its oil, natural gas and electricity consumption. Its authorities, with the support of Petrobras, are exerting great efforts to self-supply its demand, such as in the experience with using gasohol as an example for the region and the world.

Following a reform process to create a free market model, which begun in 1996, the country suffered a supply deficit that forced it to rethink the model it was in the process of implementing.

The changes were produced due to reasons that were endogenous to the country's power sector, upon examination of the purposes for the reforms and their fulfillment, because even accepting that the plan was not completed to implement the former model, the problems of lack of investment in new generation plants demanded rapid solutions. An

attempt was made to correct the deficiencies seen in the former model in order to promote development in the sector.

The purposes for earlier reforms were to ensure energy supply and lower consumer prices, removing the State from utility administration.

State withdrawal from company ownership (privatization) began with the distribution companies. Today most are private, owned by companies with foreign and domestic capital, which manage approximately 70% of the market. Publicly owned distribution companies have state and mixed stock and maintain vertical integration in generation and distribution. The smallest ones are municipal.

In the case of generating companies, the same does not occur, as the privatization schedule was not fulfilled and only about 15% of all generation belongs to the private sector. Additionally, some state-owned distribution companies did not comply with the vertical separation of generation, which still accounts for some of their assets.

Note also that the reform process began in 1996 and became effective in 1998, after which it took time to organize and mature **the Regulator ANEEL**, (Agencia Nacional de Energía Eléctrica). However, some members of its technical staff still have temporary contracts or are on loan from other institutions.

With the reforms in effect, national-scale blackouts occurred in March 1999 and in January 2002, the latter of which put in evidence the limitations of the transmission system. Towards the end of 2001 and beginning of 2002, it was necessary to ration energy in the country by up to 20% of the demand.

On a positive note, the rationing caused a change in energy consumption habits, the incorporation of efficient equipment, and substitution of electric power consumption with other sources, which meant that demand remained at low levels after the rationing period and began recovering only in 2004. Note also that the activities of PROCEL (Electric Energy Savings Program) had prepared the population beforehand to begin thinking in terms of energy efficiency, only that the crisis accelerated the process.

As a consequence of rationing, a growth in supply from thermal gas plants, in which *Petrobras* is a partner, was also encouraged, and there was a raise in tariffs.

Transmission was a good business with positive results, both for the companies and for the system, as the owners' revenues were ensured, but expansion was achieved through a planned process. The **National System Operator, ONS**, jointly with the Coordinator Committee for Electric Power System Expansion Planning, CCPE, made a proposal to ANEEL for all needed expansion and strengthening, and ANEEL tendered out the appropriate installations (lines, sub-stations and others)⁷. The transmission system works like a condominium, where revenue is shared among all owners, which has enabled investments in transmission to develop as planned.

The Operation Coordination for Interconnected Operation - GCOI, made up of all companies on the system, operated from 1973 to 1998, making it possible to harmonize technical and business criteria among all.

In 1998, the ONS began its function of centralizing operations, with technical vision but without the capacity to harmonize business criteria. Although initially the companies resisted abiding by provisions dictated by the ONS, to date the planned functioning has been achieved.

In summary, the goals set by the former model were not met, particularly in the case of rationing, because the guaranteed supply was not achieved due to a lack of market response in increasing supply. Furthermore, tariffs did not go down, and the companies continued in financial crisis.

Since the transfer of state-owned companies to private investors did not end up as planned, and the vertical separation of generation and distribution was not entirely achieved either, the former model was not completed as planned.

Additionally, in the former model, public contests were held for the concessions, and the company bidding the highest payment for the concession was awarded, which payment was then recovered through tariffs; neither were energy sales contracts required. That is, projects had no commitments for purchasing the energy to be produced, and distribution companies had no obligation to contract all the energy that the demand in their concession area required.

New Model in the Power Sector

The new model attempts to include solutions to the problems detected, incorporating two energy negotiation environments. One is free negotiation among generating companies, marketing companies and major customers, while the second is attended by all distribution companies to negotiate as a group with all generating companies until contracting 100% of their demand and proportionally distributing each generator's share in contracts with each of the distribution companies. In order to keep their contractual commitments, the distribution companies will have a guaranteed "pass through." At September 2004, the rules of operation are under public consultation.

The new model was adopted after discussions held by the Ministry of Energy and Mines with all stakeholders. Plans for expanding and operating transmission that worked well were not altered. Likewise, the rules for the ONS were not changed in terms of functioning, but rather in administrative terms. The market agents' assembly elects the members of the Administrative Council, which only has a say in managerial matters. The Board of Directors is in charge of technical issues, and is made up of three members elected by the Ministry of Energy and Mines, and two elected by the market agents. Board members hold office for 4 years but they have a probation period during the first 4 months of their duties.

Separation of activities is insisted on in the case of distribution companies that still own generation components.

The authorities clarify that all contracts in effect will be respected up to the agreed dates, so that the new model will be incorporated gradually.

The largest change is seen in the auctions for new generation developments to cover the projected demand 3 to 5 years in advance. An amount of new supply will be auctioned,

which interested parties may bid on in whole or in part, with projects that already have the preliminary economic feasibility and environmental permits, and those offering the best conditions at the lowest prices will be awarded.

Auctions for existing generation will be promoted one year in advance of the demand, and the Ministry of Energy and Mines will define the maximum purchase price, which as of 2009 may not surpass the maximum purchase price of auctions for new plants coinciding with the supply year. ANEEL will not be in charge of these auctions, but rather the directives established by the Ministry of Energy and Mines will be followed.

The **Electric Research Company - EPE**, which will carry out country-level demand integration on the basis of demand forecasts for each of the distribution companies, will define the auction amounts. The distribution companies will formally present their own demand projections in their concession area for the next 5 years (Decree 5,163 of July 2004) and will be co-responsible for estimating the magnitude of the bid to offer.

Additionally, the EPE will carry out feasibility studies for new generation projects and will supply them with the preliminary environmental license, in order to place them at the disposal of those interested in taking them in the auctions.

Additional auctions will be encouraged to complete the needs of distribution companies up to 1% of the total load contracted by the company, with a supply period of up to two years. Distribution companies may make adjustments in their long-term projections by a maximum of 3%, three years in advance, and with one year adjustments may not exceed 1%. Should distribution companies have a greater demand than forecasted, they must purchase energy on the spot market and may not pass the cost on to their customers.

The **Electric Energy Commercialization Chamber - CCEE**, (Decree No. 5,177 of August 2004) created as part of the new model to hold energy purchase and sales auctions, register sales and purchase contracts in the regulated environment and record the contract amounts in the freely negotiated environment, replaced the Wholesale Energy that was operating before.

A **Sectoral Monitoring Committee** was also created, which must check compliance with demand forecasts and development consistent with bids.

CHILE

Chile has limited resources of its own and must support its supply with imports.

The **Ministry of Economy and Energy** is the authority that sanctions the sectoral regulations, sets regulated prices based on studies by the CNE, grants public utility concessions, reporting to the SEC, and solves differences between the members of the Economic Load Dispatch Center - CDEC).

The National Energy Commission – CNE (Comisión Nacional de Energía) is the Regulator of the Sector, prepares plans and policies for the energy sector, develops energy demand and supply forecasts, and technically reviews price structures and levels.

The Electricity and Fuels Superintendence - SEC (Superintendencia de Electricidad y Combustibles) audits and supervises compliance with legal and regulatory provisions, technical standards for generation, production, storage, transportation, and distribution of liquid fuels, gas and electricity. It audits compliance with the technical standards of the sector and checks the quality of services provided to users. The natural gas business, transportation, distribution and marketing are subject to regulation.

Power Sector

The current legal framework has been in effect since the 1982 and defines the duties and activities of the institutions as detailed below. In March 2004, second generation reforms were approved that attempt to improve certain aspects, as noted in the text, deriving from experience with market operations.

The Economic Load Dispatch Center - CDEC (Centro de Despacho Económico de Carga) is in charge of the joint operation of generator plants and lines of the electric system, for the purpose of achieving the minimum cost possible in power supply, with an established security. It is made up of the generation and transmission companies that have an installed capacity and length of transmission lines above prefixed amounts. The Board of Directors is made up of one representative from each company.

Although **Free Customers** were those above 2 MW of installed power and represented 55% of the market, recent reforms reduced the limit to 500 kW with the idea of expanding the space for free negotiation.

The **Regulated Market** is made up of the distribution companies and customers with an installed power below the limit for Free Customers. The so-called Node Prices are the maximum for transactions in each bar of the system, determined by the National Energy Commission every six months, which should not have a difference greater than 5% of the average prices for the last four months of the free market (the reforms of March 2004 reduced the limit from 10% to 5%).

There is the **Competition Tribunal** that was established on the basis of Decree Law 211 of 1973, amended by Law No. 19,911 of November 2003 that came into effect in February 2004 and began to operate in July 2004.

Besides what has already been pointed out, the amendments of March 2004 attended to certain topics, which included:

- They specified the procedures for determining transmission tolls, in order to enable the development and remuneration of 100% of the transmission system to the extent that it is efficient.
- They specified the toll norms, particularly for sub-transmission, to enable bidders other than distribution companies access to Free Customers located in the concession areas of the latter.
- They introduced the market of supplementary services, establishing the transaction and valuation of technical resources and making it possible to improve the quality and security of services.

- They establish a mechanism for solving disputes within the power sector, both between companies and the authority, and among companies, by establishing a highly specialized panel of experts made up of seven professionals, two of which will be lawyers and the other five engineers and/or economists with much expertise in the sector.
- Conditions were improved for developing small, non-conventional power plants, mostly using renewable energy, by opening the electric markets to this type of plants, establishing the right to dispatch energy through the distribution systems, and exemption from payment of tolls for the use of the trunk transmission system.

Chile has 4 electric systems: the Large North Interconnected System - SING (Sistema Interconectado del Norte Grande) with 33.9% of all installed power, the Central Interconnected System – SIC (Sistema Interconectado Central) with 65.2% of all installed power, and the systems of Aysén and Magallanes, with 0.3% and 0.6% of all installed power.

In the SING, in terms of generation company ownership based on installed power, four investment groups are participating: ENDESA with 22% and two companies, AES with 27% and two companies, Edelnor with 21% and one company, and Electroandina with 30% and one company.

In the SIC, the active business groups with a share in installed power are: ENDESA with 51% and four companies, Chilectra Generation – AES with 22% and 3 companies, and Colbun with 17%.

Gas Sector

The sectoral reforms set up since 1978 established a normative framework that regulated the functions and activities of the following actors.

Production Companies, especially the **National Petroleum Company** – ENAP (Empresa Nacional del Petróleo), which operate individually or in partnership with third parties, extract natural gas from reservoirs located in Chilean territory and control 80% of all fuel demand, while the other 20% is covered with independent imports.

There is freedom to **import** natural gas, complying with certain administrative and legal requirements.

Transportation Companies provide the natural gas transportation service from the point of entry to the transportation system to the point of delivery to distribution companies. For consumers contracting directly with production companies, and warehouses, the ENAP and private companies intervene. These are natural monopolies through non-exclusive concessions, and there may be several for the same point of origin and destination of transportation, with regulated tariffs.

Trade Companies are those who purchase and sell natural gas on behalf of third parties.

Distribution Companies provide the service of gas supply to final users that do not contract their supply independently. They constitute a natural monopoly based on non-exclusive concessions, and there may be several for the same distribution area or points of origin and destination of transportation. Distribution companies purchase natural gas directly from production companies or marketing companies.

Consumers are small and large final users. Large Users may contract their supply of natural gas independently for self-consumption, negotiating the transaction conditions freely, without prejudice to the rights granted to distribution companies.

The recent problems of supply restrictions from Argentina created a secondary market with the quotas. However, in the power sector, the generating companies optimized the coordinated use with production from the other plants of the system.

PARAGUAY

It is the largest exporter of hydroelectric energy in the region, but it has no oil or natural gas reserves.

The Ministry of Public Works and Communications coordinates the energy sector.

The Paraguayan electrical subsector is vertically integrated and no plans exist to separate the activities. The **state integrated utility - ANDE**, (Administración Nacional de Electricidad) simultaneously performs the roles of regulator, operator and supplier of generation, transmission and distribution services. ANDE's approval is required in order to renew or correct any electrical energy services concession or project to expand or modify existing infrastructure.

URUGUAY

The National Energy Direction of the **Industry, Energy and Mines Ministry** is responsible for long term energy planning, the development of energy policy and the supervision of public companies that operate in the electricity and hydrocarbons subsectors, as well as the company that distributes gas through a distribution network in Montevideo.

The electrical subsector does not have a market structure, through legislation provides for a wholesale electrical market. The Uruguayan state utility - UTE (Administración Nacional de Usinas y Transmisiones Eléctricas), is a monopoly in all segments of the electrical business and functions in a vertically integrated manner. There are no independent producers yet, though the law provides space for them.

In 1997, the **Regulator UREE** (Unidad Reguladora de la Energía Eléctrica) was created to supervise the operation of the sector, and the Manager of Electric Market - ADME (Administración del Mercado Eléctrico) was established to put the market into operation.

The company providing the service freely determines gas prices on the network, and its only obligation is to ensure that transportation and distribution rates are offered in a non-discriminatory and public manner.

2.4 ANDEAN REGION

The five countries of the Andean Region that constitute the Andean Community of Nations are rich in energy resources, and petroleum, natural gas and hydroelectricity are part of the patrimony of these countries. The self-supply of energy has always been an achievable goal for all of these countries, and for that reason the energy integration process began only a few years ago, in an effort to achieve the economic efficiency that complementarities existing among the countries could provide.

The harmonization of the laws for trading electricity internationally between Colombia, Ecuador, Peru and Venezuela has made satisfactory progress in recent years, promoted by the ministries of energy and implemented through the joint efforts of the regulatory agencies of the four countries.

On December 19, 2002, the Andean Community Commission (Comisión de la Comunidad Andina) adopted Decision 536 with a general framework for subregional electrical interconnection and electricity trading in the community.

The institutional structure of the energy sectors of the Andean Region countries is given below.

BOLIVIA

Bolivia's large natural gas reserves make it the largest supplier to the south cone and open the possibility of exporting liquefied gas to North America.

Electrical Sector

The companies were capitalized based upon a March 1994 Law known as the Capitalization Law ("Ley de Capitalización"); complemented by the Sectoral Regulation System created by the Sectoral Regulation Law SIRESE ("Ley del Sistema de Regulación Sectorial"). The purpose of the system is to regulate, control and supervise electricity, hydrocarbon, transportation, telecommunication, water and other services. SIRESE includes the General Superintendence and Sectoral Superintendences, as well as the Electricity Superintendence and Hydrocarbons Superintendence.

The **Vice-Ministry of Electricity and Alternative Energies** of the Ministry of Public Works provides regulations for the sector.

The **Electricity Superintendence** serves as the Regulator and Controller of the electrical market and supervises the operation of the National Committee of Load Dispatch - CNDC (Comité Nacional de Despacho de Carga) that has the responsibility of managing the Wholesale Electricity Market and coordinating generation, transmission, and Load Dispatch at a minimal cost on the National Interconnected System.

All **Generating Companies** are owned or controlled by the private sector, and produce electrical energy. The most important are: Corani, Guarachi, Valle Hermoso, Cobee, Río Eléctrico, Hidroeléctrica Boliviana, Synergia and La Compañía Eléctrica Bulo Bulu.

