



---

**LATIN AMERICAN ENERGY ORGANIZATION**



**October, 2004**

## **LATIN AMERICAN ENERGY ORGANIZATION**

The Latin American Organization (OLADE) is an international public cooperation, coordination and advisory agency, aimed essentially at promoting the integration, protection, conservation, defence and rational use of the region's energy resources.

The Energy Review of Latin America and the Caribbean is a yearly publication issued by the Permanent secretary of OLADE. Its contents are supported by information obtained from the member countries and the studies and analyses conducted by the secretariat.

The data have been obtained from the Energy –Economic Information System (SIEE), which is base on information provided by the Ministry of Energy in each Olade member country. The data-base that the system contain can be access by our Web site.

Partial reproduction of the contents is permitted as long as the source is duly quoted.

### **Editor-in-Chief:**

Diego Pérez Pallares.  
Executive Secretary.

### **Editorial Board:**

Alejandro Villarreal.  
Director of Projects and Strategies

Mauricio Garrón B.  
Coordinator of Energy & Sustainable  
Development

Annette Fitzpatrick.  
Coordinator of Hydrocarbons

Marcelo Neira.  
Coordinator of Electricity

Byron Chilingua.  
Coordinator of Renewable Energy and  
Environment

Sircia de Sousa.  
Coordinator of Information.

Latin American Energy Organization - OLADE.  
Ave. Mariscal Antonio José de Sucre N58-63 y Fernández Salvador, OLADE  
Bldg., San Carlos sector. P.O.Box. 17-11-6413, Quito-Ecuador. Phones: 593-2-  
598280/122. Fax: 593-2-539-684.  
E-mail: [secretaria.ejecutiva@olade.org.ec](mailto:secretaria.ejecutiva@olade.org.ec)  
Web: [www.olade.org.ec](http://www.olade.org.ec)

## **FOREWORD**

To develop this document we have placed our eagerness to present an analysis of the Energy Sector of Latin American and Caribbean, it contains information about the current energy situation of each of our member countries, regional data, as well as economic and social indicators corrected and extended through historical series.

The 2003 Energy report, presents an innovative structure for analysis that allows the reader to easily find general information on the energy sectors of the 26th OLADE Member Countries. In addition, the written publication presents data from Algeria, an extra regional participant country of the Organization.

With the objective of enriching the statistical value that the document have presented since initial editions, this document contain the participation of our Technical Coordinators in the each of our specialized areas of our Organization: Energy Policy, Hydrocarbons, Electricity, Statistical Information, Renewable Energy and Environment. It is likely to emphasize in this occasion, for the first time the Energy Report is spread into the immediate year subsequent to the one of reference, as it was obtained thanks to the effort of our specialists and the cooperation of our Countries Members.

The modern world presents us with constant changes and challenges for the security of supply that sets dynamic integration within the strategic areas. In this sense, we expect that this document will be a useful tool to face the challenges of the Energy Sector of our Region.

**DIEGO PEREZ PALLARES**  
Executive Secretary



## INDEX OF CONTENT

<b>1. WORLD OVERVIEW .....</b>	<b>7</b>
<b>2. REGIONAL OVERVIEW OF LATIN AMERICA AND THE CARIBBEAN .....</b>	<b>8</b>
HYDROCARBONS SECTOR.....	8
ELECTRICITY SECTOR.....	9
RENEWABLE ENERGY AND THE ENVIRONMENT .....	11
<b>3. REVIEW OF THE ENERGY SECTOR IN THE COUNTRIES OF LATIN AMERICA AND THE CARIBBEAN .....</b>	<b>13</b>
<i>ARGENTINA</i> .....	15
<i>BARBADOS</i> .....	19
<i>BOLIVIA</i> .....	21
<i>BRAZIL</i> .....	25
<i>CHILE</i> .....	30
<i>COLOMBIA</i> .....	33
<i>COSTA RICA</i> .....	37
<i>CUBA</i> .....	40
<i>ECUADOR</i> .....	43
<i>EL SALVADOR</i> .....	46
<i>GRENADA</i> .....	49
<i>GUATEMALA</i> .....	51
<i>GUYANA</i> .....	53
<i>HAITI</i> .....	55
<i>HONDURAS</i> .....	57
<i>JAMAICA</i> .....	60
<i>MEXICO</i> .....	62
<i>NICARAGUA</i> .....	67
<i>PANAMA</i> .....	70
<i>PARAGUAY</i> .....	73
<i>PERU</i> .....	76
<i>DOMINICAN REPUBLIC</i> .....	80
<i>SURINAME</i> .....	82
<i>TRINIDAD Y TOBAGO</i> .....	84
<i>URUGUAY</i> .....	88
<i>VENEZUELA</i> .....	91
<b>4. STATISTICAL ANNEX .....</b>	<b>95</b>



## 1. WORLD OVERVIEW

The year 2003 was characterized by great volatility and uncertainty in the energy markets. This was reflected principally in an increase in oil prices, the highest in the past 20 years.

It should also be noted that world energy reserves continued to increase, and that there are oil reserves to cover current energy demands for 40 years and natural gas demands for 60 years. There are indications that discoveries will continue to be made in the coming years, so the energy security of the countries involves more an analysis of their distribution than a lack of supply.

World energy consumption increased by 2.1% with respect to its 10 year historical average, due especially to consumption in Asia, which increased by 4% compared to 2002. Natural gas consumption increased by 2%, despite a 5% decrease in demand in United States (USA), the largest consumer of this type of energy. The largest increase in sales was for LNG, which increased by about 12% this year, lead by USA, Japan, and South Korea.

World oil production was affected by events that occurred, such as the war in Iraq and the oil strike in Venezuela; however, production by the other OPEC countries made up for these decreases. Production by non-OPEC countries also increased considerably, principally in Russia.

Other energy sources, such as coal, also recorded a considerable increase over 2002 of 6.9%, due especially to consumption by China and USA. Nuclear power generation decreased by 2% and hydroelectric power generation increased by only 0.4%, die especially to consumption in Latin America and Asia.

Finally, it is expected that in the coming years, energy consumption will continue to be lead by the demand for oil, closely followed by the demand for natural gas, which will become the second most popular source of energy. The determining factor in this scenario will be the increase in the demand for natural gas in Asia, which will lead the rate of growth of this market.

## 2. REGIONAL OVERVIEW OF LATIN AMERICA AND THE CARIBBEAN

### 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 were 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 neighbouring 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 6<sup>th</sup> 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



## 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, cogenerators 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)

## 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.



### **3. REVIEW OF THE ENERGY SECTOR IN THE COUNTRIES OF LATIN AMERICA AND THE CARIBBEAN**





## ARGENTINA

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	Buenos Aires	o Oil Proven Reserves (Mbbbl)	3,258.80
President:	Nestor Kirchner	o Natural Gas Proven Reserves (Gm3)	766.18
Energy Secretary:	Daniel Cameron	o Coal Proven Reserves (Mt)	423.05
Area (km2):	2,779,221	o Total Energy Supply (kBep)	433.616.00
Population (inhab):	38,430,000	o Production (kBep)	583,054.00
Monetary Unit:	Argentinean Peso	o Import (kBep)	12,370.00
Official languages:	Spanish	o Export (kBep)	160,154.00
GDP per capita (US\$)	3,376	o Final Energy Consumption (kBep)	290,168.00

Source: IMF/SIEE-OLADE/Government agencies

Argentina has a population of 38.4 million inhabitants and a gross domestic product of US\$ 129.7 billion dollars. It is the fourth largest oil producer in the region, the second largest producer of natural gas, and it is fourth among the countries with the largest electrical power generation. Its largest energy exports are to Chile, Brazil, Uruguay, and Paraguay. Its electrical power generation is mostly based on natural gas and hydroelectric power.

In May 2003, the Brazilian company, PETROBRAS, purchased a majority of the shares of one of the biggest companies in Argentina, PEREZ COMPANC, which then became known as Petrobras Energia.

In October, the Argentine subsidiary of Petrobras announced plans to build an interconnection line between its hydroelectric plant in Neuquen and Chile, with a length of 205 miles and an approximate cost of US\$ 135 million. It is expected that the development of the project will begin in 2006.

### Energy Policy

In early 2003 energy policy was subordinate to macroeconomic policies that were imposed to control the financial crisis and economic recession that Argentina faced principally between 2000 and 2003. In May 2003, Nestor Kirchner became President of the Republic, and faced the enormous challenge of improving the economic situation after two years of recession and financial crisis. Though the macroeconomic policies were able to stabilize the economy, the energy policy had only begun to be implemented by mid 2003.

It should be noted that the companies in the sector faced major changes during the crisis years (2000-2002) due to the policies adopted by the government during that period.

One of those policies was the creation of an oil export tax (20%) and the freezing of internal market prices. Due to this policy of low internal market prices, especially for natural gas, investment in both exploration and production fell.

As part of the measures for counteracting this drop in investment, a law was passed in January 2003 that allowed the repatriation of 70% of the income obtained by international companies, which, added to high international crude oil prices that augmented the profits of the companies, the previous policies were counteracted to some extent.

A second measure was taken in October when Congress passed a law that gave the government the authority to negotiate new contracts and pricing structures for natural gas and electricity until December 2004, in order to implement gradual price increases. With respect to the electrical sector, it is important to remember that Argentina privatized the entire electrical sector and that the market is perceived to be efficient and competitive; private agents intervene according to the supply and demand, and the State participates through the regulator. In 2003, energy policy, as in the above case, was related to macroeconomics. Electrical rates were thus frozen and since the economy went from fixed to variable convertibility, all the devaluations of the peso with respect to the dollar were absorbed by the electrical companies. Some liquidated their assets and others withdrew from the market because of the losses they incurred. There has been no increase in investment in generating capacity despite the economic recovery.

In December 2003 the government announced plans to finalize the construction of the third nuclear power plant at an estimated cost of US\$ 300 million. Construction is expected to begin in 2004 and will be completed in 2008.

Finally, it should be noted that among the challenges for the coming year regarding policy matters is the promotion of gas and oil field development, given the disincentives the companies faced in previous years. This decision involves either price increases in the internal market with the accompanying high social and political costs, or perhaps the State will again undertake investment decisions. There is also the challenge of tackling industrial as well as urban air pollution through concrete programs, which will involve the design of plans to encourage the use of clean or alternative energies.

## **Hydrocarbons sector**

The oil sector in Argentina is fully private with Repsol-YP being the largest oil producer, accounting for almost 50% of production. Petrobras of Brazil has recently become involved in the country's oil operations. Argentina's domestic problems have seriously affected investor confidence, but the country has since seen a resurgence of some drilling activities in 2003.

Natural gas is the dominant fuel source in Argentina. At January 2003, the country's proven natural gas reserves were estimated at 27 Tcf. The quantities which are not consumed, domestically, are exported to Chile, Brazil and Uruguay.

There are approximately nine refineries in Argentina with a total capacity of 625.0 thousand barrels per day. The major part of the capacity is held by Repsol-YPF, Esso and Shell.



## Electricity Sector

The installed electrical generation capacity, including that of self-producers, was 30,599 MW, an increase of about 9.9% over the previous year.