The **Distributing Companies** of the main centers of consumption are: Electropaz S.A., Emprepez and Seysa in La Paz, CRE LTDA. in Santa Cruz, ELFEC S.A. in Cochabamba, ELFEO S.A. in Oruro, CESSA in Sucre and SEPSA in Potosí. The private companies that have the largest share of the sector are Iberdrola, which is associated with General Electric and American International Group. PPL Global from United States is also present.

The **Wholesale Electrical Market** is where energy, power and other complementary services transactions take place. It includes the Contract Market, where sellers and buyers freely agree prices, and the Spot Market, where prices are set on an hourly basis. Part of the contract market includes obligatory distributors' contracts, which that must contract 80% of the peak demand.

The Electricity Transportation Company (Empresa Transportadora de Electricidad) manages transmission on the National Interconnected System and belongs to the Red Eléctrica de España group. The Isa-Bolivia Company, a subsidiary of the Isa de Colombia group, is also involved.

Regulated Consumers are all those that are connected to a distribution company and do not reach the demand ceiling.

Unregulated Consumers are those that exceed 1 MW of demand and are permitted to negotiate freely with generators. Four unregulated customers carry out transactions on the wholesale market.

A noteworthy effort has been made in rural electrification, and in the 1998-2001 period, coverage to isolated villages doubled from 13.7 to 24.5%. The Government promotes the Bolivia Rural Electrification Plan – PLABER, through the Vice-Ministry of Electricity and Alternative Energies, to develop, encourage, and promote electrification for productive development.

Gas Sector

The agency that governs the sector is the **Ministry of Mines and Hydrocarbons**; it issues the necessary regulations through the Vice-Ministry of Hydrocarbons and the General Direction of Hydrocarbons.

The **Hydrocarbons Superintendence** is in charge of regulating, controlling and supervising activities involving concessions and licenses, natural gas and liquid hydrocarbon transportation, petroleum refining and marketing, internal marketing of refined petroleum products and natural gas, and the prevention of monopolistic practices.

The capitalization of the **stated owned petroleum company YPFB** (Yacimientos Petrolíferos Fiscales Bolivianos), allowed it to abandon productive activity and become the Bolivian counterpart as representative of the State in shared risk contracts in exploration, production, and marketing.

COLOMBIA

Colombia is a producer of oil and coal, which go to internal supply and for export.

The **Ministry of Mines and Energy** is the sectoral authority, establishes the policies, regulates, plans and coordinates all activities relating to the electricity utility.

The **Mines and Energy Planning Unit – UPME** (Unidad de Planificación Minero Energética) is an administrative unit under the Ministry of Mines and Energy, has administrative and budgetary autonomy, is responsible for integral indicative planning for the sector, determining the energy requirements of the population, and defining long, medium and short-term plans for the sector.

The **Energy and Gas Regulatory Commission – CREG** (Comisión de Regulación de Energía y Gas) is an administrative unit under the Ministry of Mines and Energy. It regulates the supply of public power and gas utilities. In the case of natural gas, it regulates the activities of transportation, distribution and marketing. It must also promote free competition and avoid the abuse of dominant position in the supply of public power and natural gas services. The CREG has promoted a framework of supervised freedom based on norms and tariff formulas for agents in the natural gas supply chain.

The **Domestic Public Services Superintendence – SSPD** (Superintendencia de Servicios Públicos Domiciliarios) is under the Ministry of Economic Development. Its duties include inspection, oversight and control of all companies providing public household services, including natural gas, and supervision of the CREG.

Power Sector

The 1994 Law restructured the Colombian power sector, placing limits on vertical integration, incorporating the marketing activity into those of generation, transmission and distribution, creating the wholesale electricity market, including private participation and an institutional layout that is described below.

The **Electric Interconnection Company – ISA** (Empresa de Interconexión Eléctrica S.A.), with a majority of state capital (72%), is responsible for most of power transmission in the country. Furthermore, it is in charge of managing Wholesale Power Market and operating the national transmission system.

There are currently 40 **Generating Companies** in which the private sector has 44% of all shares.

There are 33 **Distribution Companies** with an approximate share of 50% of all private capital stock.

Generating companies, distribution companies and companies dedicated exclusively to this activity may carry out the **Electricity Trade**. There are approximately 66 trading companies.

The **Unregulated Users** are empowered to negotiate their supply directly and are those with a demand greater than 100 kW or 55 MWh per month. They represent some 40% of the national demand.

An international assessment of power market operation established that the results are satisfactory, once overcoming the problems caused by the large state presence in the distribution companies, especially the lack of payment guarantees for energy delivered by the generation companies.

Gas Sector

The State manages the country's hydrocarbons through the **Petroleum Colombian Company – ECOPETROL** (Empresa Colombiana del Petróleo), which carries out oil production and transportation directly or in association with private companies. The owner of most of the oil products refining and storage business, over the past years it has transferred its gas pipeline transportation system facilities to the gas company and has sold its share in natural gas distribution companies. ECOPETROL tends to work solely on upstream activities.

The **Gas Colombian Company – ECOGAS** (Empresa Colombiana de Gas) is in charge of projecting, building, operating, managing and commercially exploiting its gas pipelines. Initially, it had the gas pipelines transferred from ECOPETROL and, later on, the new gas pipelines that have entered into operation.

ECUADOR

Ecuador produces oil for export and last year completed the construction of a second oil pipeline to double its transportation capacity to the port of delivery.

The **Ministry of Energy and Mines** is responsible for defining policies for the sector; however, the Electric Sector Law (Ley de Régimen del Sector Eléctrico) does not mention any function for the Ministry in the sector.

Electrical Sector

The energy sector of the region implemented changes to replace a structure that was based on companies that controlled an entire subsector, with systems where the purpose of competition is to benefit customers with better prices and better service. The Ecuadorian energy sector has not ignored this global tendency and the Electric Sector Law, issued in October 1996, modified the structure that had existed up to that time. The reform involves separating the activities into three businesses: generation, transmission, and distribution, and the creation of a Wholesale Electrical Market.

The regulatory body, CONELEC, had to wait more than a year to become operational, and began functioning only in November 1977. It was not until April 1999 that the new structure of the sector began operation with the establishment of the wholesale electrical market, where transactions are carried out.

The actors and their functions are described below.

The **Regulator CONELEC** (Consejo Nacional de Electricidad) establishes the regulations for economic dispatch and governs the operation of the Wholesale Electrical Market, monitors compliance with the law, and controls the fulfillment of regulations, determines concessions, establishes the basis for calculating regulated rates, and applies them.

The **Energy National Control Center CENACE** (Centro Nacional de Control de Energía), whose members are generation, transmission, and distribution companies and large consumers, is responsible for the technical and economic management of bulk energy to guarantee the proper operation of the National Interconnected System (SNI). It is in charge of administrating transactions in the Wholesale Electrical market (MEM).

The **Solidarity Fund** (Fondo de Solidaridad) is a state holding company that holds the shares of companies that were previously owned by the Instituto Ecuatoriano de Electrificación, INECEL, the vertically integrated state company.

The **Generators** operate their companies and assume the commercial risks inherent to production under the principles of transparency, free competition and efficiency.

The same rules for private sector participation apply to the sole **Transmission Company TRANSELECTRIC** (Compañía Nacional de Transmisión Eléctrica S. A.), which was established with the state-owned shares of SNI, as those that were established for generating companies. The transporter is required to expand the system according to plans prepared for it and approved by CONELEC.

The **Distribution and Trade** of electrical energy is carried out by 20 limited companies under concession contracts granted by CONELEC for a specific geographical area based on competition by comparison.

Large Customers are allowed to negotiate directly with generators for the energy they require, and their demand is equal to or greater than 1 MW.

At the present time most of companies are publicly owned; the Solidarity Fund owns Transelectric, one of the largest generating companies and owns most of the shares of the distribution companies; Municipalities and Provincial Councils hold a minority share. Attempts to privatize or even introduce private managers into distribution companies have failed and few private actors operate generating companies.

The actors in the above-described situation are mostly state companies that are organized as limited corporations with shares. CONELEC has taken control of the only private distribution company. Small hydroelectric power plants sell electrical energy directly to large customers.

Gas Sector

There is no explicit legal framework for natural gas, but there are some guidelines for selling gas produced in fields that can be operated by private companies. Petroecuador manage the trade. Contractors that make contracts for hydrocarbon exploration and production can sign additional contracts for producing free natural gas, if they discover commercially viable fields in the contract area.

The **Ministry of Energy and Mines** has a more specific role in the case of hydrocarbons; in addition to defining policies for the sector, it regulates and controls the operation of the sector through the **National Direction of Hydrocarbons**.

Petroecuador is responsible for trade, and is the state petroleum company that handles production, transportation and distribution.

Since 2002, MachalaPower has been operating a simple cycle natural gas power plant supplied by the reservoir in the Gulf of Guayaquil.

PERU

Peru has a large potential to participate on natural gas markets with its Camisea reserves that began to be exploited in 2004 with the arrival of the gas pipeline from that field to Lima.

The **Ministry of Energy and Mines** (MEM), through the Electricity General Direction as a technical regulatory body, is in charge of proposing and/or issuing standards for the power generation, transmission, distribution, and marketing activities, signing power concession contracts, granting power generation approvals, sectoral planning, and also promoting the development of the sub-sector.

Power Sector

Since the reforms of 1990, this sector has a normative framework that is oriented to liberalizing the market and free competition, with the activities of the sub-sector separated, on which basis assets were transferred to the private sector and investments were captured. The expansion of installed capacity by private initiatives has received investments for an estimated total of 4,600 million dollars from 1993 to 2003 (2,700 of which were from the private sector). Of the total investments, generation received 2,400, transmission received 612 and distribution received 1,628.

This normative framework covers the following participants in the power sub-sector.

The **Energy Investment Supervision Body – OSINERG** (Organismo Supervisor de Inversión en Energía) is in the scope of the MEM to supervise energy sub-sector activities to ensure that they comply with the legal provisions and technical standards of the power and hydrocarbons sub-sectors, and fulfill the provisions relating to environmental protection and conservation. The resources for OSINERG come from contributions made by the companies of the sector, and its duties are normative, regulatory, supervisory, auditing, and penalizing. It also fixes tariffs for public utilities, transportation and distribution.

The **System Economic Operation Committee – COES** (Comité de Operación Económica del Sistema) is made up of the generation and transmission companies of the interconnected system, with the purpose of minimal cost dispatch and settlement of transactions on the market. The COES Board of Directors consists of 9 members, 8 representatives from the generation companies and 1 from the transmission companies.

Also attending with a right to speak but not to vote is a representative of the distribution companies and one of the Major Customers. Taking into account that several generation companies belong to the same group of investors, each group may have a maximum of 2 board members.

Electric Companies are power concessionaires and authorized agencies, which may be generation, transmission and distribution companies.

Free Customers (demand over 1 MW) negotiate directly with their suppliers under a competition regime.

The Institute for Competition and Customer Defense – INDECOPI (Instituto de Defensa de la Competencia y de la Propiedad Intelectual) is complementing the direct participants. In the power field, it oversees compliance with the laws of the market and defends the interests of consumers and companies that may have been adversely affected.

Ownership of the Power Sub-sector

The largest private owners of the sector are:

In generation with the percent share in effective installed power: Endesa with 23.3% (Spain), Duke Energy with 10.4% (USA), and Tractebel with 6.5% (Belgium). The Peruvian state retains 47.4% of all installed power. In transmission: ISA (Colombia), Hydroquebec (Canada) and *Redes de España* (Spain). In distribution: Endesa and SPG.

Gas Sector

The Peruvian natural gas sector is organized with a vertical segmentation. The transportation companies and distribution companies must allow third parties free access to their systems' transportation capacity, provided it is not committed to supply contracted demand.

The gas market participants are as detailed below.

The **Ministry of Energy and Mines** (MEM), through the Hydrocarbons General Direction (DGH), is the governing body with normative duties, the concessionary body, and the promotional body. It is in charge of granting licenses and concessions for the exploitation of hydrocarbon activities, both oil and natural gas.

Perúpetro is a private law state company. In its capacity as Contractor, it is in charge of promoting, negotiating, formalizing, and supervising the fulfillment of license contracts or of exploration and exploitation services. It retained these activities from the former corporation, *Petroperú*.

The **Energy Investment Supervision Body – OSINERG** has the same duties as described under the power sub-sector, because its duties include the two sub-sectors.

Production companies have license contracts or contracts for hydrocarbon exploitation services, that extract natural gas from reservoirs located within the national territory.

The Law allows them to freely dispose of gas production, subject to free competition, they may sign freely negotiated supply contracts with marketing companies, distribution companies and large users.

Marketing companies are individuals or corporations that purchase and sell natural gas transportation or distribution capacity, on their own account or on behalf of third parties, being neither concessionaires nor transportation companies.

Transportation companies are enabled for natural gas transportation service from its entry into the transportation system to the point of delivery to loaders (distribution companies, consumers that contract directly with the producer).

Distribution companies are enabled to provide gas supply service to final users that do not contract their supply independently, with prices regulated by OSINERG. The distribution companies carry out natural gas purchasing operations, negotiating directly with production companies or marketing companies.

Consumers are small and large final users. Large users may independently contract their natural gas supply for self-consumption, freely negotiating the conditions of transaction, without prejudice to the rights granted to distribution companies for their habilitation.

Market Operation Experiences

There are a few aspects that arise from market operation experience, which may be summarized as follows:

Since transmission signals do not work entirely well, it has been decided that the indicative plan for the sector, developed by the MEM, should not only be indicative in the case of transmission, but should also be binding, thus making it possible to promote system expansion by virtue of the established requirements.

Tariffs are set on the basis of marginal cost of the 48-month work plan. There is then the issue of discretionality for OSINERG (excess of power) if it is the one to select works to be included in the base plan.

The distribution companies are obliged to contract all the energy they require for their customers and show the supply guarantee by December of the current year under penalty of losing the concession. However, since marginal costs are above the bus prices, the generation companies have rejected that contracting, and the MEM has decided to dictate an emergency decree to free the distribution companies from the requirement established in the Law of Concessions.

CAMISEA Field

Exploitation: Reservoir exploitation requires an initial processing to separate dry gas from the liquids. Therefore, there are two pipelines that run parallel for the initial stretch and then separate, the one that transports liquids with capacity of 33,000 barrels per day that terminates in Pisco on the southern coast, and another for dry gas that continues northwards to Lima. The initial part of this pipeline has larger capacity tubing (1000

million cubic feet per day) in order to limit disturbances to an environmentally sensitive section of virgin forest. (It was built without access roads, transporting materials by river and helicopter). Then the tubing section is reduced to adjust to the country's domestic demand (400 thousand cubic feet per day). Calculated reserves are 8.7 TCF, which represents 60 years of domestic consumption.

Exploitation is under the responsibility of a consortium that includes Pluspetrol, the head of the consortium, Zonatrak (Algeria), SK (Korea) and Hunt (USA).

Transportation: TGT (Techint, Argentina) is in charge of the gas pipeline.

Distribution: the Company *Gas Natural de Lima y Callao* (GNLC) of Tractebel, from Belgium.

PAGORANI Field

With an initial reserve estimate of 3.0 TPC, final exploration has been awarded and is being signed with the same consortium that exploits Camisea, only that now it is headed by Hunt.

Oil

Exploitation: Pluspetrol manages oil exploitation in the Northeast (the largest) while Petrobras, Petrotech and Saped (China) are in the North. Petrobras is offshore. There are currently fewer participants than before privatization.

Refining: Before, it was a monopoly activity in the hands of the state-owned company Petroperú. Now three players participate: Repsol, with the largest refinery and another small one; Petroperú with 4 small refineries; and Maple, located in the Central Forests with supply to a limited territory due to its geographic situation. There is competition between Repsol and Petroperú, which due to production limitations cannot have very different prices.

Wholesale Distribution: Participation has very few restrictions, and 25 are qualified. The demands for a minimum of six months advance distribution are not required for reentering companies. Some manage limited volumes without inventories. An attempt is currently being made to better define the rules for participation as a wholesaler. Before, this was a state monopoly.

Retail Distribution: Since before the reforms there was a free market, and this remains the same.

Lubricants: Before the reforms, the state-owned company Petroperú supplied 50% of the market and Mobil supplied 26%. With the privatization, Mobil purchased that 50% and took control of the market, reducing the level of competition.

Levels of Competition, INDECOPI's Vision

Final consumer prices have shown a downward trend. However, in terms of tariffs there is no real competition because the regulator, who takes into account free market prices

as a reference, fixes tariffs and generally those prices have been higher than the regulated prices.

The Law of Concessions establishes the limits for participation on the market, for vertical integration over 5%, and horizontal over 15%, for stock ownership transactions, after which the companies should notify INDECOPI and the Free Competition Committee reviews the effects that the levels of participation could have on competition in the respective market.

INDECOPI is in charge of different issues and rooms organize them. These rooms may be the second instance in the claims that are processed.

The largest participation in the generation segment belongs to the group of plants belonging too the Peruvian state and, in second place, to ENDESA.

The evolution of the Hirschman Index – Herfindhal (IHH)⁸ has declined by 25% from 1997 to 2002, reaching values that are relatively high for international levels, but explainable in a market the size of the Peruvian one,⁹ a reduction that is similar in percentage to the bus prices.

Regulation and Tariffs

In Peru, there is twelve years of market experience, but the former Tariff Commission only joined OSINERG since 2001.

As part of that experience, note that the transmission trunk had free access and was regulated, while the branches were not regulated considering that they had to be built for and only for a specific function. However, experience has shown that later developments obliged using those branches for additional purposes, feeding new loads or receiving new generation, and access problems arose. Therefore, since December 1999, branches are also under the general transmission regulations.

Customers of less than 1 MW have tariffs that are regulated by OSINERG, based on established bar prices. Customers of over 1 MW are free, but network use has regulated tolls.

Bus prices are set for 4 years, but the drought supported by hydroelectric plants since eight months ago have pushed prices for Free Customers upwards. Regulated tariffs should normally remain within a band of more or less 10% of the free market price. However, since regulations demand that large customers present their contracts to the regulator, for contracts containing aspects other than general negotiations between the generation company and the customer, such as assets transfers and others, prices per kWh are not entirely transparent to the regulator. This caused serious problems for precisely determining the free market price.

Apparently, competition has been sacrificed by the presence of regulated bus prices for distribution companies.

Interconnected System Economic Operation Committee, COES

To date, there are 14 generation companies and 5 transmission companies. Apparently there is a lack of mechanisms for planning expansions, and a lack of a defined process for transmission expansion decisions.

Also, there is the perception that regulated bus prices have remained below free market prices or even below spot market prices and hourly settlements, which has caused claims from the generation companies.

Furthermore, the possibility of including natural gas from Camisea in the gas pipeline that has entered operation, in existing and new plants, bodes well for a price reduction.

VENEZUELA

Due to the size of its oil reserves, Venezuela is an important supplier in the world, among the top ten of the planet.

The **Ministry of Energy and Mines** (MEM) is responsible for the direction of the sector and, through the Vice-minister of Energy, formulates sectoral policies, develops plans and audits the activities of the power, oil and gas, and mining sectors. It defines regulatory policies and is in charge of transmission and distribution concessions, as well as granting authorizations for generation.

Power sector

The Power Sector Law issued in September 1999, establishes the creation of a Wholesale Power Market, based on the principle of free competition in energy production and marketing activities. In December 2001, the Organic Electric Utilities Law was passed, modifying the terms initially established for commencement of operations by the regulatory agency, the **Electric Power National Commission – CNEE** (Comisión Nacional de Energía Eléctrica) and the **Electric System National Administration Center – CNG** (Centro Nacional de Gestión del Sistema Eléctrico), in charge of Wholesale Power Market administration and operation. Market operation has taken a long time, and the terms have had to be modified.

In the power sector, 13 electric companies operate with diverse degrees of vertical integration, eight of which are privately owned. Four of these have AES of the United States as its majority shareholder; one belongs to Enron, another to Venezuelan shareholders, and another to a paper producer and the Public Service Enterprise Group (PSEG Global).

Gas Sector

The **National Gas Agency – ENAGAS** (Ente Nacional del Gas), which is autonomous but reports to the Ministry of Energy and Mines, relates the gas production sector to consumers, seeking the incorporation of private domestic and international capital, and supervising the conditions of equity among private and public players, under defined rules and regulations to promote the development of the gas industry.

Tariff setting for final consumers is under the Ministry of Energy and Mines and the Ministry of Production and Commerce, while ENAGAS develops the bases for tariff definition. Retail consumer tariffs are made up of the gas purchase price, the transportation tariff, plus the distribution tariff.

2.5 THE CARIBBEAN

The Caribbean subregion consists of countries that are mainly islands in the Caribbean Sea; they are importers of energy with the exception of Trinidad and Tobago, which have petroleum and natural gas. The countries have small markets with rather limited possibilities for the participation of various companies competing for the market, so vertically integrated companies are the predominant option.

The institutional structure of the energy sector of each of the countries is described below.

BARBADOS

The “**Ministry of Energy and Public Utilities**” coordinates the activities of the sector in the country.

The Barbados electrical sector has always been private and the principal company is “**Barbados Light and Power Co. Ltd. (BL&P)**”, which was established in 1911. The total installed capacity consists of thermal plants, mostly diesel plants. The cement and sugar industries produce their own electricity, rather large amounts for the Barbados market, and sell their electrical surpluses to the electric company.

Through the “**Public Utilities Board,**” the State controls the rates the monopolistic company sets for the residential, commercial and industrial sectors, and recognizes a rate of return on the company’s assets. Since generation is totally thermal, the government approved rate for BL&P includes a monthly adjustment for variations in fuel import prices.

Barbados produces a small amount of petroleum that is handled by the “**Barbados National Oil Company (BNOC)**”. Due to the lack of a refinery, that production is sent to Trinidad and Tobago in return for refined products. Natural gas production is also sufficient to satisfy national demand.

CUBA

The **Ministry of Economy and Planning** defines energy policies on a national level.

Cuba adopted the sole purchaser model in 2000, keeping the vertically integrated state company, the **National Electrical Utility – UNE** (Unión Eléctrica Nacional), which is the national company in charge of power generation, transmission, distribution, and marketing throughout the country. The UNE includes: (i) the National Load Dispatch, which is responsible for operating the generation plants and transmission lines; and (ii) six departments under which are a series of companies (projects, construction, etc.), including 14 distribution companies. It operates an independent producer in a Private-State company that is expanding its share to a new plant that is under construction.

The UNE reports to the **Ministry of Basic Industries (MINBAS)**, which sets the overall policy guidelines and approves the tariff schedule and levels proposed by the UNE. Independent power production companies participate who, through concessions and licenses, sell the generated energy to the UNE and whose participation is subject to

centralized minimum cost planning. There is a sole tariff for the entire national territory, environmental protection is attended to, and there are service quality standards that promote energy savings and efficiency.

There is one independent power producer operating one power plant with a shared ownership with the government and they have a new power plant under construction.

GRENADA

The **Ministry of Works, Communications & Public Utilities** is in charge of defining policies and coordinating the energy sector.

The electrical sector consists of a state monopoly under the company, **Grenada Electricity Services Limited (GRENELEC)**, which is involved in the entire chain from generation to distribution; there is a subsidized rate system for residential, commercial and industrial sectors. The electrical sector subsidy is implemented through a pricing policy for fuel that is consumed in power plants tax free.

GUYANA

Guyana Energy Agency coordinates the activities of the energy sector and defines policies for the sector.

In 1997, the public company, **Guyana Electricity Corporation (GEC)**, was partially privatized; it is responsible for electrical generation, transmission and distribution in the major populated areas of the country. The state company, LINMINE, which produces bauxite, is also part of the electrical sector; it generates energy for its own needs and for the areas around the community of Linden. GEC is interconnected with LINMINE and purchases part of the power it generates. Guyana Sugar Corporation Limited (GUYSUCO) is another major producer and uses the energy generated for its own needs. The public company, GEC, operates under the directives of the Office of the Primer Minister (OPM). Energy transactions between LINMINE and the public company, GEC, are arranged by mutual agreement. The Commission of Public Companies sets rates for final users. The Commission of Public Companies also approves the expansion plan that is developed by GBEC. In 2003, the Government bought back the shares of GEC that were sold to a private company.

HAITI

The electrical sector is coordinated by the “**Minister des Travaux Publics, Transport et Communications (MTPTC)**” through the Bureau des Mines et de l’Energie.

The structure of the country’s electrical system is a state monopoly operated by “**Électricité d’Haïti (EdH)**”. The president of EdH is the President of the Republic, who delegates the office of the General Manager to the Minister of MTPTC. The president of EdH issues general directives about EdH policies, and the Administrative Council regulates and approves rates, investment plans and loans. The rate structure is based on the long-term marginal cost and includes social considerations for low-income families.

JAMAICA

The **Ministry of Commerce, Science & Technology**, directs the energy sector.

Electrical generation, transmission and distribution is managed by Jamaican Public Service Company (JPSCo), which was a state company until March 2001 when Mirant Corporation of United States purchased 80% of its shares, and it came under the control of that company. Though JPSCo owns the main generation facilities in the country, there are three independent producers (IPPs) from which it purchases energy under long term contracts.

The **Office of Utilities Regulation** is the regulatory body that establishes operating standards and protects consumers and the environment.

DOMINICAN REPUBLIC

The National Energy Commission (Comisión Nacional de Energía) was created in 2001 with general authority over the entire energy sector and all its activities. It has legal status, autonomy, and is responsible for proposing and adopting policies, analyzing the operation of the sector, developing plans, preparing regulations, monitoring the operation of the market, and promoting the rational use of energy.

Electrical Sector

Reforms to the electrical sector were introduced in 2001 through the promulgation of the Electricity General Law (Ley General de Electricidad) No. 125-01, which includes a free market and allows vertical integration with a limit on market domination. The institutions of the sector and their functions are described in the following paragraphs.

The **Electricity Superintendence** (Superintendencia de Electricidad) is in charge of setting rates and tolls that are subject to regulation, authorizing changes in indexed rates, monitoring and supervising compliance with laws, regulations, and technical standards, supervising the behavior of the market to avoid monopolistic practices, and granting concessions.

The **Coordination Entity** (Organismo Coordinador) is responsible for the operation of the system, power dispatching, transmission, distribution and marketing; it also calculates and appraises settlements of market transactions. It includes all companies from all activities.

In 1999, the **integrated state corporation CDE**, (Corporación Dominicana de Electricidad) was divided into 7 Business Units and one Corporate Unit to operate as independent companies and in order to privatize them.

In the area of **Distribution**, AES Corporation acquired 50% of the shares of Distribuidora del Este, and UNIÓN FENOSA acquired Distribuidoras del Norte y Sur.

In **Generation**, the New Caribbean Investment consortium acquired Generadora Itabo y Haina.

The **Dominican Corporation of State Owned Electric Utilities CDEEE** (Corporación Dominicana de Empresas Eléctricas Estatales) replaced CDE and includes the Electric Transmission Company - EDET (Empresa de Transmisión Eléctrica Dominicana) and the Dominican Hydroelectric Generation Company - EGEHID (Empresa de Generación Hidroeléctrica Dominicana), which operate and maintain 18 hydroelectric plants in the country involving a total of 411 MW.

Despite the reforms and the participation of private companies, restrictions on the supply have not been overcome and the indebtedness of the companies that supply energy has increased.

In September 2003, the Spanish company, Unión FENOSA, reached an agreement with the State to return the shares of the two distributing companies it acquired in 1999 because of a “critical condition involving cash flow and financial health”; the re-nationalized distributing companies of North and South continue operating independently, but now all the shares belong to the State.

SURINAM

The “**Ministry of Natural Resources**” supervises the operation of the energy sector.

The electrical sector is a state monopoly and “**Energie Bedrijven Suriname**” (EBS), is involved in the entire chain from generation to distribution. Part of the energy distributed by EBS is generated by the aluminum producing company, Suriname Aluminium Company (SURALCO), which is the largest self-producer in the country. Under the “Brokopondo” agreement, the Government agreed in 1957 to purchase 80 GWh of hydroelectric power each year from SURALCO until 2045.

TRINIDAD & TOBAGO

The Ministry of Energy and Energy Industries determines the energy policy and coordinates the activities of all subsectors.

The **Trinidad and Tobago Electricity Commission** (T&TEC) is authorized to generate, transmit, transform, and distribute electrical energy and sell it to consumers anywhere in the country. T&TEC has a Committee appointed by the President of the Republic that it is not an executive committee and sets the policy guidelines for the company. The sector is a state monopoly, and the **Regulated Industries Commission** (RIC), state regulatory body, set rates as the successor to the Public Utilities Commission; it controls water, electricity and telecommunications.

The country is the largest producer of petroleum and natural gas in the entire Caribbean. BP Trinidad and Tobago (BPTT), which is 70%, owned by British Petroleum and 30% by Repsol-YPF, is the company that reports the largest production. Petroleum Company of Trinidad and Tobago (Petrotrin) is the company with the second largest crude oil production.

Natural gas production has seen the largest increase in recent years because of the increase in reserves, the large petrochemical complex, and the operation of the liquefaction plant for export.

3. Summary of the current situation

Table 1 presents the countries of the region according to the different structures their sectors currently have; the vertical axis shows the ownership options of the sector and the horizontal axis shows the operating options of the sector; the classifications are explained below.

Ownership Options

a. Exclusive state ownership

The vertical axis begins with the original position of most of the countries prior to the reforms, exclusive state ownership where all the assets of the electrical system are state property.

b. Mixed ownership

Moving away from the origin of the two axes, there is a second option where private investors are the shareholders of companies in which the state has a share. There are also a few entirely private companies that participate partially in the sector.

c. Private ownership

Finally, the option furthest from the origin involves countries where the electrical system is primarily privately owned. This case involves two options, the first with vertical segmentation and obligatory separation between the activities of generation, transmission, and distribution, while the second option allows vertical integration.

Operating options

d. Central control

Traditionally, the entire electrical chain was considered to be a natural monopoly, so it was logical for a single entity to own and operate the electrical service in an area; this involved either State ownership or a subsector with private companies. For years, the electrical subsector was considered to be monopolistic and a single company managed the concession.