92,053 GWh of electrical power was generated, an increase of 9% over the previous year, but it has still not returned to the 2001 level. The wholesale electrical market, including the interconnected system, is managed by the company CAMMESA, and generators have continued to participate in free competition, despite the hard macroeconomic crisis that began in 2002.

Regarding international electrical power transactions, about 2,543 GWh were exported, and 7,578 GWh were imported, mainly from Paraguay. Both electrical imports and exports were lower than in 2002. Part of the electrical generation is supplied by Bolivian gas.

Regarding electrical power consumption, final users consumed 80,026 GWh, a 9% change from the previous year.

Average internal electricity prices for commercial, industrial and residential customers, as of December 2003, including taxes and expressed in dollars, were 0.044, 0.021 and 0.041 US\$/kWh, respectively. There was a slight recovery after the drastic drop in prices in 2002 due to the elimination of the exchange rate parity.

Regarding electrical service coverage, no estimates are available for 2003, but the latest report received by OLADE mentions that 95% of homes have electrical power service.

The Government did not accept proposals from several companies and agencies to increase rates, and authorized a loan to prevent CAMMESA from having to increase prices due to seasonal variations in generation costs. These situations create state of uncertainty in the sector; however, it is known that the Government is making enormous efforts to normalize the situation gradually.

The Presidents of Argentina and Paraguay set up a binational commission to establish a financial plan for finishing the Yacyreta hydroelectric project, and the government of the Argentine province of Misiones proposed a plebiscite on the construction of the Corpus Cristi hydroelectric project.

## Renewable energy and environment

In the energy supply for 2003, renewable energy has a large share because the country has hydropower, wind energy, biomass, geothermal generation and solar energy. With regard to the hydropower, it has an installed capacity of 9,782.73 MW, with a power generation of 33,777 GWh.

In wind energy, by year-end 2003 there were 26 MW installed, which generated around 71 GWh, with an average capacity factor of 31%. Additionally, there is an estimated 2 MW in small size wind generators, a considerable percentage of which are located in the province of *Chubut*. The wind potential of Argentina is very high and is

concentrated in the southern provinces (*Tierra del Fuego, Santa Cruz and Chubut*) and the provinces of *Río Negro, Neuquén* and the sea coast of Buenos Aires.

In geothermal generation, it has the only geothermal plant in South America, with an installed capacity of 0.6 MW, but unfortunately, it is not in operation. However, we should mention that Argentina has an appreciable geothermal potential.

In solar energy, photovoltaic systems are used for rural electrification in remote areas, but its effect on the energy matrix is very low. We should point out that there is much experience in the management of rural companies for rural electrification with photovoltaic energy. The largest renewable energy programs in Argentina include the *Program de Abastecimiento Eléctrico para la Población Rural Dispersa* (PAEPRA) and the *Proyecto de Energía Renovable en Mercados Rurales* (PERMER).

In environmental terms, Argentina has the National CDM Office, which is very active in promoting renewable energy projects, with the support of the Canadian Government to carry out the project “*Iniciativa Canadá – Argentina para fortalecimiento de la capacidad técnica en el Mecanismo de Desarrollo Limpio*” (CACBI), in which other countries of the Southern Cone such as Bolivia also participate.



## BARBADOS

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	Bridgetown	o Oil Proven Reserves (Mbbbl)	2.51
General Governor:	H.E. Sir Clifford Straughn Husbands	o Natural Gas Proven Reserves (Gm3)	766.18
Energy and Public Works Minister:	Anthony Wood	o Coal Proven Reserves (Mt)	423.05
Area (Km2):	431	o Total Energy Supply (kBep)	2,860.58
Population (inhab):	270,000	o Production (kBep)	974.43
Monetary Unit:	Barbados Dollar	o Import (kBep)	2,487.61
Official languages:	English	o Export (kBep)	586.88
GDP per capita (US\$)	9,624	o Final Energy Consumption (kBep)	1,831.13

Source: IMF/SIEE-OLADE/Government agencies

Barbados has a population of about 270,000 inhabitants and has a GDP of US\$ 2.5 billion dollars. Its products are refined in Trinidad and Tobago and though its natural gas reserves are not large, they are sufficient for its own consumption.

### Energy Policy

Energy policy is oriented toward guaranteeing a supply of energy at the lowest possible price. Offshore and onshore exploration for oil and gas will be promoted in order to ensure that increased demand is satisfied. It also plans to increase refined products storage capacity, and for this US\$ 80 million will be required.

Alternative energy use and development is also encouraged; for this purpose a Center of Renewable Energy Excellence will be created, and a wind power complex will be built.

A third policy objective is to encourage the use of natural gas, and plans exist for increasing the number of home users to 26,000.

### Hydrocarbons sector

Barbados is the other country in the English –speaking Caribbean with proven hydrocarbon reserves, albeit, in small amounts. Despite the efforts of the Barbados National Oil Company (BNOC) to expand oil production, its oil production has been declining. In 2003, Barbados' oil production was almost 1600 bbl/d. Also, its limited amounts of natural gas production are used solely for its domestic natural gas demand. Therefore, a proposed Natural Gas Pipeline, being initiated by the Trinidad and Tobago government, will benefit Barbados, greatly, and serve to meet the island's future demand from power generation, and from the other sectors in the economy, especially

tourism, on which it relies heavily. Currently, Barbados has no refining capacity. Trinidad and Tobago refine its oil supplies, and re-ship the petroleum products for domestic consumption.

## **Electricity Sector**

The installed electrical generating capacity, including that of self-producers, was 210 MW, and it is assumed that it has not changed in 2003.

Electrical power production was 871 GWh, an increase of 1.3% over the previous year. This island country has no possibility for importing or exporting electricity.

Regarding electrical power consumption, final users consumed 782 GWh, an increase of 1% over the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.200, 0.197 and 0.188 US\$/kWh, respectively. The prices reported are identical to those of December 2002.

Regarding electrical service coverage, it is estimated that 98% of homes have electrical service.

## **Renewable Energy and Environment**

The share of renewable energy in Barbados' energy matrix is small because the natural resource potential is limited to solar, wind and biomass resources. In solar energy, its contribution does not affect the overall balance, despite much use for water heating in the residential sector, promoted by the State and executed by the private sector, which is exporting equipment to the countries of the Caribbean.

In terms of biomass, its use is limited to sugar cane bagasse for self-production of energy in the sugar industry.

In wind energy, there is a reported installed capacity of 0.3 MW. Given the current potential, the Electric Company of Barbados, "Light & Power" prepared the 2003 feasibility study of a 10 MW wind farm in St. Lucy. The preliminary findings are positive and are subject to the availability of an appropriate site.



## BOLIVIA

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	La Paz	o Oil Proven Reserves (Mbbbl)	486.11
President:	Gonzalo Sánchez de Lozada	o Natural Gas Proven Reserves (Gm3)	810.70
Minister of Mines and Hydrocarbons	Guillermo Torres	o Coal Proven Reserves (Mt)	
Area (km2):	1,098,580	o Total Energy Supply (kBep)	41,502.51
Population (inhab):	8,810,000	o Production (kBep)	67,636.79
Monetary Unit:	Bolivian Peso	o Import (kBep)	2,029.73
Official Languages:	Spanish, Quechua, Aymara	o Export (kBep)	26,849.45
PIB per capita (US\$):	990	o Final Energy Consumption (kBep)	19,598.51

Source: IMF/SIEE-OLADE/Government agencies

Bolivia has a population of about 9 million inhabitants and a Gross Domestic Product of 7.6 billion dollars. In energy terms, it is the country with the second largest natural gas reserves in the Region after Venezuela, and is among the 10 countries with the greatest hydroelectric reserves in the region. Its major energy export markets are Brazil and Argentina.

### Energy Policy

The year 2003 was characterized by social upheaval and political instability that resulted in vagueness and indecision of the energy policies. Between January and December 2003 the Minister of Energy was changed 3 times, and after 15 months of his presidential term, the resignation of the current president, Gonzalo Sanchez de Lozada was made public in October. Though the social convulsion began due to the problems of the economic recession, these were exacerbated by lack of leadership in energy policy matters involving natural gas exports through Chilean or Peruvian ports.

The energy policy guidelines established in 2003 included mass home and vehicle use of natural gas. The government set the goal of connecting 250,000 homes over a 5-year period by privatizing networks operated by YPFB and an increase in connections that would be the responsibility of the private sector. The goal of converting 70,000 vehicles to natural gas in 5 years was also set. Both plans have yet to be implemented.

Policy objectives also included the industrialization of natural gas by building petrochemical plants and Gas to Liquids plants for natural gas. With regard to the former, the idea is to build a plant on the Brazilian border in order to export the products to that market. There are companies interested in developing it (Oderbretch, and others), though an increase in the amount of gas exported to be able to extract ethanol as the raw material for this project is still pending.

With respect to the Gas to Liquids plant, since Bolivia imports diesel to cover a 40% deficit in meeting the internal demand, it hopes to develop a plant to produce diesel from natural gas. However, since there are few plants in the world that have this technology, and large investments are required, this means that large markets are necessary in order for it to be feasible; feasibility studies are currently being prepared by the companies and consortiums involved.

A third policy objective is to expand natural gas export markets to neighboring countries and outside the continent. This includes increasing the amount exported to Brazil and Argentina. Also pending are the construction of a gas pipeline to Paraguay and the construction of a new gas pipeline to Argentina.

Finally, development plans include the Liquefied Natural Gas project that involves exporting natural gas through a nearby port (Chile or Peru) to Mexico and United States. However, the choice of the port is pending due to constant protests by various organizations opposed to exporting energy through Chilean ports; these led to the resignation of the president of the Republic in October 2003. To resolve this conflict a referendum to be held in 2004 was proposed.

Regarding the electrical sector, it should be noted that in April the executive issued a law to reorganize the sector, and the electrical sector, which was traditionally part of the ministry of hydrocarbons, was transferred to the ministry of economic development, thus eliminating a great potential for the development of integral energy policies.

The policy guidelines for the energy sector include extending the coverage of rural electrification by implementing alternative energy in rural areas and expanding electrical interconnection lines.

It is also planned to construct new thermoelectric generation plants for export. Thus, in July, for example, the company, Red Electrica de España, announced a project for constructing a transmission line to link La Paz, Bolivia and Puno, Peru. This project seeks to provide cheaper energy to that part of Peru. In September, a Brazilian company, Furnas, announced that together with Pan American Energy, it is studying the development of a mega project for the construction of a 2,000 MW thermoelectric plant and the construction of a 938-mile transmission line that would link Bolivia and Brazil.

## **Hydrocarbons sector**

In 2003, the country suffered some major setbacks as a result of civil unrests, mainly because of the Government's plan to export its natural gas to the United States and Mexico via Chile, with which it has a longstanding border dispute. It is unfortunate that the country is faced with such uncertainties, since it is quite obvious that Bolivia's economic growth will be dependent upon its strategies for its natural gas. Accordingly, the present Government has indicated that it will hold a referendum on the issue.

Bolivia's total proven oil reserves stood at 486.1 million barrels as of January 2003.

Given that in its last licensing bid round, Bolivia has attract one sole bidder, Petrobrás in August 2003, it is expected that the flow of investments have changed into exploitation instead of exploration and that path will continue in the becoming years.

The country has not been able to attract many investors. Bolivia is a net importer of petroleum, largely because of its diesel imports. In an attempt to reduce this heavy dependence on diesel imports, the government has expressed an interest in the construction of two Gas to Liquids facilities: one through a consortium of Ivanhoe Energy, Syntroleum Corporation and Repsol-YPF, which is undertaking a feasibility study on developing an estimated \$3 billion, 90,000-bbl/d Gas-to-Liquids project in Santa Cruz; and, the other is a project of GTL Bolivia and the U.S.- based Rentech.

The official estimate of Bolivia's natural gas reserves in 2003 stand at 29tcf. The country has intensified exploration efforts in recent years, which have resulted in many large discoveries. Currently, Bolivia exports its natural gas to in the region to Argentina and Brazil, and there are further plans for the construction of a larger regional gas pipeline through a project called Gas Integration (Gasin). Bolivia would receive greater interest from investors, if it committed to building an LNG export facility, settle its internal and border wrangling on the destiny of its natural gas.

As stated above there are two proposed GTL facilities, which will effectively monetize Bolivia's large natural gas reserves. The feasibility study will examine whether it would be viable to convert natural gas into diesel and naphtha, not only for local domestic usage, but also to sell to Paraguay, Peru, Brazil, as well as Mexico and the United States.

A proposed US\$5 billion project by an LNG export consortium, Pacific LNG, which had plans to build a pipeline and port facilities to export Bolivian natural gas to the United States and Mexico via the Pacific Coast has met with some delay, largely because a decision is yet to be made on whether an LNG regasification terminal will be constructed in the Peruvian port city of Ilo, which will be more costly, or in the Chilean port city of Patillos. However, Bolivia stands to lose market share if it continues to vacillate, since its neighbors are also vigorously pursuing plans to develop their natural gas fields and win markets for LNG exports.

The major refineries in Bolivia are Cochabamba, Santa Cruz and Sucre with a combined capacity of approximately 54.0 thousand barrels of crude oil production per day.

## **Electricity Sector**

The installed power generating capacity, including that of self-producers, was 1,353 MW, 2.4% less than the previous year. Two generating units were taken out of service at the Guaracachi Power Plant. Efforts continued to connect into the national system the isolated Tarija and Trinidad systems, which use fuel and require subsidies.

The production of electrical power was 4,269 GWh, an increase of 1.9% over the previous year. This growth is similar to the national GDP, which shows a high correlation.

Regarding international electricity transactions, there were no exports, and 9 GWh were imported. Regarding interconnections, the Governments of Bolivia and Peru are still planning to interconnect their electrical systems by linking the Senkata substation (220 kV, 50 Hz) in La Paz, to Puno (230 kV, 60 Hz), but the budget is high because it involves linking systems with different frequencies.

Regarding electrical power consumption, final users consumed 3,665 GWh, a change of 1.9% from the previous year.

Due to a sufficient electrical power supply, prices per kWh on the wholesale market showed a tendency to drop until March 2003, so a compensatory fund was established to cover possible future increases. Average prices including taxes for commercial, industrial and residential customers were 0.084, 0.040 and 0.055 US\$/kWh, respectively, in December 2003, a slight decrease compared to the same month in 2002.

Regarding electrical service coverage, it is estimated that 65% of homes have electrical service: 87% in urban sectors and 28% in rural areas. Under Bolivian Rural Plan for Electrification (PLABER), this index has continued to improve. The Vice Minister of Electricity and Alternate Energies, has completed 16% of the 200,000 residential connections that are planned by 2007 under PLABER.

A team of experts was appointed to analyze the privatization of 10 companies, and will evaluate the success of the privatizations and tangible results that are perceived to date, almost seven years after the process began.

The Bolivian Regulator (Superintendency of Electricity) prepared a bidding competition for hiring a consulting firm to evaluate changes in the electrical power law in order to attract more investors from the private sector.

## **Renewable Energy and Environment**

The country has renewable energy resources, of which it has been using hydraulic energy, biomass and solar energy. Wind and geothermal energy is not used yet, despite their large potential and the studies done. With regard to hydropower, in 2003 an installed capacity of 479.2 MW was recorded, which has allowed a power generation of 2,306.7 GWh, although the value added by small plants cannot be determined.

The biomass share is important as firewood, mainly for rural residential sector, and as bagasse for the sugar industry. An initial assessment has also been carried out on the feasibility of producing gasohol. Solar energy is used in rural electrification projects meant for remote areas, but its contribution does not affect the overall supply of energy.

The National CDM Office was consolidated during 2003, which has been promoting renewable energy projects. There are several projects awaiting approval under this mechanism, especially as regards hydroelectric plants.

The most important renewable energy project being carried out under the coordination of the Government is the *Programa Nacional de Electrificación Rural* (PRONER). Several projects are also coordinated by non-governmental organizations such as *PROPER*, *ENERGETICA* and others.

It is worth mentioning that in 2003, the World Bank approved a loan to cover the expansion of power supply to rural areas through solar panels, to benefit 100,000 inhabitants.





## BRAZIL

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	Brasilia	o Oil Proven Reserves (Mbbl)	10,601.91
President:	Luiz Inacio Lula da Silva	o Natural Gas Proven Reserves (Gm3)	245.34
Minister of Mines and Energy	Dilma Rousseff	o Coal Proven Reserves (Mt)	5,259.20
Area (km2):	8,511,965	o Total Energy Supply (kBep)	1,449,705.02
Population (inhab):	178,470,000	o Production (kBep)	1,306,325.09
Monetary Unit:	Real	o Import (kBep)	345,884.15
Official Languages:	Portuguese	o Export (kBep)	187,907.41
PIB per capita(US\$):	2,947	o Final Energy Consumption (kBep)	2,041.51

Source: IMF/SIEE-OLADE/Government agencies

Brazil has a population of about 178.4 million inhabitants and has a Gross Domestic Product of about 526 billion dollars. It has the largest hydroelectric reserves in the Region, the second largest coal reserves and the third largest oil reserves. Its principle energy export markets are Argentina, Uruguay, and Paraguay.

### Energy Policy

After becoming president, Luis Ignacio Lula da Silva included the establishment of a new energy policy in his agenda to give special importance to the electrical sector, since the country had experienced a major energy crisis with frequent blackouts in previous years. Thus, in July 2003, the Minister of Energy unveiled a new model for the electrical sector with the goal of guaranteeing the supply, stabilizing prices, and attracting new investment to the sector.

The proposed reforms included encouraging the utilization of hydroelectricity as a source of generation in order to diversify the sources and thus stabilize energy prices.

Another proposed reform was the creation of the “Electricity for All” program that was launched in November by President Lula in order to providing electrical service to 12 million Brazilians living in rural areas by 2008. The implementation of this mega project involves an investment of about 2.5 billion dollars, 73% of which will be financed by the federal government and the remainder by local governments and companies in the sector. In this program the installation of infrastructure to transport electrical energy to homes (electrical connections) will be free for low-income families. Part of the policy also specifies that priority will be given to the use of local labor and the purchase of national equipment and machinery, which will be manufactured near the areas served as much as possible.

A third reform has to do with relaunching the Programa de Incentivo a las Fuentes Alternativas de Energía Eléctrica (PROINFA) [Program of Incentives for Alternative Sources of Electrical Energy]. This program was modified by Law 10.762 of November 11, 2003 to include greater participation by the States in the program, the encouragement of national industry and the inclusion of low-income families. Through this program for supplying energy, it is hoped to create a complementary instrument for hydroelectric generation for remote areas. In the Northeast, wind energy will complement hydroelectricity, since the rainy season is the inverse of the windy season. It will be the same case for the south and southeast using biomass, where the sugar-making season is the inverse of the rainy season. Under this program, it is hoped to double the share of renewable energies by 2006, and achieve 5.9% of the total production of electrical energy.

President Lula's new policy for the hydrocarbon sector gave the domestic sector a greater participation in the development of gas and oil projects. Thus investments in these projects must include a percentage for purchasing goods and services from Brazilian firms. For example, the bidding competition for the construction of ocean platform p-554 requires that 70% of the parts be built in Brazil.

Moreover, it announced the design of a plan for expanding the use of natural gas by extending distribution networks to the residential, domestic, and industrial sectors, and for replacing fuel oil. A commission was established that included representatives of the Ministry of Energy and Mines, and the National Petroleum Agency. It is expected that a design for the final plan will be submitted next year.

The government's policy designs and goals include the expansion of Brazil's heavy crude refining capacity. Petrobras plans to invest 5.5 billion dollars by 2007 to increase its refining capacity to about 1.9 million barrels per day. It was announced that the first step of this plan would be the construction of Brazil's first heavy crude refining plant with capacity for 150,000 barrels per day.

Petrobras plans to expand its oil and gas operations outside Brazil. In May 2003, Petrobras purchased an Argentine company, Perez Companc, and has gas and oil projects in other countries, including Bolivia, Cuba, Venezuela, among others. It should be noted that the exploration of new fields in Brazil is still part of the plans. It was announced that it has plans to invest about 34 billion dollars in exploration over the next 4 years.

The challenges that will face policy design over the next year include the preparation of a new regulatory model for the electrical sector, which must establish proper coordination between the electrical sector and the other sectors involved, as well as a balanced legal framework for the operations of private and state companies, and the regulatory agency. There are many expectations regarding this process that could jeopardize future investments in the sector if it is not handled properly.

## **Hydrocarbons sector**

Based on its strategic plan, Brazil is planning to become self-sufficient in oil production. However, its rapid population growth seems to be making this ambitious target for oil-sufficiency, a mammoth undertaking.

Brazil has substantial oil reserves at 10.6 billion barrels, which are even more likely to increase, significantly, in the coming years, particularly since Petrobras has reported, in 2003, a number of oil discoveries offshore in the Campos Basin. Initial estimates from the discoveries totalled 2.95 billion barrels of heavy oil. Oil discoveries have also been made in the Santos Basin, estimated at some 435 million barrels of light oil. Notwithstanding its large oil deposits and production level, the country still cannot satisfy domestic demand, and must rely on imports. Brazil has exported, in 2003, an estimated 249.0 thousand barrels of oil and some 245.7 thousand barrels of petroleum products per day. On the other hand, it was reported that its oil imports amounted to 361.7 thousand barrels per day, while imported petroleum products were 166.0 thousand barrels per day. Brazil's mix of exports includes petroleum products, as well as the heavier crude oil, which its domestic refineries are unable to refine. As a strategy to improve its oil reserves, Brazil recently opened up exploration activities to attract foreign investors.

Brazil's natural gas reserves now stand at 8.6 trillion cubic feet (tcf), with the Campos and Santos basins holding Brazil's largest natural gas fields. It is Petrobras' view that these discoveries could even hold up to 14.8 Tcf of natural gas, up from a previous estimate of 2.46 Tcf. The Government is also promoting more domestic consumption of natural gas.

Encouraged by the potential of additional reserves from the reassessment of its natural gas basins, Petrobras is contemplating building an LNG gasification terminal to export natural gas to the United States.