Most of the countries of the region based their electrical service on a single state-owned company.

e. Single buyer

This principle has been applied in the region for several years and has allowed private actors to become involved in a limited way; this has taken place especially in generation, as part of a process in some cases and as a complete step in others.

f. Integrated and autonomous

This type of coordination involves a different distribution of roles between the State and the company(s) that operate in the subsector. They carry out their activities according to their own initiative, planning, implementation and rationale. The State has to approve the corresponding decisions on investment, rates, etc.; thus on its own or through an entity that represents civil society (public commission) it undertakes the functions of regulator since a public service is involved.

Therefore this method does not imply vertical or horizontal disintegration. The integrated organization is the dominant method used in the electrical subsectors of industrialized countries such as USA and Germany. Many private, public and mixed companies participate in these subsectors. However, there is no effective competition among them, because often they have exclusivity under a concession contract for a supply area, or areas or type of customer demarcates the companies.

g. Open market

Natural monopolies remain in force only for electrical transportation and distribution activities where disputability is considered to be lacking. In systems that are sufficiently large to permit and guarantee competitive behavior, several actors can compete in generation and marketing segments.

Table 1: Current situation of the electrical systems

OWNERSHIP OPTIONS ↑	(c) Private Ownership	Vertical Segmentation with Incompatibility of Functions				Argentina (***) Bolivia(**) Guatemala(**) Panama(**)
		Vertical Integration Allowed			Barbados	Chile(**) El Salvador(**) Peru(**) Dominican R.
	(b) Mixed Ownership		Cuba Ecuador Jamaica México Trinidad & Tobago Honduras	Costa Rica Grenada Guyana Uruguay Venezuela	(*) Colombia(**) Brazil Nicaragua	
	(a) Exclusive State Ownership		Suriname	Haiti Paraguay		
			(d) Central Control	(e) Single Buyer	(f) Integrated Autonomous	(g) Open Market
		→ OPERATING OPTIONS				

(*) With or without strict vertical disintegration (incompatibility of functions);
 (**) With weak horizontal separation;
 (***) With strong horizontal separation

4. Results of the Reforms

In order to ensure as objective an analysis as possible and avoid the inherent risks of arguing in favor of liberalized markets or vertically integrated systems, elaborating on economic trends or theories that lead to ideological arguments, which is not the purpose of this study; as Jamasb from the University of Cambridge¹⁰ states, “until we know more, the implementation of reforms will be more based on ideology and economic theory, rather than solid economic evidence”.

This chapter uses the extraordinary database that OLADE has maintained for all its Member Countries for more than 30 years in its Economic—Energy Information System, SIEE, in order to observe the effects of the introduction of different reforms on the evolution of several variables and indices in the countries of the region.

By introducing competition, reforms primarily seek to improve prices paid by consumers. In the region, improving does not only mean reducing prices, since in several countries there existed a rate structure that included subsidies; the result was an unreal situation in which state companies did not cover their costs and were incapable of obtaining financing to expand service. It should be noted that those countries where rates included a subsidy component, there was first a price increase when they were eliminated, and from that point, the evolution be studied.

Utilizing a classification that summarizes the structures that exist in the region, and the grouping of countries given in Table 1, the three sections of this chapter present several indices for the groups of countries.

The first section includes countries that chose an open market with a predominant participation of the private investors in the ownership of the sector; both where vertical integration is not permitted as well as where some degree of integration is permitted.

The second section includes countries that have an open market and mixed ownership; that is, private investors and the state share the ownership of the sector.

The third section describes the evolution of selected indices for the countries that chose the model of a single buyer, and integration and regulation; that is, those groups of countries where a limited market functions.

4.1 Countries with an open market and private ownership

The first indices studied were the prices for industrial and residential sectors for countries that do not permit vertical integration, as well as those where some degree of vertical integration is permitted.

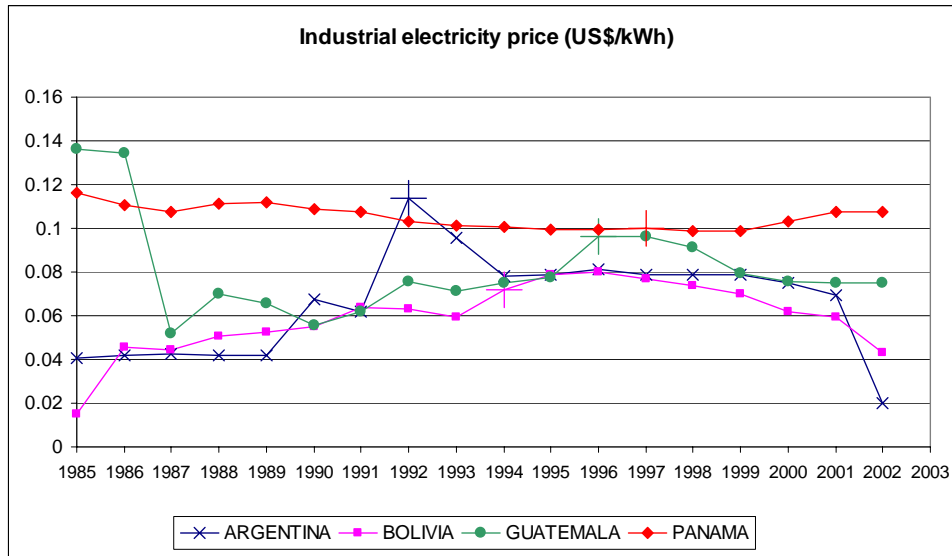


Figure 1. Group of countries with vertical segmentation and incompatibility

The cross in the figures denotes the year in which structural reforms were introduced in the electrical sector of the country in question. In the case of Chile, the reforms took place in 1982, leading the world, so the year of the reforms is outside the period shown in the graph.

It can be seen that in three of the four countries shown in Figure 1, prices for industry have tended to decrease, meeting one of the expectations of the reforms. In one case, these prices increased.

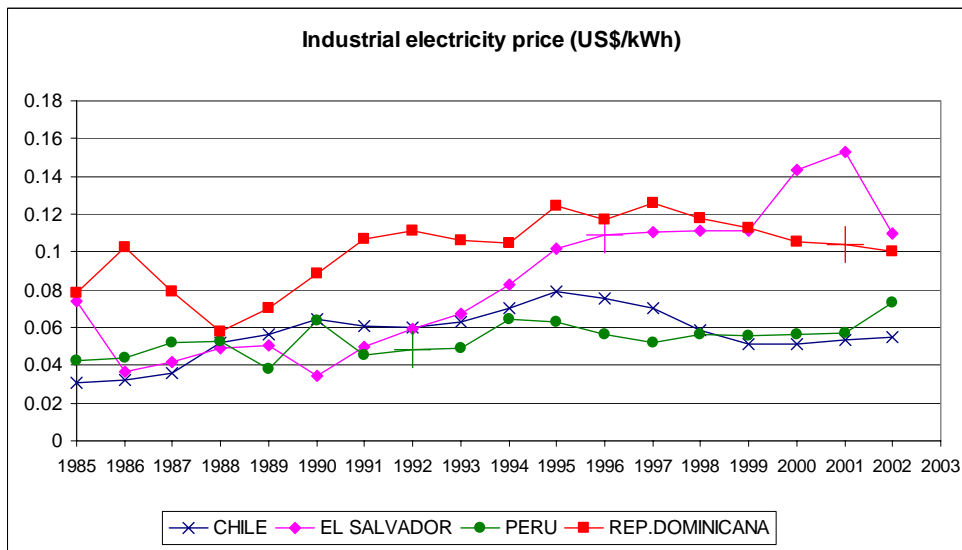


Figure 2. Group of countries that permit vertical integration

The tendencies are not so clear for the group of countries in Figure 2; however it is possible to see the initial price adjustments caused by the change from a situation in which political prices were maintained by state companies with no negotiating capacity

with the governmental agencies in charge of setting rates, to a situation where the market determines those conditions.

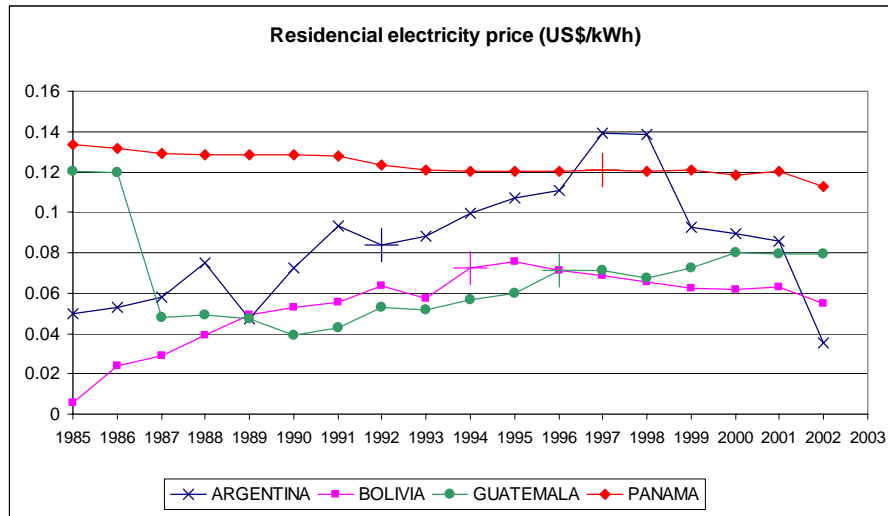


Figure 3. Group of countries with vertical segmentation and incompatibility

It should also be remembered that by presenting these prices in current dollars, exchange rate adjustments give rise to corrections that cannot always be made as quickly as would be desirable, or because current regulations require that they be made after certain periods.

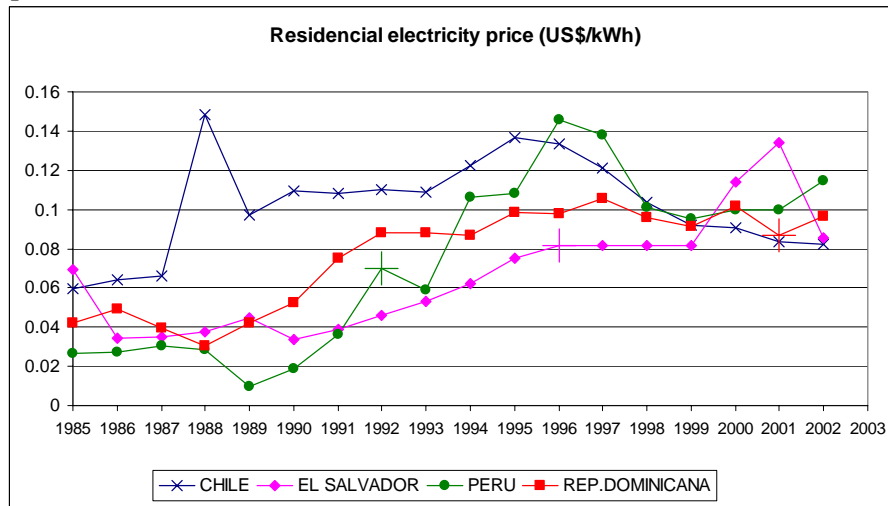


Figure 4. Group of countries that allow vertical integration

Residential sector rates tend to increase, which can be explained in most cases by the elimination of subsidies that distorted reality.

The figures show the variations in electricity prices before and after the reforms, and the trends are heterogeneous; in some countries they increased while in others the values remained approximately constant. In some cases prices fell, as it was hoped competition would do from the time it was introduced in the world.

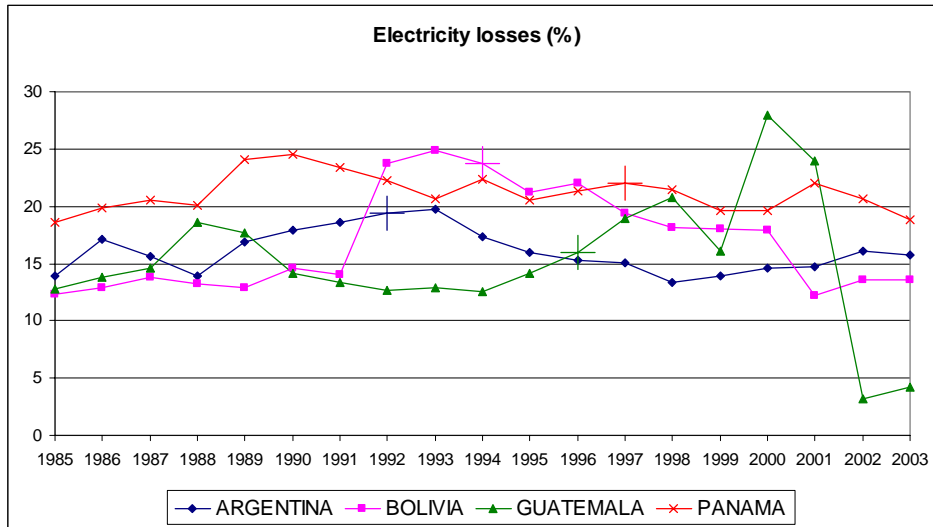


Figure 5. Group of countries with vertical segmentation and incompatibility

Another index whose variation was important to the analysis is that of electrical energy losses in the electrical system at the national level.

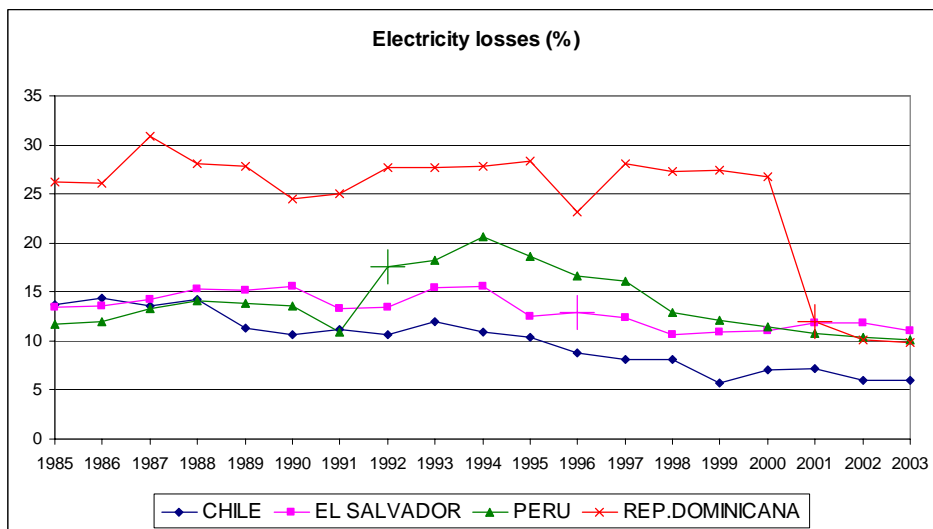


Figure 6. Group of countries that allow vertical integration

The regulatory framework in almost all the countries specified a permissible percentage of losses for which distributors would be paid; it would then decrease in subsequent years after the concession took effect. This determination obliged operators to make efforts to reduce losses, and this was reflected in the evolution of the index presented by Figures 5 and 6; it was the result for most of the countries, with the exception of one.

Chile stands out among all the countries because over the past 8 years it achieved figures of less than 10%; specialized publications mentioned this figure in the past as being beyond the capabilities of the countries of the region.

The next index to be examined is shown in the following figures, and is the increase in installed capacity.