There are currently 13 refineries in Brazil with an overall capacity of 2,041.5 thousand barrels of oil per day. Petrobras plans to invest \$11.2 billion in the construction of a new refinery with a capacity of 200,000 bbl/d and to upgrade and expand many of its existing refineries. The main goal of Petrobras' current investment plan is to increase Brazil's ability to refine heavy crude oil, which makes up a large portion of the country's crude oil production.

## **Electricity Sector**

The installed electrical generating capacity, including self-producers, was 86,505 MW in late 2003, an increase of 4.9% over 2002. Self-generators represent 6,218 MW.

Regarding electrical power production, 364,846 GWh were generated, a variation of 5.6% compared to the previous year, which shows a large increase in the Brazilian electrical sector.

This country is very active on international electricity transactions: 6 GWh were exported and 37,141 GWh were imported, principally from Paraguay, but also from Argentina and Venezuela. Brazil is the largest importer of electricity in the region.

Regarding electrical power consumption, final users consumed 329,771 GWh, a 5.5% variation compared to the previous year. This shows a high level of economic growth, because programs for saving power and placing efficiency stickers on electrical equipment were promoted at the same time.

Average internal electricity prices for commercial, industrial and residential customers, as of December 2003, including taxes and expressed in dollars, were 0.073, 0.038 and 0.083 US\$/kWh, respectively. Increases in the order of 40% compared to the same month in 2002 were reported, which are due basically to variations in the exchange rate.

Regarding electrical service coverage, it is estimated that 95% of homes have electrical service; 99% in urban areas and 74% in rural areas. In several countries, the data is from censuses that are not recent, and there is no breakdown of homes that obtain electricity illegally. The “Electricity for All” program launched by the Government calls for universal electrical service in Brazil. The goal is to complete the program in 5 years.

A decision has been made to market the power from Itaipu and Electronuclear through Electrobras.

The Government established a Chamber of Infrastructure Policies to promote the development of the energy sector, and decreed that rates be realigned and subsidies progressively reduced, until they are eliminated completely in 2007.

ANEEL published a resolution defining the bidding competitions for the purchase of power, the Ministry of Mines and Energy carried out a public survey on methodologies for calculating the Economic Values of alternative sources of power, and BNDES confirmed the release of R\$ 3 million to capitalize distributors of electricity.

The Senate passed a draft law that regulates the distributor support program, the universal supply of electricity, PROINFA (Program for Encouraging Alternative Sources) and the use of the CDE (Energy Development Fund).

## **Renewable Energy and Environment**

Brazil has a large renewable resource potential, and makes much use of hydropower, biomass, wind energy and solar energy. In geothermal generation, despite its large potential, there is no confirmation of its possibilities for power generation. In 2003, hydropower reported an installed capacity of 67,791.8 MW, with a power generation of 290,006.4 GWh.

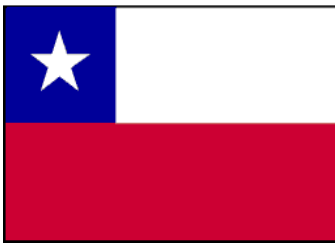
In biomass, the gasohol program is outstanding and is being strengthened due to its affect on the energy matrix. Of similar importance is the share of firewood, charcoal and bagasse, which is used for self-production of energy in the sugar industry. Urban solid waste treatment with energy recovery is also being consolidated.

In terms of wind energy, there is an installed capacity of 28.6 MW, although many permits have been granted for the study and establishment of new plants, as part of the *Programa de Incentivo a las Fuentes Alternativas de Energía Eléctrica* (PROINFA), whose purpose is to promote wind energy, hydroelectric power and biomass energy. Additionally, in 2003 the *Atlas del Potencial Eólico Brasileño* was launched.

As for solar energy, there is much experience in implementing rural electrification projects using photovoltaic panels, and a variety of initiatives by the government, the power companies, and other organizations.

Among the main programs being developed to promote renewable energy are the *Programa Brasileño del Alcohol* (PROALCOHOL), the *Programa de Desarrollo Energético de Estados y Municipios* (PRODEEM), *PROINFA*, and the *Programa Luz para Todos*.

Regarding the environment, there is a National CDM Authority made up of an inter-ministerial committee, through which several projects are being promoted, not the least of which are hydroelectric plants and urban solid waste treatment plants.



# CHILE

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	Santiago	o Oil Proven Reserves (Mbbbl)	29.00
President:	Ricardo Lagos	o Natural Gas Proven Reserves (Gm3)	44.00
Executive Secretary, National Energy Commission	Luis Sánchez Castellón	o Coal Proven Reserves (Mt)	165.43
Area (km2):	756,950	o Total Energy Supply (kBep)	192,346.61
Population (inhab):	15,810,000	o Production (kBep)	63,692.17
Monetary Unit:	Chilean Peso	o Import (kBep)	153,848.99
Official Languages:	Spanish	o Export (kBep)	23,075.37
PIB per capita (US\$):	5,257	o Final Energy Consumption (kBep)	227.00

Source: IMF/SIEE-OLADE/Government agencies

Chile has a population of about 13 million inhabitants and a GDP of about 83 billion dollars. It has few energy resources and is a net importer of energy. The principal countries from which it imports energy are Argentina, Brazil, Nigeria, Peru, and Venezuela. The rate of increase of energy consumption is the highest in the region, totaling 6% per year.

## Energy Policy

Chile's energy policy in recent years has provided strong support to the diversification of its energy supply, and special importance has been given to the consumption of natural gas, both for domestic as well as industrial use, and the generation of electricity. Thus, consumption increased more than 300% between 1991 and 2003. However, since strikes in Argentina (its principal supplier) during 2002 caused blackouts in Chile, the government hopes to improve the regulatory system, as well as the treaties signed with its neighbor, in order to ensure greater reliability of the supply, in harmony with the development and optimum use of power plants that collaborate to ensure a better quality environment in cities that have pollution problems. A first measure is that the government plans to ensure that all natural gas plants can be adapted to use oil as well, and plants must maintain a stock of oil in case the natural gas supply fails.

This policy includes expanding energy integration with Argentina since it is expected that natural gas consumption will double over the next 4 years.

The policies take into account the implementation of exploration and production projects outside Chile. Within this framework, in February of 2003, the Ministry of Finance approved the disbursement of 264 million dollars in order to modernize Chile's refineries. Petroleos de Chile has projects in Argentina, Ecuador, Colombia, and Egypt.

A policy of the electrical sector is to continue the rural electrification program that began during the previous administration. The goal is to achieve rural coverage of 90% by 2006. It should be noted that currently Chile and Costa Rica are the countries that have the greatest electrical coverage in the Region.

Another policy is the promotion of renewable energy to supply isolated rural communities that cannot be reached by electrical networks. A project was initiated this year to supply electrical energy to 6,000 homes using solar or photovoltaic panels. Other projects that use wind energy are in the design stage. The promotion of renewable energy also includes the gradual replacement of diesel systems with hybrid systems based on renewable energy.

Finally, one of the challenges in the coming year will be the structuring of a natural gas supply security plan that will meet the high rate of growth in energy consumption that it is expected to continue in the coming years.

### **Hydrocarbons sector**

The energy consumption has been steadily increasing, reaching 80.61 million bbls in 2003, a growth of 6.57% from 2002.

Chile's domestic hydrocarbon reserves are concentrated in the Magallanes basin, where its State-owned oil company, Empresa Nacional de Petróleo (ENAP) has developed 23 fields. However, because of the maturity of its wells, not much has been accomplished. Other exploration efforts have also proven unsuccessful. Over the years, the oil company has been pursuing joint venture partners to reactivate its idle and declining fields.

Chile has three refineries, all of which are controlled by ENAP, with a combined capacity of 227.0 thousand barrels of crude oil per day.

Chile does not have huge natural gas reserves, estimated at 1.5 trillion cubic feet (tcf). At the same time, the country's natural gas production is declining at -14.30% by 2003. On the other hand, consumption has increased, tremendously, and now constitutes a major part of the country's energy mix.

ENAP is seriously looking at LNG and plans to issue a tender for the construction of an LNG regasification facility at Quintero in central Chile sometime in the near future.

### **Electricity Sector**

The installed generating capacity for public service was 9,969 MW, and including the self-generators, it was 10,738 MW, an increase of 2.2 %.

Regarding electrical power production, 45,055 GWh were generated, a variation of 3.2% compared to the previous year.

Regarding international electricity transactions, no exports were reported and imports were 1,667 GWh, principally from Argentina. Several generators also depend on natural gas, a major portion of which is imported from Argentina.

Regarding electrical power consumption, final users utilized 41,894 GWh, a 2.7% increase compared to the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of November 2003, including taxes and expressed in dollars, were 0.093, 0.063 and 0.097 US\$/kWh, respectively. On the average, these were 19% and 15% greater than December 2002.

Service coverage is estimated to be 97% of homes, with almost 100% in urban areas and 809% in rural areas.

The Senate approved a proposal by the Ministry of Economy and Energy to regulate transmission fees.

The Minister's Council of the National Energy Commission (CNE), approved the construction of the 480 MW Candelaria gas generation project belonging to Colbun, but Colbun was forced to suspend construction work temporarily because the local municipality canceled its work permits.

## **Renewable energy and environment**

Renewable energy is used regularly in the energy sector of Chile, with a large share for hydropower, biomass and solar energy. In geothermal generation, the potential is very high, but has not yet been exploited. Despite having a specific law to promote this resource, only a few concessions have been granted.

In 2003, there was a reported hydropower generation in the order of 24,176.5 GWh, with an installed capacity of 4,279.14 MW.

In terms of biomass, experience has been gathered in the use of biogas from urban solid waste dumps, and some plants also use forest waste for cogeneration.

In 2003, there was a reported installed wind energy capacity of 2 MW, which corresponds to a plant built in the XI Region. Note also that Chile has a large wind potential.

In solar energy, most use is centered in electrification of remote rural areas through the *Programa Nacional de Electrificación Rural* (PER).

Interestingly, in 2003 the *Programa Chile Sustentable* developed a draft law for using renewable energy in the power generation, which was submitted to the consideration of the National Government.

With regard to the CDM, the National Authority is the Consejo de Ministros de la Comisión Nacional de Medio Ambiente (CONAMA), which is in charge of promoting these projects.





## COLOMBIA

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	Bogota	o Oil Proven Reserves (Mbbbl)	1,542.40
President:	Alvaro Uribe	o Natural Gas Proven Reserves (Gm3)	188.04
Minister of Mines and Energy	Luis Ernesto Mejía	o Coal Proven Reserves (Mt)	6,521.70
Area (km2):	1,138,910	o Total Energy Supply (kBep)	213,557.52
Population (inhab):	44,220,000	o Production (kBep)	541,531.18
Monetary Unit:	Colombian Peso	o Import (kBep)	785.66
Official Languages:	Spanish	o Export (kBep)	322,248.84
PIB per capita (US\$):	1,841	o Final Energy Consumption (kBep)	396.00

Source: IMF/SIEE-OLADE/Government agencies

Colombia has a population of 44.2 million inhabitants and a GDP of 81.3 billion dollars. It has the largest coal reserves in the region; it is in second place with regard to hydroelectric potential and is among the six countries with the largest oil reserves. Its principal energy (oil) exports are to United States.

In April 2003, Colombia and Venezuela agreed to build a gas pipeline to export natural gas to the Maracaibo region. It hopes to expand the gas pipeline to Panama and Ecuador.

In January 2003, the Colombian Association of Mines began a campaign to promote coal exports to the countries of Central and South America and in April, the Government budgeted US\$ 320 million for the development of infrastructure to increase the coal export capacity.

In January, an electrical transmission line was inaugurated between Colombia and Ecuador and a second was inaugurated in March.

In April, Panama and Colombia signed a memorandum of understanding on energy integration.

### Energy Policy

Colombia's energy policy for the electrical sector includes the goal of promoting the development of new energy technologies (wind), the identification and development of new electrical generation projects based on natural gas, and encouraging the connection of isolated municipalities to the interconnected system, and the construction of micro and small hydroelectric plants when resources are available.

Other objectives include the maintenance of a rate system that reflects the costs of efficient service. For this purpose, in March 2003, the Ministry of Energy and Mines announced an increase in electrical rates based on a new regulatory model.

A third goal involves the expansion of the energy market (interconnections) between neighboring countries (Brazil, Venezuela, Ecuador, Peru, and Panama).

Finally, there is the implementation of regulations on nuclear energy and the creation of mechanisms for promoting private participation in expansion plans.

In the hydrocarbons sector, the main objective of energy policy is to increase oil reserves, since during the past ten years there have been no new oil discoveries and the reserves have dropped significantly over the past 4 years. This policy permits the production period of partnership contracts with the state company (ECOPETROL) to be extended, so that crude oil production can continue until the economic limit of the reservoir is reached. A second measure is to change from a fixed royalty of 20% to a variable one. Third, to reduce Ecopetrol's share in partnership contracts, and finally for contracts to give separate treatment block by block. Through these measures, the government hopes to position Colombia as one of the most competitive countries in terms of oil contracts.

Other policy objectives include reducing the subsidies on gasoline, strengthening the fight against fuel contraband, completing the deregulation process for the liquid fuel chain, in order to encourage new participants to become involved, as well as competition.

Finally, with regard to natural gas, it is expected that new tax incentives will be adopted to encourage the growth of the program for using natural gas in motor vehicles, and it is expected that the design of a plan for the mass distribution of natural gas in the industrial, commercial, and domestic sector will be initiated.

## **Hydrocarbons sector**

Colombia's oil production has declined steadily reaching 197.58 million barrels in 2003 at a negative growth of -6.37%. It is stated that infrastructure sabotage from guerrilla groups has mainly contributed to this decline. In fact, Ecopetrol took strike action in the first quarter of 2003 to protest the abduction and killings of its oil union workers.

All hydrocarbon reserves in Colombia are state-owned, and are regulated and controlled by Empresa Colombiana de Petroleos (Ecopetrol) and the Ministry of Energy and Mines (MEM). Private companies operate in joint ventures contracts with Ecopetrol. In 2003 several exploration contracts were signed with Ecopetrol, and drilling activities have already commenced.

The *Plan de Masificación de Gas Natural* (Natural Gas Mass Consumption Plan) by the Colombian government aims to increase natural gas usage. Colombia's natural gas reserves are located in 18 basins, seven of which are located offshore. Colombia and Venezuela agreed to build a \$120 million pipeline that would allow Colombia to export

natural gas from the Guajira basin to Venezuela's Maracaibo region. This pipeline, it is felt, could eventually be extended to Panama and Ecuador.

Colombia's current refining capacity is some 396.0 thousand bbl/d. All refineries are 100% owned and operated by Ecopetrol. Currently there is a private initiative to construct a refinery at Sebastopol. Although Colombia is a net oil exporter, gasoline and diesel fuel are imported to meet domestic demand.

## **Electricity Sector**

In 2003, its installed electrical generating capacity, including self-producers, was 13,653 MW, 1.4% less than the previous year.

Regarding the production of electrical power, 47,682 GWh were generated. This is a variation of 5.4% compared to the previous year. This figure was influenced by greater exports to Ecuador.

In March 2003, began operations the 230 kV interconnection between Ecuador and Colombia; the Regulators, CONELEC of Ecuador and CREG of Colombia harmonized their respective regulations on international transactions. On that basis, 1,120 GWh were exported to Ecuador, and total exports were 1,182 GWh, while 69 GWh were imported. The governments of Colombia and Panama approved an electrical interconnection of 400 km.

Regarding electrical power consumption, final users utilized 36,518 GWh, a 2.3% variation compared with the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.092, 0.072 and 0.077 US\$/kWh, respectively. This is an increase of about 20% compared to the figures for the same month in 2002. The new rate structure will produce increases of about 8% over two years.

In 2003, it was estimated that 90.7% of homes were supplied with electricity, in urban areas the figure is 97.6% and in rural areas, 65.3%. The Ministry of Mines and Power submitted a draft law to supply electricity to 1.5 million persons in rural and urban areas.

## **Renewable Energy and Environment**

Colombia has many renewable resources that are used for energy purposes, mainly hydropower, biomass, solar energy, and wind energy. With regard to geothermal generation, in the 2003 studies were done on the Paipa-Iza field, but no generation plants are forthcoming so far.

With regard to hydropower, there is a reported installed capacity of 8,893.34 MW, with 35,952.4 GWh of generation. Although it is not possible to specify the amounts contributed by small plants, their total installed capacity is 168 MW.

In terms of biomass, bagasse is much used by the sugar industry and for self-production of electricity (about 25 MW). Studies have also been done on landfills, and there is much use of firewood in the residential sector. In wind energy, *Empresas Públicas de Medellín* is building the first plant with an installed capacity of 20 MW, which is expected to begin operations in early 2004. It is financed using company funds and a contribution from the sale of carbon certificates, delivered by the World Bank.

Regarding solar energy, numerous rural electrification projects have been developed using photovoltaic panels, with an estimated installed capacity of 2 MW.

In environmental terms, the National CDM Authority is fully operational under the Ministry of the Environment, Housing and Territorial Development, which is very actively promoting projects, especially in the areas of hydropower and wind energy.



## COSTA RICA

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	San José	○ Oil Proven Reserves (Mbbbl)	0.00
President:	Abel Pacheco	○ Natural Gas Proven Reserves (Gm3)	0.00
Energy Authority:	Carlos Manuel Rodríguez Echandi	○ Coal Proven Reserves (Mt)	32.80
Area (km2):	51,100	○ Total Energy Supply (kBep)	24,226.44
Population (inhab):	4,170,000	○ Production (kBep)	11,712.89
Monetary Unit:	Colon	○ Import (kBep)	14,624.57
Official Languages:	Spanish	○ Export (kBep)	1,702.59
PIB per capita(US\$):	3,981	○ Final Energy Consumption (kBep)	25.00

Source: IMF/SIEE-OLADE/Government agencies

Costa Rica has a population of 4 million inhabitants and has a GDP of US\$ 16.5 billion dollars. It is one of three Central American countries with refining capacity, together with Nicaragua and El Salvador.

### Energy Policy

Costa Rica's energy policy is based on four principles:

- a) Maintaining the role of the State in activities involving the development of energy resources.
- b) Ensuring that energy development contributes to maintaining social, economic, and political equilibrium.
- c) Safeguarding national sovereignty by avoiding excessive external dependence on strategic inputs and
- d) Maintaining and improving the quality of life of the people

These principles highlight to the fulfillment of the principal objective, which is to "Ensure an adequate supply of energy for the integral development of Costa Rican society."

The policy for the hydrocarbons sector is to promote investment in exploration and production, to maintain strategic petroleum refining and storage capacity, to study the advisability of integration with the countries of the region, and to include natural gas as an energy source in the national market.

In the electrical sector, it will promote the manufacture and importation of equipment that uses renewable energy sources for electrical generation, and priority will be given to those that are environmentally clean. Moreover, it will promote the expansion of the

networks through a program of rural and peripheral electrification, as well as the exportation of electricity to other markets, and it will continue the process of Central American interconnection.

## **Hydrocarbons sector**

Costa Rica has no hydrocarbon reserves and its economy is highly dependent on tourism. Costa Rica oil import bill is steadily growing at an estimated 3.81 millions of barrels in 2003, representing a growth rate over 2002 of 9.22%. The country has no natural gas in its energy mix. The refining capacity of Costa Rica is approximately 25 thousand barrels of crude oil per day.

## **Electricity Sector**

Installed electrical generation capacity for public service and self-producers was 1,939 MW, a 7.5% increase over the previous year.

Regarding electrical power production, 7,565 GWh were produced, a variation of 1.1% compared to the previous year.

Exports were 118 GWh and 41 GWh was imported through the Central American interconnection.

Regarding electrical power consumption, final users utilized 6,708 GWh, a variation of 7.2% compared to the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.086, 0.060 and 0.062 US\$/kWh, respectively. In dollar terms this meant reductions of 5 %, 11 %, and 0.3 %, respectively, compared to December 2002 figures. In late 2003, the regulator, ARESEP, approved an average increase of 15.7% in residential electrical rates for the distributor, Compañía Nacional de Fuerza y Luz, CNFL, which had requested an increase of 21.5%. Electrical rates in Costa Rica have not been affected much by the increase in petroleum prices because their principal component is hydroelectric.

It is estimated that 98 % of all homes, and almost 100% of urban homes, have electricity. It is therefore one of the countries with the highest levels of electrification.

Costa Rica participates actively in the SIEPAC project for constructing a new electrical interconnection in Central America. To give substance to this new system; regional regulatory and operating agencies have been created. These are: Regional Electrical Interconnection Commission - CRIE and Regional Operating Agency –EOR; under the Framework Treaty for Central American Electrical Interconnection.

The labor union of ICE, the state telecommunications and electrical power company, threatened to strike due to a reduction in its budget, but after several days of dialogue, agreements were reached. However, several projects have been postponed.

In September, the Legislative Assembly ratified the appointment of Aracelly Pacheco as the new General Regulator of the Public Services Regulatory Authority, ARESEP.

## **Renewable Energy and Environment**

Costa Rica is a country that has given preferential treatment to renewable energy. Practically all of its electricity is generated with these resources, be it geothermal, wind, hydropower, biomass, or solar. Geothermal resources provided the lion's share of the energy supply for 2003, with an installed capacity of 162.71 MW that generated 1,385.9 GWh.

As for hydroelectric power, there is an installed capacity of 1,295.6 MW that generated 6,021.9 GWh of electricity.

In terms of wind energy, Costa Rica has the largest installed capacity of Latin America and the Caribbean, with 66 MW, and has plans to build an additional 40 MW. In biomass, the sugar mills generate a considerable amount of electricity for self-production and sale of surplus to the national network.

As regards solar energy, a number of photovoltaic systems have been installed throughout the country as part of rural development projects, but they have little effect on the overall supply of energy.

Costa Rica uses the CDM for developing several projects in the energy and environmental sectors, notably hydroelectric, wind and landfill projects. The National CDM Office fully operational and is actively promoting especially hydropower and urban solid waste projects.