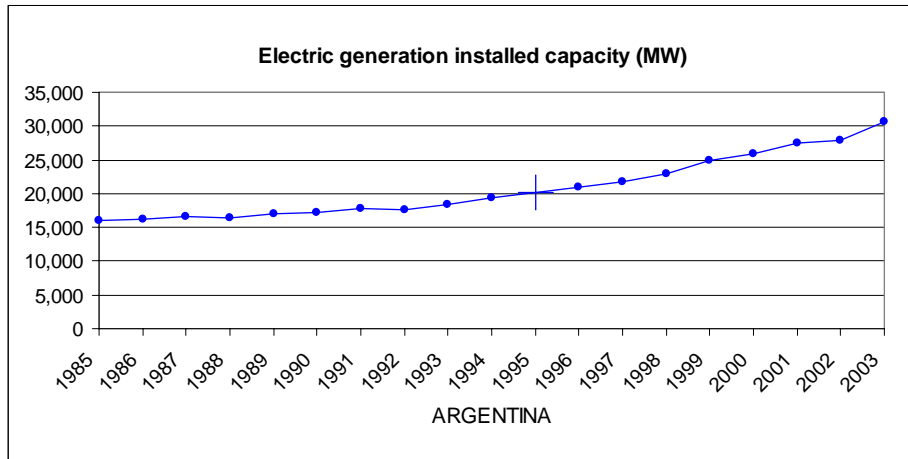


Figure 7. Group of countries with vertical segmentation and incompatibility

Argentina had to be taken separately in this case because the size of the market does not allow the variations among the other three countries to be noted.

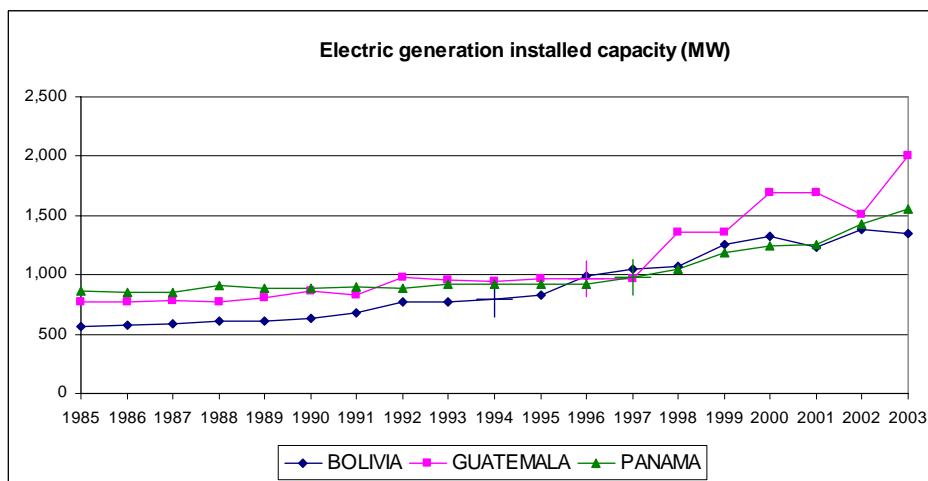


Figure 8. Group of countries with vertical segmentation and incompatibility

The trends were similar in the other countries of the first group.

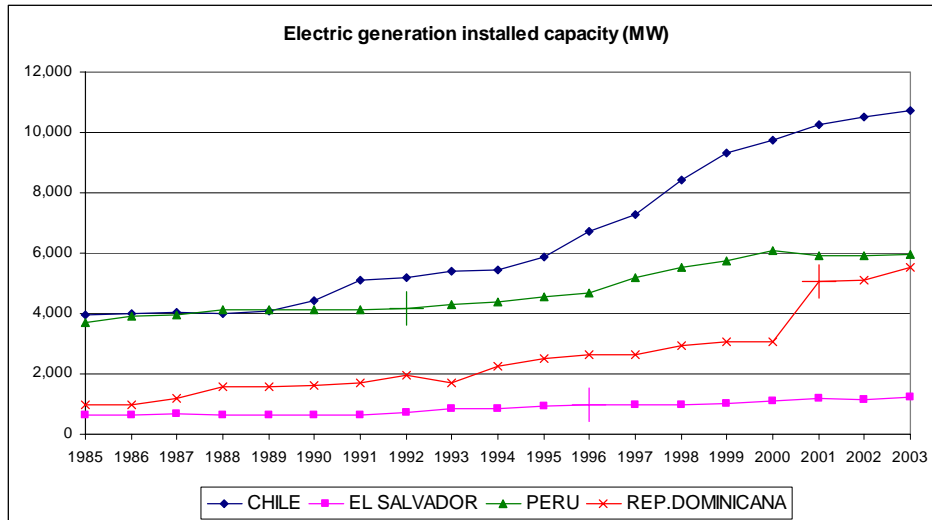


Figure 9. Group of countries that allow vertical integration

It should be noted that the increase in supply since the reforms, has occurred at a higher rate than that of the previous stage; this clearly demonstrates the new investment that was attracted in the countries of the two groups that were studied.

If we examine the breakdown of generation, particularly hydroelectric and thermal (Figure 10) we find that over the past 8 years, for all the countries of the region, earlier trends have been reversed; hydroelectric generation was not only dominant, but the rate of growth was also higher. In recent years, thermal generation has increased more quickly in the region, proving something that was foreseeable for private investors; thermal plants have shorter construction times, and also involve less financial risk. In an extreme case it is also possible to move a power plant, something that would be practically impossible in the case of a hydroelectric plant. The unit investment per installed kW is lower, and though the operating costs are higher, the recovery is quicker.

Considering that only 132 GW of the 703 GW of hydroelectric potential of the region are being utilized, which is only 19%, and the observed trend of emphasizing thermal generation, the development of the region's large hydroelectric resources is being postponed.

Considering that the region is rich in fossil fuels, and has 10% of the world's petroleum reserves and 4.3% of the world's natural gas reserves, the delay in utilizing its hydroelectric reserves signifies that its exportable resources, that is, the region's contribution to supplying the world's energy needs is lower that it would otherwise be if a sizeable component of the internal supply were covered by hydroelectricity.

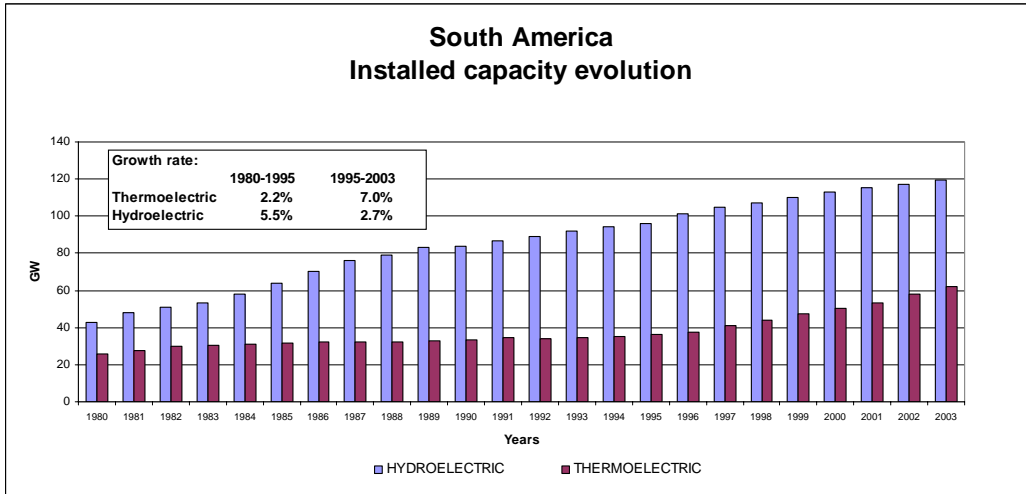


Figure 10. Ratio of hydroelectric generation to thermal generation

In order to analyze the changes caused by reforms in the sector, the following figures show the evolution of the energy intensity in the two groups of countries that chose the market model.

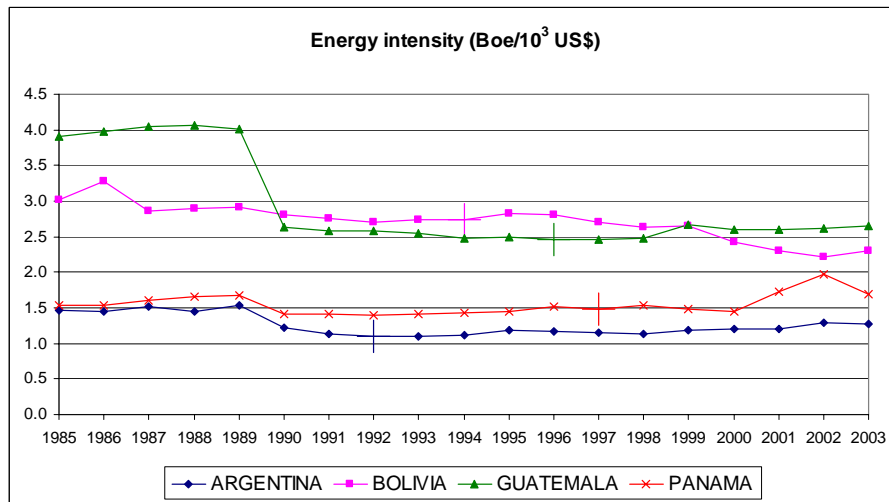


Figure 11. Group of countries with vertical segmentation and incompatibility

The energy intensity improved somewhat prior to the reforms in most of the cases presented, whereas after the reforms improvement in the sector has been slow but steady.

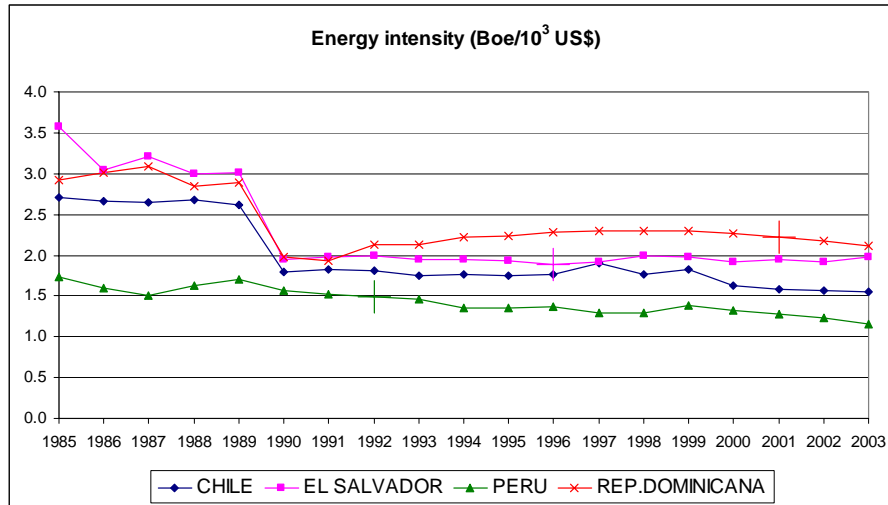


Figure 12. Group of countries that allow vertical integration

Regarding energy intensity and especially the changes that have taken place in the share of thermal versus hydroelectric generation, the level of emissions per barrel of oil equivalent used in the electrical sector in most of the countries of the region has not changed much despite the incorporation of more efficient power plants, such as the combined cycle, which occurred in this group of countries and should have reduced the emissions per unit of energy produced.

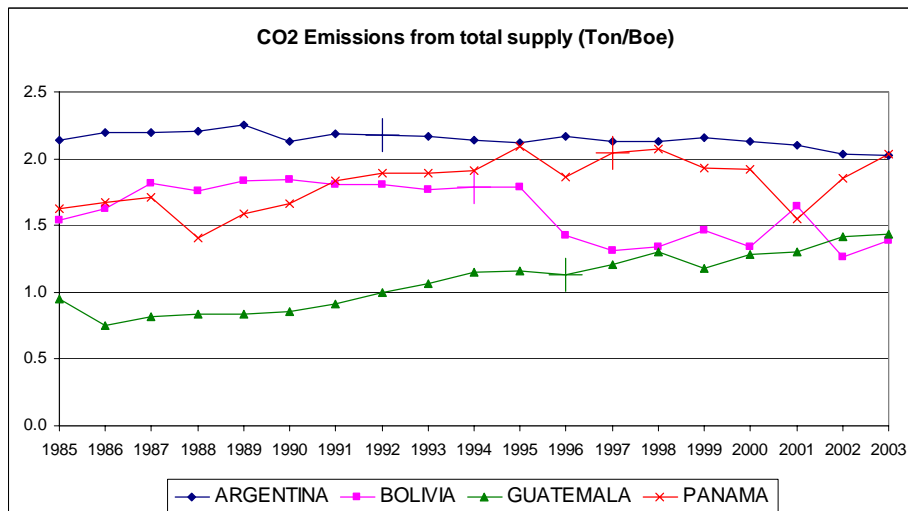


Figure 13. Group of Countries with vertical segmentation and incompatibility

The situation is similar in the group of countries that allow vertical integration.

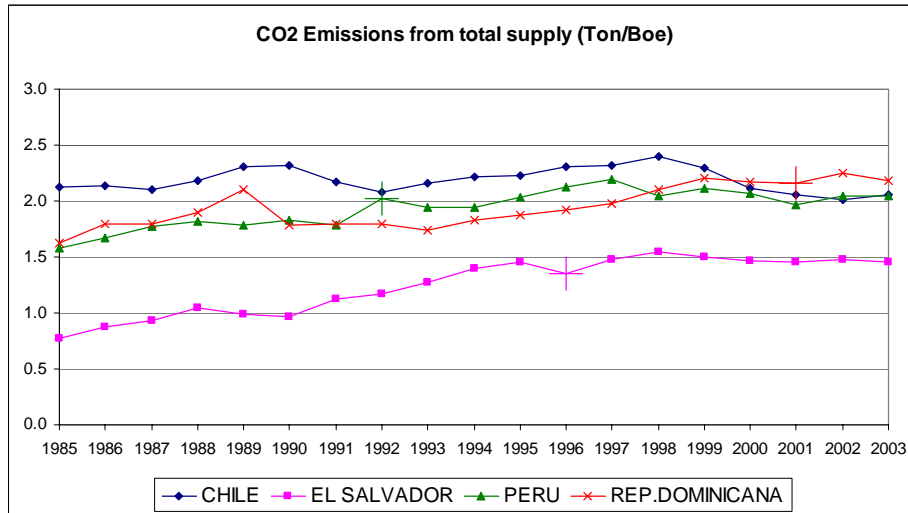


Figure 14. Group of countries that allow vertical integration

4.2 Countries with an open market and mixed ownership

The price variations seen in this group of countries, like the countries in the previous groups, occurred first in the industrial sector and then in the residential sector.