## CUBA

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	Havana	o Oil Proven Reserves (Mbbbl)	74.50
President:	Fidel Castro Ruz	o Natural Gas Proven Reserves (Gm3)	70.50
Minister of Foreign Investments and Economic Cooperation	Marta Lomas Morales	o Coal Proven Reserves (Mt)	82,249.42
Area (km2):	110,860	o Total Energy Supply (kBep)	50,405.86
Population (inhab):	11,306,249	o Production (kBep)	32,300.90
Monetary Unit:	Cuban Peso	o Export (kBep)	150.00
Official Languages:	Spanish	o Final Energy Consumption (kBep)	3,959.10
PIB per capita (US\$):	2,300		

Source: IMF/SIEE-OLADE/Government agencies

Cuba has a population of about 11 million inhabitants and a GDP of US\$ 31.5 billion dollars. It imports about 50% of the oil it consumes (50%), mainly from Venezuela, under an agreement (Caracas Agreement) that will expire in 2005. Cuba is the largest producer of renewable energy in the Caribbean.

### Energy Policy

Energy policy is oriented toward achieving energy independence. It promotes oil exploration, principally offshore, through shared risk contracts between the State Corporation, Cubapetro, and private companies. Part of the energy independence strategy involves the development of renewable energy sources. It plans to continue supporting the use of biomass as the principal source of alternative energy. It is expected that renewable energy will be 40% of the total amount of primary energy that is produced in the next year.

### Hydrocarbons sector

Cuba has been showing significant growth in its oil production, which in 2003 reached 80,000 bbl/d. However, it is still a net importer of oil as consumption averaged an estimated 209,000 bbl/d. Accordingly, Cuba has to meet its shortfall of oil and petroleum products from other countries; and similar to some other countries in the region, Cuba, through the Caracas Accord, purchases some 78,000 bbl/d of oil and petroleum products from Venezuela. By the end of 2003 Cuba's proven crude oil reserves were 74.50 billion barrels, while its natural gas reserves were 2.5 Tcf.

There are plans for drilling off Cuba's northwest coast through Repsol-YPF. The results could repaint Cuba's energy picture as a net importer of oil, should there be any



significant finds. Repsol-YPF is projecting to spend more than \$40 million on the project in anticipation that a potential 1.6 billion barrels could be discovered offshore. Brazil's Petrobras is, also, currently conducting a feasibility study to determine whether to re-start exploration operations in Cuba, after an earlier failed attempt.

Most of its domestic crude oil production has been described as with low ° API and high sulphur based crude, so that its refineries process imported crude oil, mainly from Venezuela. The overall refining capacity of Cuba is 150.0 thousand barrels of crude oil per day.

## **Electricity Sector**

The installed electrical generating capacity, including self-producers, was 3,959 MW in 2002. OLADE has not received reports of any changes in 2003.

Regarding electrical power production, 15,909 GWh was generated, a variation of 1.3% compared to the previous year.

Regarding electrical power consumption, final users utilized 12,469 GWh, a variation of 1.3% compared to the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.105, 0.084 and 0.143 US\$/kWh, respectively. This means that there were increases, in dollars, of 5 %, 9 %, and 4 %, respectively, compared to December 2002 values.

It is estimated that 96% of homes have electricity, 99% in cities and 87% in rural areas.

Priority has been given to rapid recovery power projects and promoting the electrification of irrigation systems to reduce the use of imported fuel. Efficient power use programs continue to be applied.

In mid May, 2003, the 19th Latin American Conference on Rural Electrification was held in Havana, which demonstrated to participants from many countries on the American continent and from other continents, the notable achievements in this area by the Cuban electrical sector.

## **Renewable energy and environment**

These energy sources are very important in the energy structure of Cuba, especially biomass, hydropower, solar energy and wind energy. In biomass, sugar cane bagasse has been used to generate electricity for self-consumption and to feed the national network, with an installed capacity of 790 MW. In hydropower, 78 GWh were generated in 2003.

In terms of solar energy, photovoltaic panels are used to develop electrification programs for remote rural areas, with an emphasis on education and health. For example, the *Isla de la Juventud* is developing a project to increase the share of renewable energy in the energy services of the island, under the coordination of the

Ministry of Science, Technology and the Environment, with the support of the United National Organization for Industrial Development and GEF.

As for wind energy, 0.45 MW plant is in operation, and studies have been done to exploit the country's large potential.

In Mayo 2003, the *IX Conferencia Latinoamericana de Electrificación Rural* was held in *La Havana*, with progress reports on several renewable energy projects throughout the region.

Regarding environmental issues, Cuba has a National CDM Authority that is the Ministry of Science, Technology and the Environment, which is working on the promotion of projects, especially in biomass, with the backing of several cooperation agreements with other countries such as Canada.



## ECUADOR

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	Quito	o Oil Proven Reserves (Mbbbl)	5,060.00
President:	Lucio Gutiérrez	o Natural Gas Proven Reserves (Gm3)	4.30
Minister of Energy and Mines	Eduardo López	o Coal Proven Reserves (Mt)	22.00
Area (km2):	256,370	o Total Energy Supply (kBep)	63,674.94
Population (inhab):	13,000,0000	o Production (kBep)	178,420.87
Monetary Unit:	American Dollar	o Import (kBep)	11,064.67
Official Languages:	Spanish	o Export (kBep)	110,281.60
PIB per capita(US\$):	2,084	o Final Energy Consumption (kBep)	184.90

Source: IMF/SIEE-OLADE/Government agencies

Ecuador has a population of 13 million inhabitants and a GDP of 27 billion dollars. It has the fourth the largest oil reserves in the region after Venezuela, Mexico, and Brazil, and is one of the 10 countries with the greatest hydroelectric reserves in the region. Its main energy export markets are United States and Colombia

In May, it granted a concession for the construction of the Mazar hydroelectric plant that will have a capacity of 180 MW, and in November the Brazilian company, Oderbretch, began construction of a hydroelectric plant in Tungurahua that will have a generating capacity of 230 MW.

In September, the heavy crude pipeline (OCP) began operating, which permitted Ecuador's crude oil transportation capacity to double to 850,000 Bbl/d.

### Energy Policy

Following drops in production by the state corporation (Petroecuador) that occurred over the past year, principally due to a lack of investment, the goal of hydrocarbon energy policy is to increase oil production. In April, the government announced plans to increase production to 613,000 Bbl/d by 2007. However, the challenge is to attract investment to achieve that goal, given the problems faced by the sector, which include the following: Opposition by Petroecuador workers to opening up jobs or projects to the private sector using partnership contracts, problems involving the VAT increase in 2001, and the promulgation of a new hydrocarbons law, which raises serious doubts about the sector.

In the electrical sector, energy policy has been oriented in recent years toward the privatization of its units, but there was strong opposition from the workers as well as local governments. In July, the shares of the company, EMELEC, were transferred to

the municipal government of the city of Guayaquil, and a company, Distriguayaquil, was created.

The policy objectives also include continuing with rural electrification plans through the Fondo de Electrificación Rural y Urbano Marginal, FERUM, [Rural and Marginal Urban Electrification Fund] so that network expansion projects and the installation of small hydroelectric plants and photovoltaic systems can continue.

## **Hydrocarbons sector**

Ecuador's proven crude oil reserves stood at approximately 5 billion barrels in 2003. The increase in oil production, reportedly at 152.49 millions of bbls in 2003, mainly as a result of the opening of a new, privately operated, heavy oil pipeline, Oleducto de Crudos Pesados (OCP) in this year. This 450,000-bbl/d pipeline doubled Ecuador's oil transport capacity to 850,000 bbl/d.

Critical to meeting the Government's goal of increasing oil production is its ability to attract foreign investment, which has been plagued by a number of issues, not the least among them being environmental, taxation policies and Petroecuador workers' resistance to foreign investment.

Ecuador has relatively small proven natural gas reserves of 345 billion cubic feet (Bcf).

The total refining capacity of Ecuador is 185,000 bbl/d. Petroindustrial, the refining subsidiary of Petroecuador, operates the country's three refineries: Esmeraldas, Amazonas and La Libertad. Petroecuador is also considering building a new \$1.1 billion refinery that could process 110,000 bbl/d of heavy crude.

## **Electricity Sector**

At the end of 2003, its installed electrical generating capacity was 3,541 MW, including registered self-generators, 7.5% more than the previous year, because two barge-mounted generators were included in the statistics. The Government granted a concession for the construction and operation of the 180 MW Mazar Hydroelectric Plant to HIDROPAUTE S.A.; the reservoir of that plant will improve the operating conditions of the current Paute power station, the principal in Ecuador.

Regarding internal electrical power production, 11,501 GWh were generated, a drop of 3% compared to the previous year. This was compensated for by imports from Colombia using the 230 kV line.

The 230 kV electrical interconnection between Quito, Ecuador, and Pasto, Colombia, allows exchanges of up to 250 MW and operated since March 2003. Exports were 67 GWh, and imports from Colombia were 1,120 GWh; the two national electrical systems have had to operate synchronously since that time. Under Decision 536 of the Andean Community, CAN, Regulators from Ecuador and Colombia harmonized their regulations to facilitate electrical transactions.

Regarding electrical power consumption, final users utilized 8,366 GWh, a 3.3% variation compared to the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.111, 0.097 and 0.130 US\$/kWh, respectively. The prices reported are practically identical to those of December 2002, except those of residential users, which increased by 13 %.

Regarding coverage, it is estimated that 90 % of homes have electricity, though the data are from the 2001 census; and there is no breakdown of homes that obtain electricity illegally.

The Consejo Nacional de Electricidad, CONELEC, approved the plans of twenty distributors, and assigned US\$ 42 million dollars from the Rural and Urban Marginal Electrification Fund, FERUM, for the implementation of almost two thousand projects in 2004, mainly for the extension of networks.

The World Bank is funding a program called PROMEC, that includes projects for defining a future rural electrification strategy (CONELEC) and the implementation of renewable power pilot projects in order to determine optimum sustainability models (Ministry of Energy and Mines).

## **Renewable energy and environment**

The participation of renewable energy considers hydropower, solar energy and wind energy. With regard to hydropower, 2003 reached a power generation of 7,180.4 GWh, produce by plants with an installed capacity of 1,733.6 MW.

In terms of wind energy, four projects were in the fund-raising stages in 2003, 2 located on the Galapagos Islands, one in the province of Imbabura and one in the province of Loja.

As for solar energy, the Government has begun a rural electrification program in a few towns in Ecuador's Amazon Region. As a part of this orientation, in 2003 the *Consejo Nacional de Electricidad del Ecuador* (CONELEC) approved plans submitted by 20 distributing companies, allotting US\$ 42 million from the *Fondo de Electrificación Rural y Urbano Marginal* (FERUM) to execute nearly 2000 projects during 2004, including the expansion of networks and the installation of micro-hydroelectric plants and photovoltaic systems.

Additionally, the World Bank is financing the PROMEC program, which contemplates rural electrification activities with photovoltaic panels and hydroelectric plants.

In environmental terms, the National CDM Office is fully operational under the Ministry of the Environment. It has a project promotion unit, CORDELIM, which is supporting the project promoters.



## EL SALVADOR

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	San Salvador	o Total Energy Supply (kBep)	30,531.85
President:	Francisco Florez	o Production (kBep)	19,815.61
General Superintendent of Electricity and Telecommunications	Jorge Isidoro Nieto Menendez	o Import (kBep)	16,188.44
Area (km <sup>2</sup> ):	21,041	o Export (kBep)	1,366.55
Population (inhab):	6,520,000	o Oil Refining Capacity (kbb/dia)	44.04
Monetary Unit:	Salvadorian Colon	o Electric Generation Capacity (MW)	1,219.00
Official Languages:	Spanish		
PIB per capita (US\$):	2,292		

Source: IMF/SIEE-OLADE/Government agencies

El Salvador has a population of 6.5 million inhabitants and a GDP of about US\$ 15 billion dollars. It is the largest producer of geothermal energy in Central America and is a net importer of petroleum for internal consumption.

### Energy Policy

El Salvador began a process to privatize energy distribution that involved the dissolution of the national electric company, but the rest remains in state hands. It plans to privatize geothermal generation, however. Still pending in the policy guidelines is a reorganization of the institutional structure of the sector, and the separation of policy activities from regulation and control activities.

One of the principal policy guidelines is the promotion of integration plans to ensure the supply of energy. Efforts in this area include the current interconnection with Guatemala, the expected interconnection with Honduras, and the SIEPAC transmission line.

### Hydrocarbons sector

With no hydrocarbon reserves the country is completely dependent on petroleum and derivatives imports estimated at 6.98 million barrels in 2003, an increase of 2 % over 2002. Natural gas is not in the country's energy mix. The refining capacity of El Salvador is 44.0 thousand barrels of crude oil per day.

### Electricity Sector

Installed electrical generating capacity, including self-producers, was 1,219 MW, an increase of 7.3% over the previous year. The increases are due to an additional 18.9 MW at the Cerron Grande power plant and the repair of one of its units; as well as the incorporation of 16.2 MW at Soyapango, 6.7 MW at San Miguel and 20 MW at CASSA.

Regarding electrical power production, 4,764 GWh were generated, a variation of 6.7% compared to the previous year. In relation of international electrical transactions, exports were 103 GWh and 428 GWh were imported using the Central American interconnection.

Regarding the electrical power consumption, final users purchased 4,839 GWh, a 16.9% variation compared to the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.111, 0.121 and 0.129 US\$/kWh, respectively. In dollars, these are 4% and 6% less than for the same month in 2002. It is estimated that 76% of homes have electricity, 99% in urban areas and 45% in rural areas.

Modifications were made in the General Law of Electricity in order to strengthen the regulatory framework and grant new powers to SIGET. The reforms defined and extended the system of infractions and penalties, and incorporated aspects of service quality and mechanisms for monitoring the market and promoting competition.

Regulations that must be obeyed by electrical distributors when adjusting rates for the final consumer were promulgated, and a compensatory fund was created in the wholesale market that is to be managed by the Transactions Unit. Under this reform, electrical price adjustments will be applied each semester and will take effect on June 10 and December 10, as appropriate.

El Salvador Transmission Company, which is in charge of planning expansion, building new extensions and strengthening the transmission network, as well as maintaining the system, submitted the First Transmission System Expansion Plan for the 2004-2008 quinquennium to SIGET for approval. SIGET will prioritize the tasks and place great importance on the Central American interconnection.

## **Renewable Energy and Environment**

The share of renewable energy is sizeable, especially in geothermal generation, hydropower and biomass. In 2003, 1,128.9 GWh of power generation were reported from geothermal plants, with an installed capacity of 161 MW.

Hydropower generated 1,704.6 GWh, with an installed capacity of 422 MW. In biomass, the contribution of bagasse is important in sugar mills for power generation. There are also rural electrification programs for remote rural populations that use solar photovoltaic energy.

The National CDM Office has been formed under the Ministry of the Environment and Natural Resources and is very active in developing procedures for projects and preparing an overall base line for projects.





## GRENADA

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	Saint George	o Oil Proven Reserves (Mbbbl)	
President:	Isabel II, represented by Daniel Williams	o Natural Gas Proven Reserves (Gm3)	0.00
Minister of Energy	Gregory Bowen	o Coal Proven Reserves (Mt)	0.00
Area (km2):	344	o Total Energy Supply (kBep)	0.00
Population (Inhab.):	80,000	o Production (kBep)	567.38
Monetary Unit:	East Caribbean Dollar	o Import (kBep)	42.88
Official Languages:	English	o Export (kBep)	524.50
PIB per capita (US\$):	5,132		

Source: IMF/SIEE-OLADE/Government agencies

Grenada has a population of about 80 thousand inhabitants and a GDP of about US\$ 410 million dollars. Its energy needs depend entirely on the importation of fossil energies. The electric companies have very high generating costs and this has a repercussion on the rates due to the size of the population.

### Energy Policy

A policy goal is the development and implementation of projects that use renewable energy sources such as solar, wind, bagasse, etc. Reforms are planned to make viable or encourage these projects in the medium and long term.

### Hydrocarbons sector

Grenada lies in close proximity to Trinidad and Tobago, and the country is optimistic that it could make some hydrocarbon discoveries in the near future. In this regard, Grenada is considering the prospects of exploring for oil and gas with Trinidad and Tobago as a potential partner in such joint exploration operations. There is no refining capacity in Grenada, which imported 1.6 thousand barrels of petroleum products per day, in 2003.

### Electricity Sector

The installed electrical generating capacity for supplying the public was 32 MW in 2002. OLADE has received no reports on self-generation facilities or variations during year 2003.

Regarding electrical power production, 154 GWh was generated, an increase of 0.2% over the previous year. There are no international transactions because it is an island.

Regarding electrical power consumption, final users utilized 130 GWh, an increase of 0.3% over the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of May 2003, including taxes and expressed in dollars, were 0.234, 0.188 and 0.221 US\$/kWh, respectively. The prices reported are practically identical to those of December 2002.

Electrical service coverage was 82% according to the 1993 report

According to the Electrical Services Company of Grenada, GRENLEC, it has continued its plans to increase generation, which is currently concentrated at the Queen's Park Plant in Saint George.

During 2003, the design of the transmission system between Queen's Park and the 66kV substation to be built at Woodlands was also completed.

### **Renewable energy and environment**

The current natural resource potential is centred on solar energy, wind and biomass, with some small waterfalls, a few of which are exploited. Solar energy is limited to the use of water heaters for hospitals and the residential sector, as well as certain facilities for rural electrification. There is an interesting potential for wind energy. As for biomass, its use is limited to firewood for cooking in the rural residential sector and to bagasse as a fuel for the sugar cane industry.

Studies have also been made of the wind resources on the three islands that make up the country, and three sites of interest have been identified for generating electricity with the wind.



## GUATEMALA

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	Guatemala	o Oil Reserves (Mbbbl)	493.15
President:	Alfonso Antonio Portillo	o Natural Gas Reserves (Gm3)	0.60
Minster of Energy and Mines	Roberto González Díaz - Durán	o Coal Reserves (Mt)	0.00
Area (km2):	108,890	o Total Energy supply (kBep)	55,756.74
Population (inhab):	12,350,000	o Production (kBep)	39,979.49
Official Languages:	Spanish	o Energy Imports (kBep)	24,494.72
Monetary Unit:	Quetzal	o Energy Exports (kBep)	8,664.47
PIB per capita (US\$):	1,978	o Final Energy consumption (kBep)	48,683.42

Source: IMF/SIEE-OLADE/Government agencies

Guatemala has a population of about 12 million inhabitants and a GDP of US\$ 24.4 billion dollars. Despite its limited energy reserves, it is the largest oil producer in Central America and has one of the largest coal fired power plants in the region.

### Energy Policy

Its policy in the hydrocarbons sector is oriented toward encouraging the exploration and production of reserves and promoting regional integration.

Interconnections are promoted in the electrical like the hydrocarbons sector to ensure an adequate supply. In May, an electrical interconnection agreement was signed with Mexico. It is expected that this project will begin operation in 2005. Another policy involves the expansion of generating capacity and it is expected that several thermal generation plants will begin operation in the coming years.

With regard to rural electrification, it will continue with the development of the Programa Nacional de Electrificación Rural (PER) [National Rural Electrification Program] in order to achieve 90% coverage in the coming years.

### Hydrocarbons sector

Guatemala has an estimated 493.2 million barrels of proven oil reserves. Perenco is the dominant oil operator in Guatemala, which experienced a decline in its oil reserves in 2003 by - 0.37%. The government is reportedly preparing more blocks across the country for exploration in the near future, and there are existing plans to exploit potential reserves near Lake Izabal, Guatemala's largest lake. The refining capacity of Guatemala is 22.5 thousand barrels of crude oil per day.

## Electricity Sector

Installed electrical generation capacity including that of self-producers was 2,009 MW, an increase of 32.8% over the previous year. Regarding electrical power production, 6,561 GWh were generated, an increase of 6% compared to the previous year.

Exports were 428 GWh and 31 GWh were imported using the interconnections of the Isthmus. Mexico and Guatemala signed a memorandum of understanding for interconnecting their electrical power networks. In the future, this will facilitate the continuation of the electrical integration process between the Central American Isthmus and Mexico.

Regarding electrical power consumption, final users utilized 5,808 GWh, a 3.4% increase over the previous year. Average internal electricity prices for commercial, industrial and residential customers as of May 2003, including taxes and expressed in dollars, were 0.062, 0.074 and 0.079 US\$/kWh, respectively. Prices almost identical to those of December 2002 were reported.

It is estimated that 86% of homes have electricity, with 92% in urban areas and 80% in rural areas. The Ministry of Environment closed the 20 MW Rio Las Vacas hydroelectric plant in the municipality of San Pedro Ayampuc due to environmental contamination.

In December 2003, the “HIDROCANADA” generating plant located in the municipality of Zunil, Quetzaltenango, began commercial operations related to the National Inter-Connected System, with an installed power of 47 MW.

## Renewable energy and environment

Guatemala is exploiting several renewable sources, such as hydropower, biomass, geothermal generation and solar energy. In terms of wind energy, a wind atlas was developed in 2003. In hydropower, a power generation of 2,176 GWh was reported in 2003 from plants with an installed capacity of 627.3 MW. As for biomass, firewood has a very large share for residential use, which in 2003 was 8,765 tons. Additionally, bagasse is quite important, both for self-generation in sugar mills and for sale to the national network, generating about 604 GWh from plants with an installed capacity of 187.7 MW.

Regarding geothermal generation, a reported power generation of 195 GWh comes from an installed capacity of 29 MW. Solar energy has seen several rural electrification projects with photovoltaic panels. The Law of Incentives for the Development of Renewable Energy Projects, Decree 52-2003, was passed in November 2003. With support from UNEP, the project Investigación de Recursos de Energía Solar y Eólica (SWERA) developed the preliminary wind and solar maps for Guatemala. With financing from the Ministry of Energy and Minas, 200 iron firewood saving stoves were installed in rural homes, especially in areas that are considered to be impoverished.