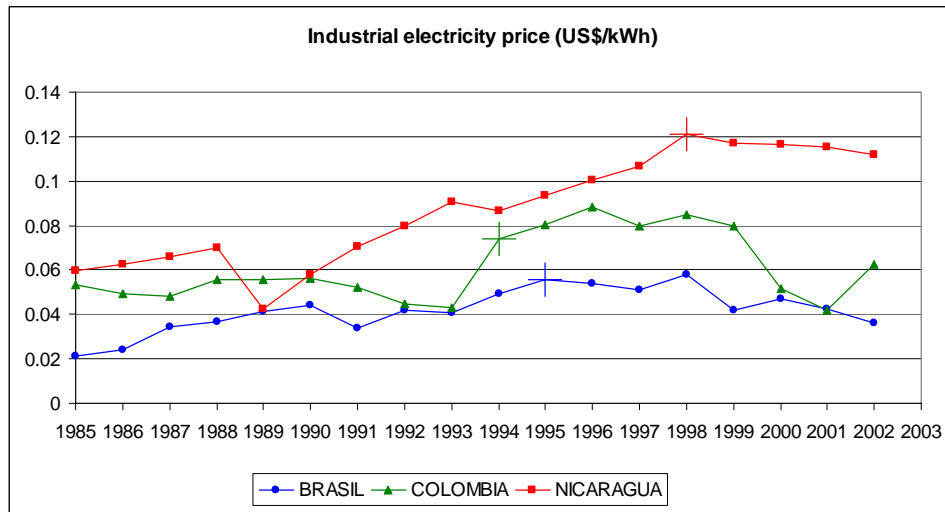


Figure 15. Countries with an open market and mixed ownership

The evolution of the prices in the residential sector is shown in the following figure.

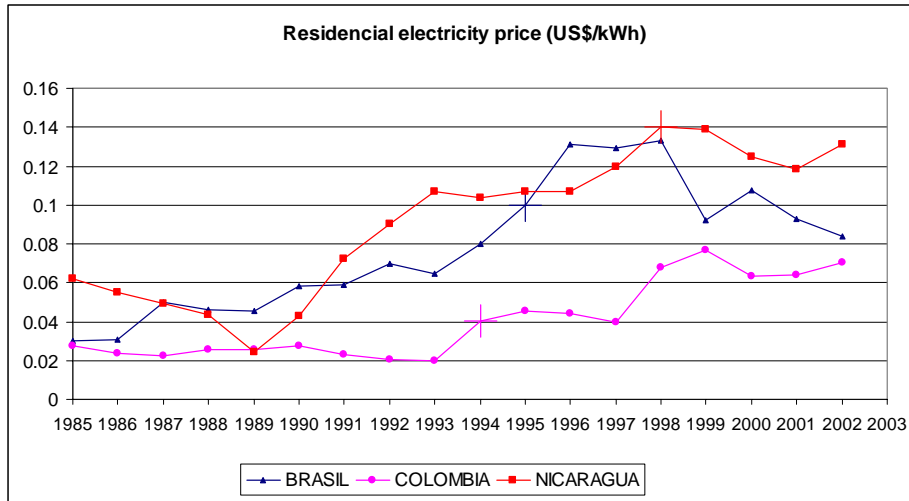


Figure 16. Countries with an open market and mixed ownership

Regarding energy losses, electrical systems in countries with partial private ownership face problems not faced by systems where the companies are entirely privately owned, because although in both cases the regulations call for losses to be reduced, political pressures hamper considerably the work that can be done to control the growth of fraud and irregularities; this is the non-technical losses component and the largest component of the losses.

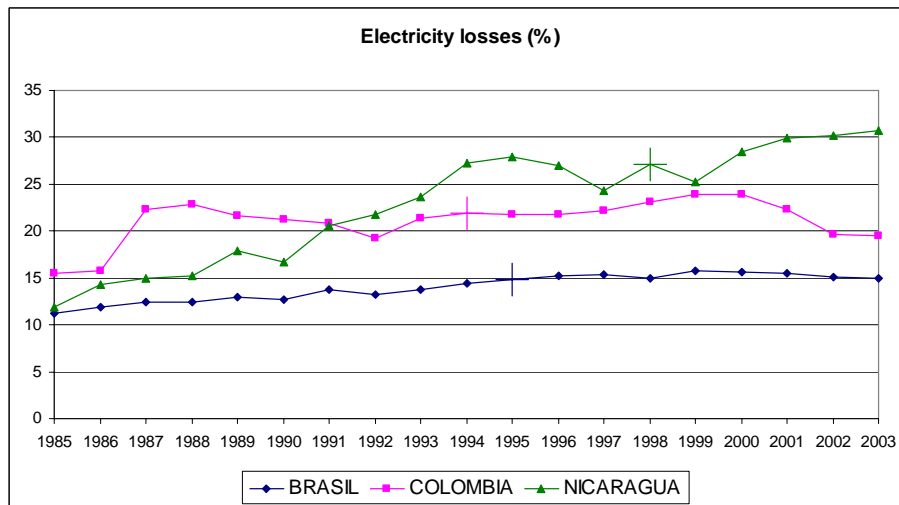


Figure 17. Countries with an open market and mixed ownership

To examine the evolution of installed capacity, it is necessary to separate Brazil from the rest of the countries so that trends in lower demand countries can be observed in the graph.

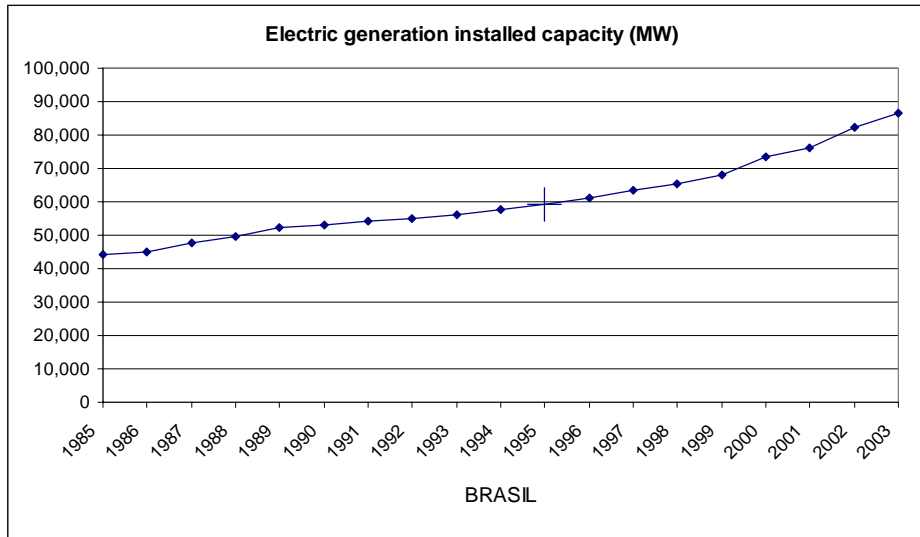


Figure 18. Countries with an open market and mixed ownership

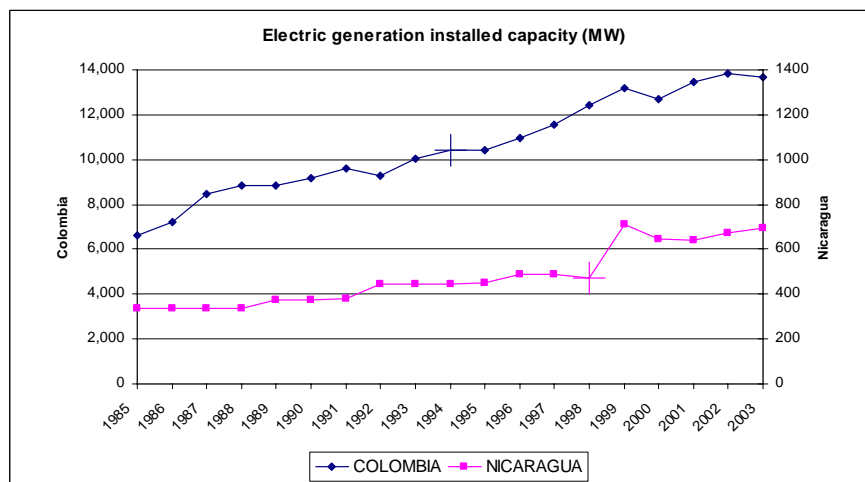


Figure 19. Countries with an open market and mixed ownership

The growth of the electrical supply demonstrates that this group also attracted investment.

The energy intensity of this group of countries is shown in the following figure.

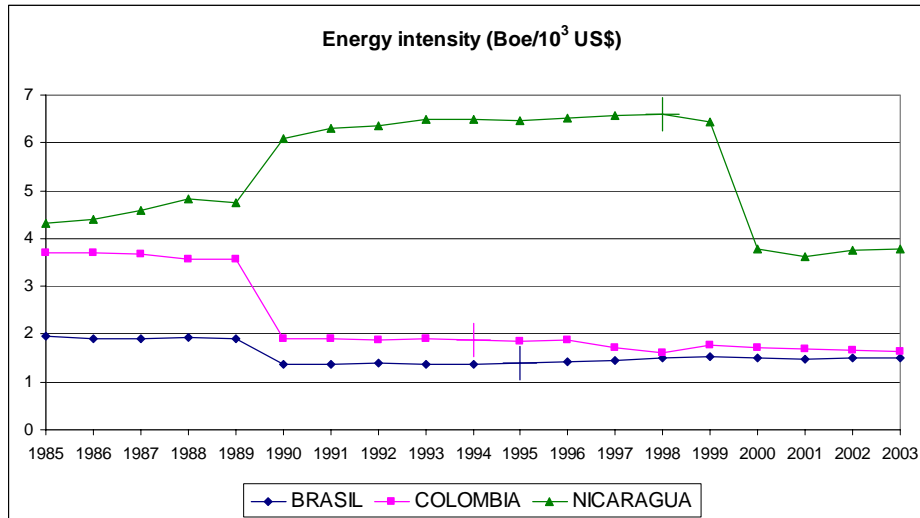


Figure 20. Countries with an open market and mixed ownership

The evolution of the variation in electrical sector emissions is shown in the following graph.

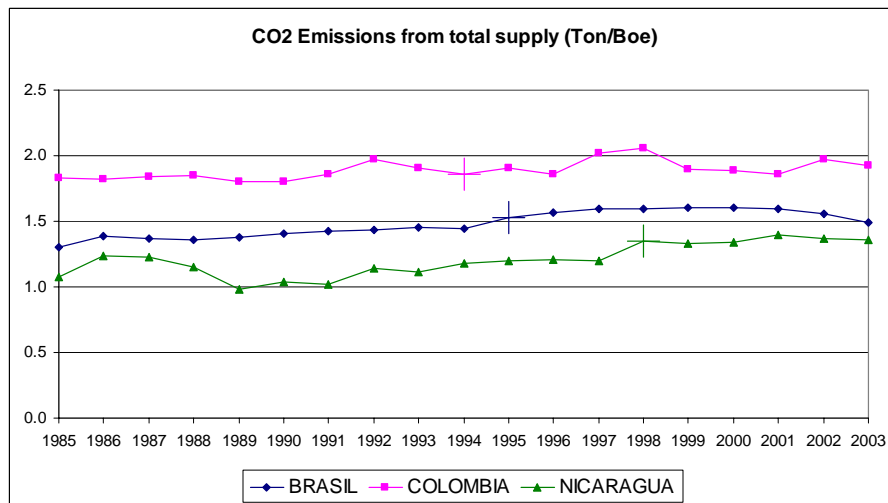


Figure 21. Countries with an open market and mixed ownership

New technologies used in thermal generation are reflected in the energy intensity and emissions.

4.3 Countries with a single buyer and integrated regulated structure

The remainders of the 26 OLADE Member Countries with a less open market are grouped in this section, because they have a lesser influence on the analysis being performed in this study.

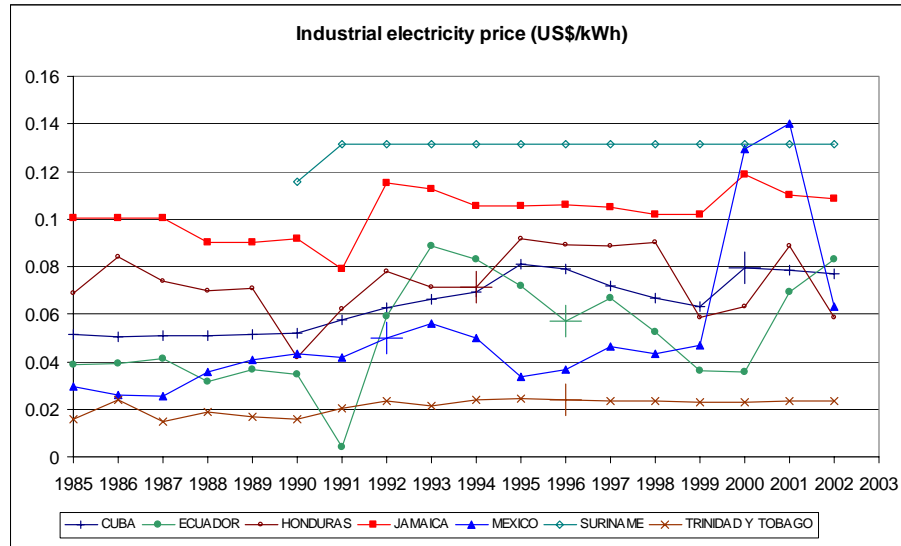


Figure 22. Countries with a single buyer model

The countries that chose an integrated regulated model are also shown in the following figures, since they also have partly open market, which is the case of the single buyer market.

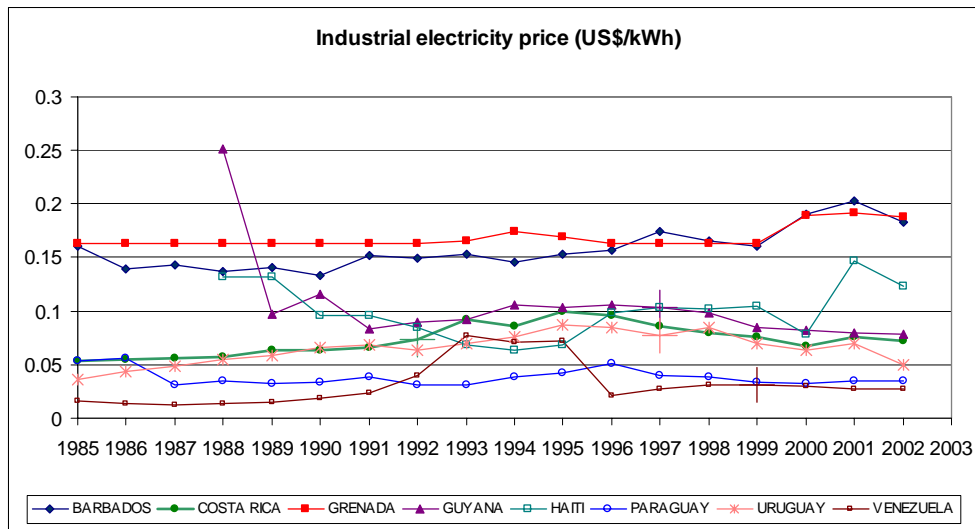


Figure 23. Countries with an integrated regulated model

The observed evolution of residential prices is shown in the following figures.

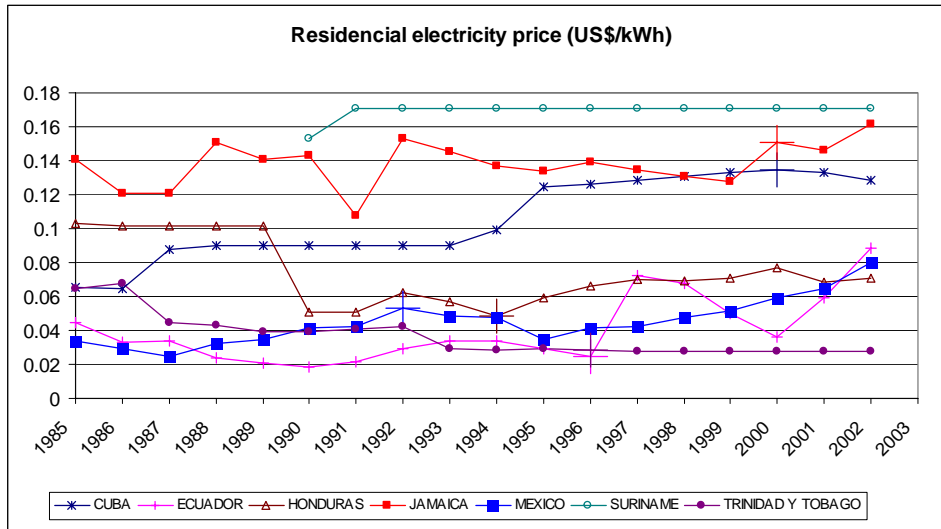


Figure 24. Countries with a single buyer model

Residential prices evolved as follows in the group with an integrated regulated model.

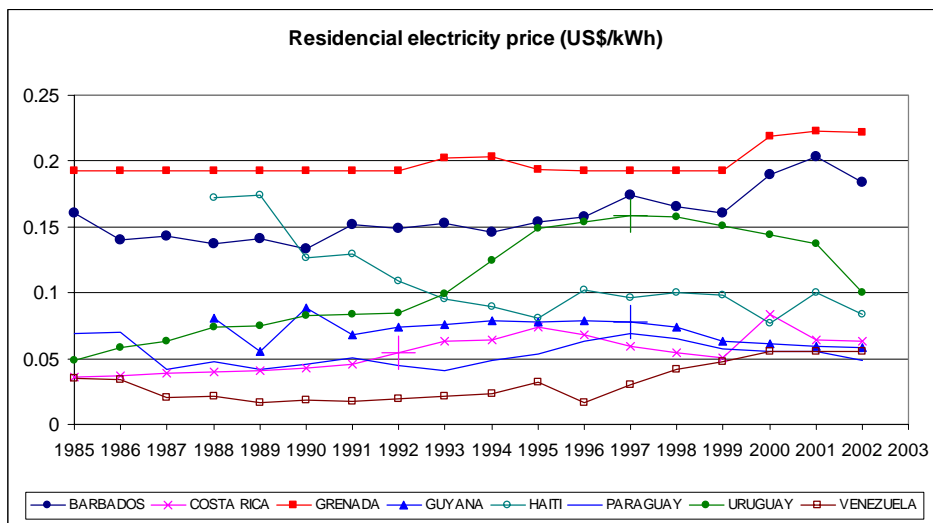


Figure 25. Countries with an integrated regulated model

Efforts of electric companies in the countries to reduce losses have produced heterogeneous results; in some cases they increased, in others they remained the same, and in a few the percentages of losses went down.

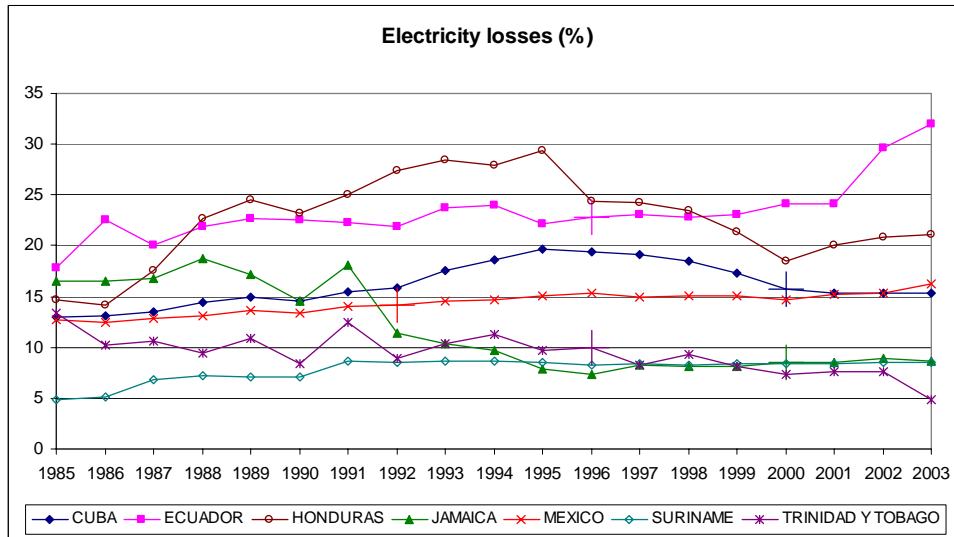


Figure 26. Countries with a single buyer model

The second group of countries provided similar results.

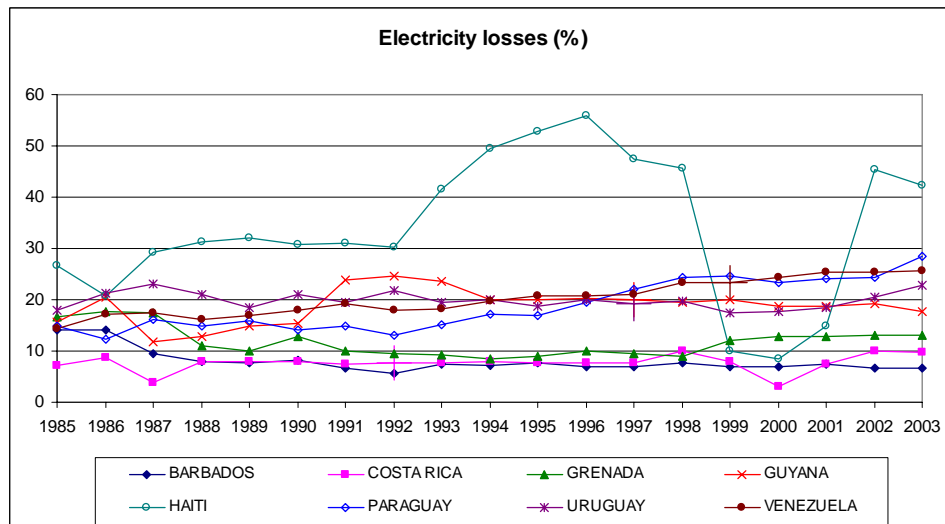


Figure 27. Countries with an integrated regulated model

The evolution of installed capacity in this group of countries is shown in the following figures.

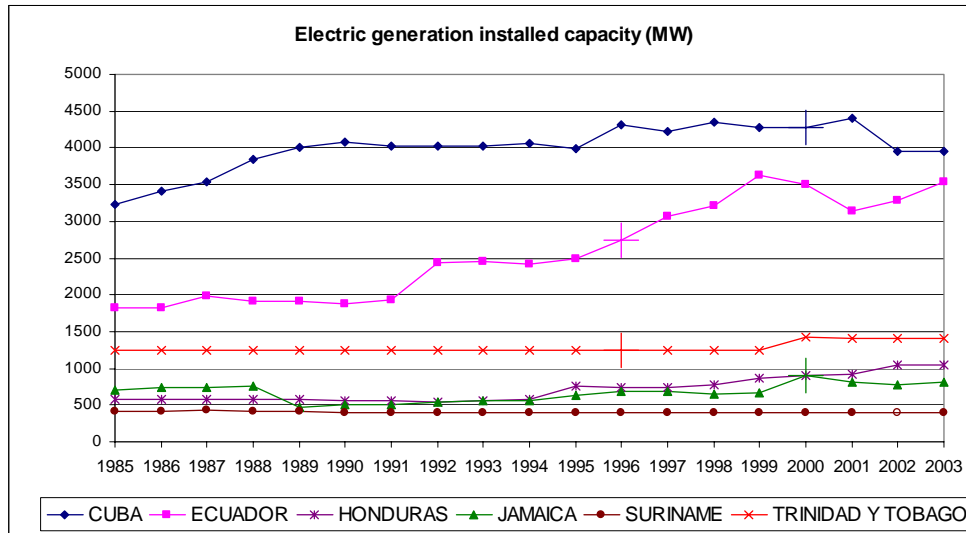


Figure 28. Countries with a single buyer model

The increase in electrical supply in this group of countries was slow; that is, the investment that was attracted did not reach the levels achieved by countries where an open market or free competition offered clear incentives to investors.

Mexico had to be separated from this group of countries because of the difference in installed capacity.

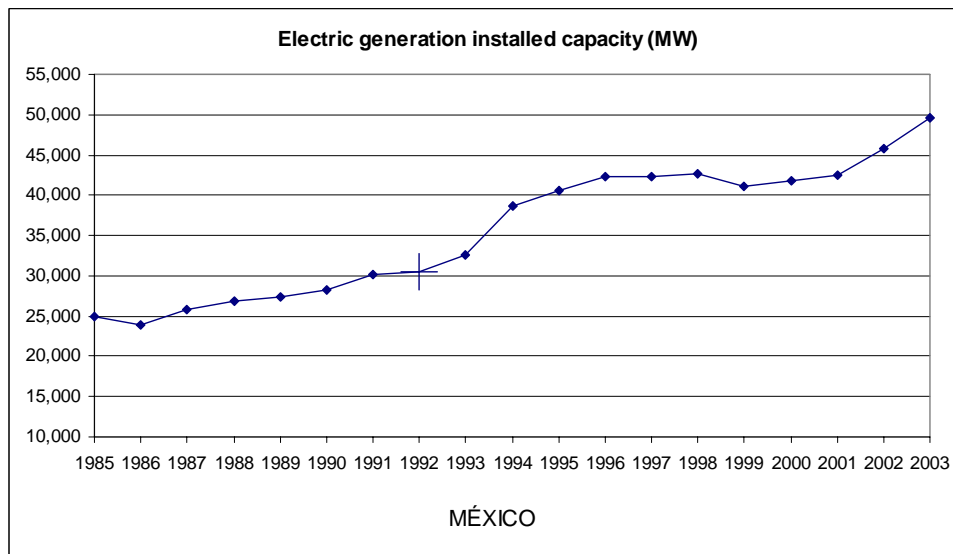


Figure 29. Country from the group with a single buyer model

The countries with the integrated regulated model are shown in the following figure.

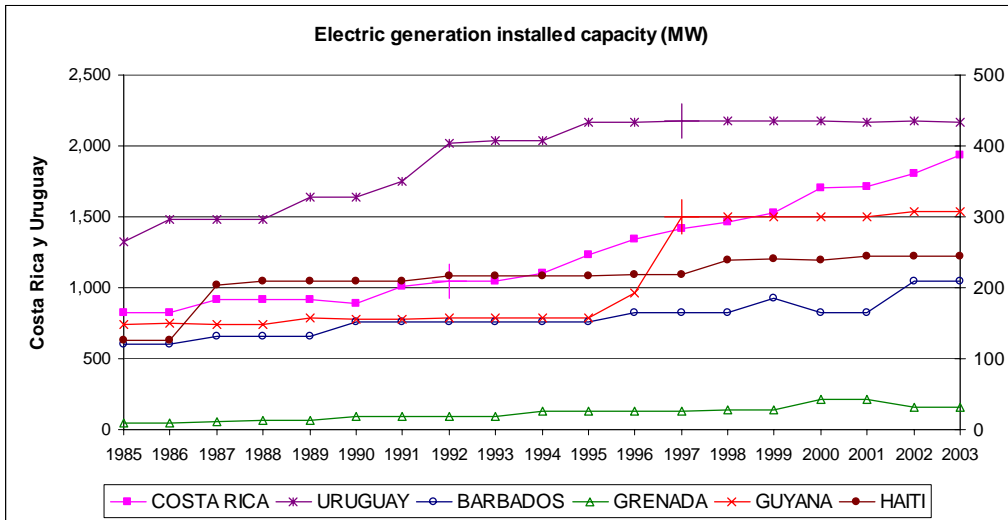


Figure 30. Countries with an integrated regulated model

Venezuela and Paraguay have a much larger installed capacity than the other countries of the group, so it was necessary to show their evolution separately.

The capacity of this group of countries to attract external investment was limited compared to countries that chose the open market model.

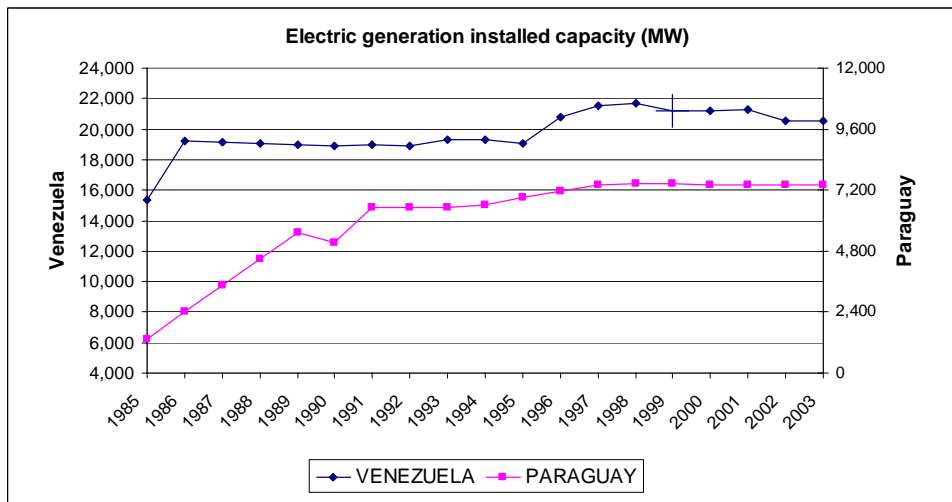


Figure 31. Countries with an integrated regulated model

The energy intensity decreased in some cases, but in others, it increased.

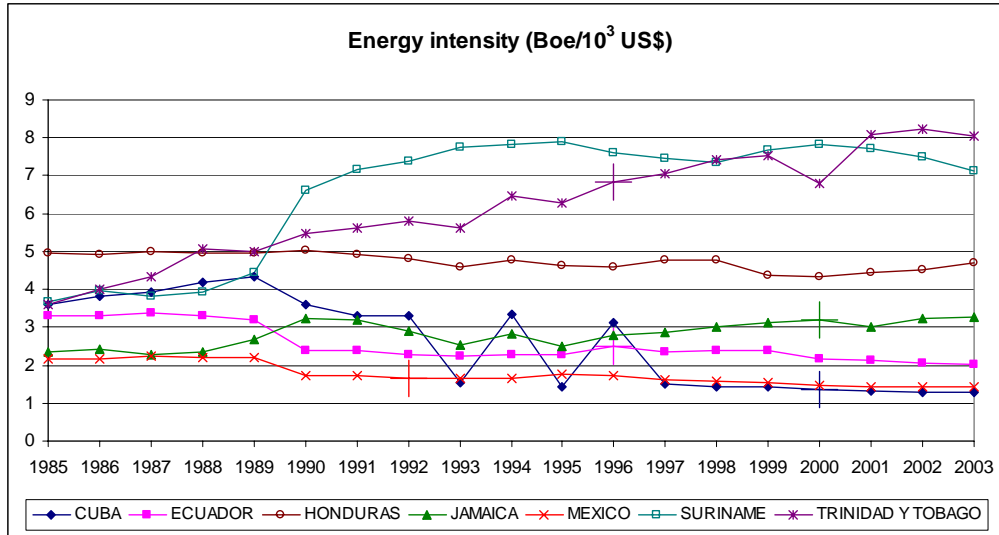


Figure 32. Countries with a single buyer model

The situation is similar in the second group of countries.

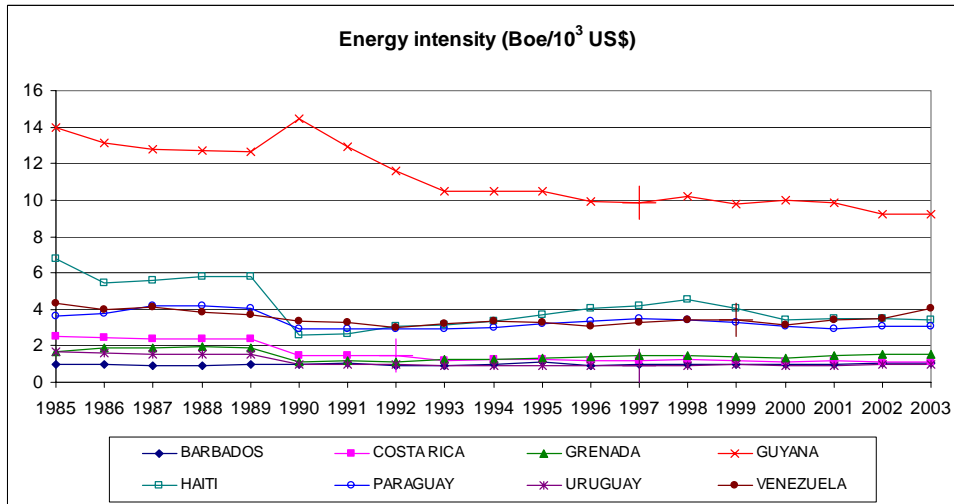


Figure 33. Countries with an integrated regulated model

The emissions per unit of energy are shown below.

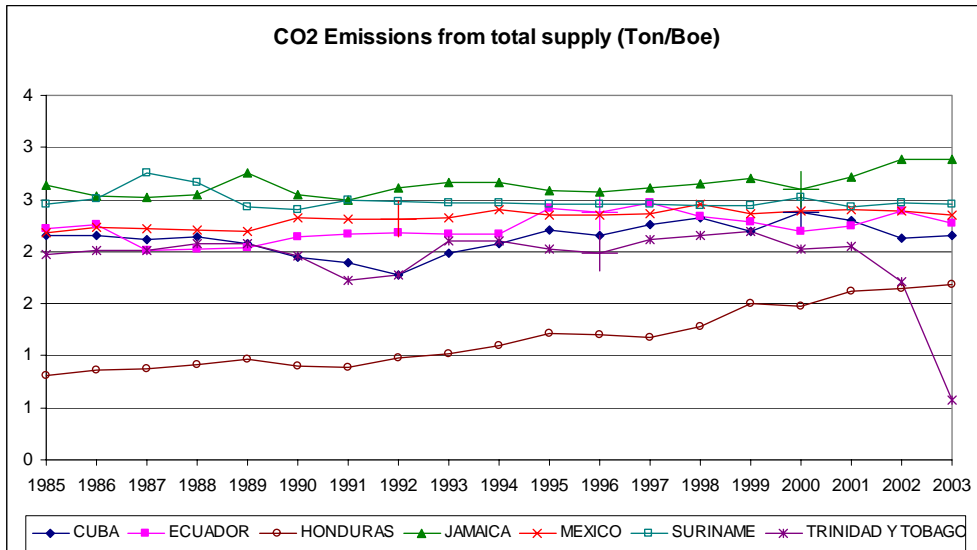


Figure 34. Countries with a single buyer model

The unit emissions remained the same in this case; demonstrating that the electrical supply structure has changed little in recent years.

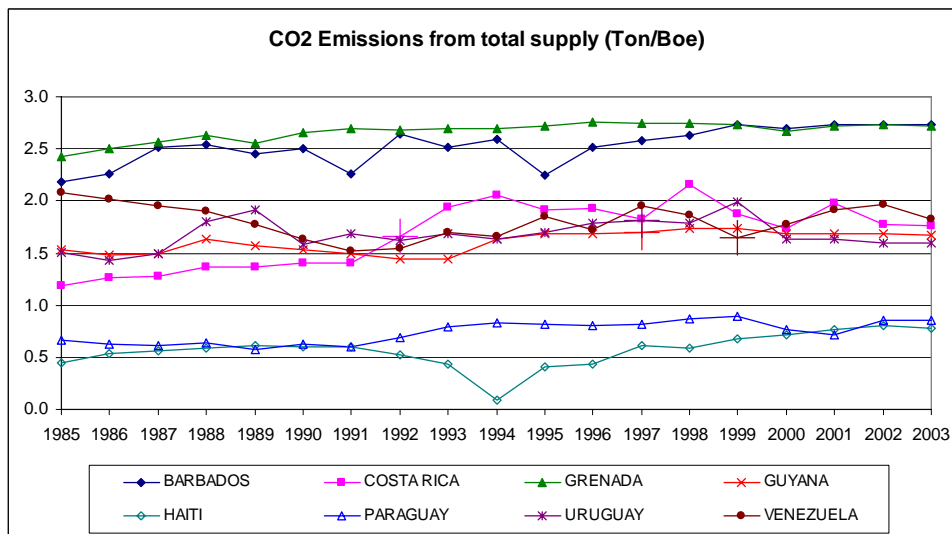


Figure 35. Countries with an integrated regulated model

The variation in unit emissions is even lower for this group of countries.

4.4 Results

Generally, the performance of the energy sector of the countries that chose an open market has improved compared to the situation prior to the reforms; that is, the improved image of the energy sector of these countries is justified.

In terms of prices, the participation of private actors has helped to promote movement toward real prices, because clear differences can be seen between countries with predominantly private sector-owned companies versus those with primarily state ownership; the companies have been unable to isolate rate definition from political considerations. Integration should be seen as an important factor for defining prices, because the differences between interconnected countries apply pressure and help equalize prices.

Regulations in the reforms on reducing energy losses in the electrical sector have provided the expected results in most countries that have an open market and predominantly private ownership. However, even among this group, some countries have not achieved the expected loss reductions. Success depends on almost total control of non-technical losses; however more work needs to be done on technical losses, which only a few countries have undertaken and as a result have achieved values of less than 10%; this was previously classified as impossible for the countries of the region.

In countries with an open market and mixed, private, or state ownership, regulatory provisions on losses did not achieve the expected results due to political pressures that still exist.

The remainders of the countries still have a large component of non-technical losses; consequently, total losses figures are affecting the financial situations of the companies.

Another noteworthy aspect is the way in which countries with a more open market have attracted investment, as demonstrated by the growth in the electrical supply following the reforms; the other countries have obtained discouraging results in this area that even endanger the security of the supply.

A space that is open, even in the countries with a limited open access market, is that corresponding to the independent producers with power stations of relatively small capacity, which can negotiate directly and freely with the free clients. This is a “win-win” negotiation for both, the buyer and the seller, because the first one obtains lower prices for the electrical energy, whereas the seller assures the payments for his production, unlike in the case of state owned distribution companies.

The attraction of investment, however, involves a matter that must be considered in the future. The region’s sizeable hydroelectric reserves have not received the desirable impulse; because the undeniable financial advantages of thermal plants have lead investors to prefer give them.

The region’s available fossil petroleum and gas resources that could be exported and contribute to the energy security of the industrialized countries are limited by the lack of development of the region’s hydroelectric plants. A way must be found to develop hydroelectric potential through private investment; Brazil is currently reforming the

structure of the electrical sector to ensure that distribution companies will purchase energy from plants that are being designed and built to reduce the financial risks of these facilities.

It should be emphasized that the investor companies are present in almost all the countries of the region to facilitate the integration process, but limiting the level of competition that can be reached with the expansion of the markets that would take place with the already mentioned process. In order to give an idea of the presence of companies in the region Table 2 shows a summary of some countries with private participation.

Table 2. Private participation in Latin America and Caribbean

ELECTRIC SECTOR
Owner companies with large regional presence

COUNTRY	COMPANIES							
	ENDESA	EDF	AES	Unión Fenosa	Iberdrola	ISA	Duke Energy	Noble Energy
Argentina	Gener y Distrib	Trans y Distrib	Distrib				Gener	
Bolivia					Distrib			
Brasil	Gener	Gener y Distrib			Gener y Distrib		Gener	
Chile	Gener		Gener y Trans		Gener			
Colombia	Gener		Gener	Gener y Distrib		Trans		
Ecuador							Gener	Gener
Guatemala				Distrib	Distrib			
Mexico		Gener		Gener	Gener			
Nicaragua				Distrib				
Panamá				Gener y Distrib				
Peru	Gener y Distrib					Trans.	Gener	
Dominican Rep.			Gener	Gener				
Uruguay			Gener					

In order to complete the overview Table 3 shows the main companies with regional interests in the natural gas sector.

Table 3. Private participation in Latin America and Caribbean

NATURAL GAS SECTOR
Owner companies with large regional presence

COUNTRIES	COMPANIES					
	Repsol-YPF	Chevron Texaco	Petrobras	Shell/ Mobil	British Gas & Petroleum	Techint
Argentina	Prod, Transp, Dist		Prod		Prod	Transp
Bolivia	Prod, Trans		Prod		Transp	Transp
Brasil	Transp, Dist		Prod y Transp			
Colombia		Prod	Prod			
Perú				Prod		Transp y Distrib
Trinidad y Tobago	LNG	Prod			LNG	
Venezuela	Prod				Prod	

Countries with small markets have been unable to attract the necessary number of actors to establish competition; countries that have not yet undertaken reforms should consider well-designed, progressive steps for achieving competitive markets. Recently, several studies have mentioned the advantages of modern initiatives for Developing Countries¹¹; and more radical positions describe solutions that involve a third path¹². But not only extreme positions discuss the need to seek new options; in a recent¹³ document the World Bank analyzed the possibility of improving state companies through a better regulatory system.

The regulatory system needs to be strengthened in the countries of the region, because lack of experience of most Latin-American countries as well as their Greco-Roman legal systems where regulation has no place, require preparation and learning from the experience of Anglo-Saxon countries with ample experience in managing regulatory systems originating from public services. The model adopted and the ownership of the companies are not important, but certain components must be regulated, such as transmission and distribution as natural monopolies; However, there may be other components such as complementary services, frequency balance and stability, voltage stability, transmission security, and economic dispatch, what would complement and improve the current structure of the electrical energy markets¹⁴.

5. Conclusions

The operating experiences of Latin American and Caribbean energy markets, based on the variables and indicators that are available in the OLADE's Economic—Energy Information System, SIEE, include heterogeneous results that call for a detailed analysis of the situation, context, and characteristics implemented in each country in order to reach categorical conclusions and lessons that would serve all the countries of the region; therefore the project has proposed four case studies to be carried out in four countries that will study these cases in depth. However, some conclusions can be drawn from the present study and are shown below.

- a. The reforms were successful in two groups of countries: in one side, those that chose a free market model with sufficiently ample demand to produce the hoped-for competition and also implemented the model until the proposed goal was reached; they obtained satisfactory results in the area of rates, losses, and improved reliability, resulting in a substantial improvement in the sector's public image.
- b. In the other side, countries that have a small demand and cannot justify a competitive market chose a single buyer structure; they also obtained satisfactory results for the indicators studied and in attracting private investment.
- c. An important observation involves the expansion of the supply; especially satisfactory results were obtained in attracting private investment while the region was one of the goals of foreign capital, more or less until the year 2000.
- d. A business which is consolidated is that of independent power producers with power stations of relatively small capacity when negotiate directly with the free clients. Since the buyer wins because obtains lower prices for the electrical energy, and the seller wins because assures the payments for his production, unlike in the case of state owned distribution companies.
- e. The number of major actors in the region is still limited to a dozen companies, mostly from Spain, United States and France, which have invested in several countries of the region; there are also several small investors at the local level that produce limited amounts of energy.
- f. The foregoing shows two characteristics. Integration should be facilitated because private large actors are present in almost all the countries of the region; interconnections would link the same actor's investments in several countries. However, competition would not be improved due to interconnection and the integration of a regional market, since the number of large actors would be the same as what has already been seen in countries with more demand.
- g. Energy losses continue to be a problem in Latin America and the Caribbean, even thinking that the regulations for their reduction, incorporated in the reforms, have given the expected results in most of the countries with open market and dominant private participation. In the countries with open market and mixed property, private and state owned, the losses regulations did not reach the desired results due to the political pressures that still exists. This situation worsens in countries of predominant state property. The achieved success come from the control of non-

technical losses, but it is still left open the work in technical losses that only few countries have undertaken and that thanks to it, they are getting losses values below 10%, that at other times was catalogued as outside the possibilities of the countries in the region.

- h.** Electric power sector solutions or models should consider the country's available energy resources, since privileging the own resources would not have to limit competition.
- i.** Brazil's successful experience with the expansion of its transmission system must be examined by the other countries of the region, and perhaps the entire world; the problems faced due to the lack of investment in this part of the electrical sector calls for creative solutions such as the one applied by Brazil.
- j.** Independent of the adopted model, the subject of sector regulation, in terms of its strength, independence, preparation of personnel and autonomy, is still a pending task. It is necessary to recall that regulation comes from Anglo-Saxon legislation and not from Greco-Roman that the countries of the region derive their legal structure and therefore experience of operation in countries of Latin America is recent and requires preparation and consolidation, so that it operates up to the challenges that imposes a developing model, like the one that is living the sector at the present time.
- k.** Structural reforms of the energy sector gave the region an opportunity to organize and, in some cases, initiate some policies for protecting the environment. Laws that had been dispersed and under different state agencies were centralized and several environmental requirements were included for granting concessions and licenses for energy infrastructure construction.
- l.** For the incipient development of energy efficiency in the region prior to the reforms, the opening of electrical energy markets and the vertical disaggregating of the sector have brought positive and negative consequences. On one side, the incorporation of commercial companies in the generation has meant a natural interest in improving the efficiency in the energy production and also, along with reforms subsidies generally tended to disappear and therefore, prices have given consumers the right signal to interest and encourage them to give priority to energy efficiency, a necessary but not sufficient signal. On the other side, the new structure of the sector involves an increased number of actors, so the responsibility for promoting energy efficiency is scattered; also, the benefits of efficiency for a vertically integrated company are not clear to some of the new actors; the improvement in power plant efficiency in particular, considering the entire supply, is not felt as acutely by individual actors. Companies that have changed owners have had to consolidate their position and face urgent problems for the shareholders, such as: improving collections, reducing technical and non-technical losses, among others. Thus energy efficiency has a very low priority in company plans that are if there was any interest at all in the subject.
- m.** The development of renewable energies has taken a new impulse with the reforms, thanks to the incorporation of special incentives for its production of energy, naturally privileging the development of the regional hydroelectric potential and in

spite of the difficulties to attract the necessary investments. In this field are expected successes in the approach that interlaces the development of renewables with the contribution to the solutions to fundamental problems of the society of the region, as promoting crops for the production of energy with bio-diesel and ethanol either exploiting biomass in depressed zones or generating employment through the contribution of the local industry in the construction of elements of the power systems.

- n.** This regional study has described several second generation reforms, in particular, in Brazil, Chile and Peru, that should be analyzed in depth in the case studies, especially their causes and possible internal discussions that undoubtedly will serve to enrich the second phase of this project; this will consist of compiling the lessons learned from the operation of the markets, especially those that will be useful for all the countries of the region.

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