In environmental matters, the authority that is responsible for CDM projects is the *Comision Guatemalteca de Implementación Conjunta*, which has been supporting the promotion of projects through its joint implementation office.



## GUYANA

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	Georgetown	○ Total Energy Supply (kBep)	6,717.25
President:	Bharrat Jagdeo	○ Production (kBep)	3,056.19
Energy Coordinator	Joseph O'llall	○ Import (kBep)	3,661.06
Area (Km2):	214,970	○ Export (kBep)	0.00
Population (inhab.):	770,000	○ Final Energy Consumption (kBep)	5,294.78
Monetary Unit:	Guyana Dollar	○ Installed Refining Capacity (kbbbl/day)	308.00
Official languages:	English		
PIB per capita (US\$):	751		

Source: IMF/SIEE-OLADE/Government agencies

Guyana has a population of about 770 thousand inhabitants and a GDP of about US\$ 578 million dollars. It has large non-renewable energy sources (hydro, biomass, solar, wind and biogas); through its principal primary sources of energy are still bagasse, firewood and oil, which is imported.

### Energy Policy

Its energy policy is based on six objectives:

- a) To ensure an adequate and sufficient supply of electricity in the country for future economic development.
- b) To eliminate the need for fiscal transfers by reducing subsidies in final prices.
- c) To reduce dependence on oil imports
- d) To promote and increase the use of renewable energy sources
- e) To encourage the use of energy in a sustainable and environmentally friendly manner
- f) To promote the use of energy conservation practices through national programs.

### Hydrocarbons sector

It has no proven oil and gas reserves, and previous efforts at exploration have resulted in border disputes with its neighbour Suriname. Based on Guyana's geological location, annexed to its hydrocarbon –rich neighbours of Venezuela, Brazil and Suriname, there should be some potential for in its exploration activities. Guyana has no refining capacity and imported 10.3 thousand barrels of petroleum products per day in 2003.

## **Electricity Sector**

According to official reports, the installed electrical generation capacity, including self-generation facilities, was 308 MW. The generating power of self-producers is very large, at 170 MW.

Regarding electrical power production, 820 GWh was generated, a decrease of 10% compared to the previous year.

Regarding electrical power consumption, final users utilized 644 GWh, a decrease of 8.9% compared to the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.09, 0.079 and 0.059 US\$/kWh, respectively. The prices reported were practically identical to those of December 2002.

Electrical service coverage was 82% according to the most recent evaluation by the pertinent agency in the country. The Government of Guyana decided to intensify the electrification of unserved areas, especially in the coastal zone where the population is concentrated. The program plans to connect 40,000 homes of poor families by 2006.

The only electric company, “Guyana Power & Light Inc.,” that was privatized years ago, came under State control again.

## **Renewable energy and environment**

The renewable energy contribution is not very significant, being limited to exploiting biomass and solar energy, although the unused water and wind potential is appreciable. For hydropower, there is only a 0.5 MW mini plant, and in terms of wind, there is a pre-feasibility study for building a 7 to 10 MW plant.

With regard to biomass, the main use is firewood for cooking in the residential sector and bagasse for energy self-production in the sugar sector. As for solar energy, there are electrification projects with photovoltaic panels.



## HAITI

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	<i>Puerto Príncipe</i>		
President:	<i>Jean-Bertrand Aristide</i>	o Coal Proven Reserves (Mt)	8.70
Minister of Public Services, Transport and Communications,	<i>Jean Paul Toussaint,</i>	o Total Energy Supply (kBep)	15,174.85
Area (km <sup>2</sup> ):	<i>27,750</i>	o Production (kBep)	11,210.35
Population (Inhab.):	<i>8,330,000</i>	o Export (kBep)	3,964.50
Monetary Unit:	<i>Gurda</i>	Final Energy Consumption (kBep)	12,446.90
Official Languages:	<i>French and natives</i>	Installed Refining Capacity (kbbl/day)	244.00
PIB per capita (US\$):	<i>337</i>		

Source: IMF/SIEE-OLADE/Government agencies

Haiti has a population of about 8.3 million inhabitants and a GDP of about US\$ 2.8 billion dollars. It has few hydroelectric resources and no hydrocarbon resources. Its main source of energy is firewood followed by oil, which is imported from the Antilles and Trinidad and Tobago.

### Energy Policy

For many years, the energy policy has been oriented toward petroleum exploration but without success. Recently efforts have been directed toward promoting renewable energy and several international aid agencies have analyzed and promoted several energy sources, including wind, solar, methanol, organic waste, and others.

### Hydrocarbons sector

The country is a net importer of energy, and it would be the greatest beneficiary of any regional energy integration initiative. In this regard, it may be worthwhile to consider undertaking a feasibility study to assess the viability of a gas pipeline extending from the LNG regasification terminal in the neighbouring Dominican Republic into Haiti. At the moment Haiti suffers from irreversible deforestation, as the population depends heavily on fire wood as a cheap source of fuel. The country also imported 11.1 thousand barrels of imported petroleum products per day, in 2003.

### Electricity Sector

The installed electrical generation capacity, including that of self-producers, was 244 MW. No reports have been received of any increase in 2003.

Regarding electrical power production, 512 GWh were generated, an increase of 8.9% over the previous year.

No international electricity transactions were reported due to the lack of connections to other countries.

Regarding electrical power consumption, final users utilized 283 GWh, an increase of 10.1% over the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of May 2003, including taxes and expressed in dollars, were 0.092, 0.088 and 0.062 US\$/kWh, respectively. The prices reported are practically identical to those of December 2002.

According to the most recent evaluation, the percentage of homes with electricity was 34%, and thus it was the least electrified country.

## **Renewable energy and environment**

The contribution of renewable energy is not very significant, being limited to the exploitation of hydropower, biomass and solar energy, although the unused wind potential is appreciable and this resource was assessed with support from the Government of France. In terms of hydropower, in the 2003 there was a reported generation of 197 GWh, from an installed capacity of 63 MW.

Regarding biomass, most used is firewood for cooking in the residential sector and bagasse for energy self-production in the sugar sector. As for solar energy, there are several electrification projects with photovoltaic panels.





## HONDURAS

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	<i>Tegucigalpa D.C.</i>		
President:	<i>Ricardo Maduro</i>	○ Total Energy Supply (kBep)	27,288.74
Secretary of Natural Resources and Environment	<i>Patricia Panting,</i>	○ Production (kBep)	12,507.64
Area (km <sup>2</sup> ):	112,090	○ Import (kBep)	14,866.31
Population (Inhab.):	6,940,000	○ Export (kBep)	169.64
Monetary Unit:	<i>Lempira</i>	Final Energy Consumption (kBep)	23,603.86
Official Languages:	<i>Spanish</i>	Installed Refining Capacity (kbbbl/day)	1,044.00
PIB per capita (US\$):	977		

Source: IMF/SIEE-OLADE/Government agencies

Honduras has a population of 7 million inhabitants and has a GDP of about US\$ 6.7 billion dollars. Its main source of energy is thermoelectric.

### Energy Policy

Energy policy has recently been oriented toward promoting projects involving renewable energies and the dissemination of improved stoves, to reduce the pressure on the ecosystem due to the inefficient and unsustainable consumption of firewood for cooking, and to reduce contaminating emissions. It also hopes to develop wind and solar energy projects, and it is carrying out studies to determine their generation potential. Efforts have also involved campaigns for efficient energy use, and projects for promoting the use of biodiesel as fuel in motor vehicles.

There are plans to develop an integral energy policy, supported by non-reimbursable OPEC funds; it includes the Renewable Energy and Energy Efficiency Policy Project that is expected to be ready for next year.

### Hydrocarbons sector

There is no refining capacity in Honduras, and the country has had to rely heavily on the importation of petroleum products, which was recorded at 38.9 thousand barrels per day in 2003. Further, Honduras has not been a consumer of natural gas.

### Electricity Sector

Installed electrical generating capacity including that of self-producers was 1,044 MW, which is almost identical to that of the previous year. The Central American Bank for Economic Integration (BCIE) provided a loan to finance social electrification projects.

It also provided loans for building a 5 MW hydroelectric project in the Department of Cortes, a 251 MW thermoelectric project at La Pavana III, a 12.2 MW hydroelectric plant, a 2.86 MW hydroelectric plant in Santa Barbara, a 12.3 MW cogeneration plant that uses bagasse from the “3 Valles” sugar factory. The Brazilian Development Bank BVNDES, provided financing so that Alstom could supply generating equipment for the Rio Blanco hydroelectric project.

Regarding electrical power production, 4,530 GWh were generated, a variation of 10.5% compared to the previous year.

The country did not export electricity and imported 331 GWh, principally from Guatemala and Costa Rica. The Honduran state electric company, ENEE, signed a short-term contract for the purchase of 80 or 90 MW from its Costa Rican counterpart, ICE.

Regarding electrical power consumption, final users utilized 3,817 GWh, an increase of 8% over the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.029, 0.034 and 0.044 US\$/kWh, respectively. These values are 72 %, 61 % and 36 % lower than those of December 2002.

It is estimated that 62% of homes have electricity, though the data are not from recent censuses. BCIE provided credit for financing social electrification projects.

The US power company, Dynegy, sold its minority shares in five power plants, including three in USA, one in Pakistan, and one in Honduras.

## **Renewable energy and environment**

Renewable energy is very important in Honduras, which exploits hydroelectric, biomass and solar energy resources. There is a large potential for geothermal and wind resources, with feasibility studies done by the private sector, but no generation plants have been built yet.

With regard to hydropower, 2003 reported a power generation of 1,745 GWh, from plants with an installed capacity of 465.7 MW. In terms of biomass, there is considerable consumption – 3,264 tons – of firewood for cooking, and bagasse is used for generation in the sugar industry. There is also cogeneration with surplus in the tobacco industry.

As for solar energy, there are several rural electrification projects with photovoltaic panels, and broad experience in generation service through leasing by a private company.

In 2003, the Secretariat of Natural Resources and the Environment (SERNA) did an assessment of solar and wind resources as part of a regional initiative (SWERA Project) with financing from the Global Environment Facility. Also established was an Energy and Environment Alliance between Central America and Finland to promote the

sustainable use of renewable energy sources. Two studies were done as part of this initiative: one to determine the potential for wind energy generation on the island of Roatán, and the other to start up a power plant based on wood wastes.

2003 saw the beginning of the process of National Policy Making for Renewable Energy and Energy Efficiency, with financing from the International Development Fund of OPEC / UNDP. Additionally, the bases were set for developing an initial assessment of the biomass sub-sector.

In May 2003, SERNA started up a 5 kW remote micro hydroelectric plant in *Los Suncuyos, Tomalá* and *Lempira*, benefiting 29 families living in this community. This is a multi-purpose pilot project that also contemplates an irrigation system. Also implemented were 480 “Justa” type improved hearths in some 15 populations of the municipalities of San Lorenzo and Nacaome.

In the environmental field, the General Energy Department was assigned to coordinate CDM activities for the Honduras energy sector. This department is very active in supporting project developers and signed a Memorandum of Understanding with the Dutch Government for the sale of emissions reduction certificates.



## JAMAICA

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	<i>Kingston</i>	○ Coal Proven Reserves (Mt)	333.00
President:	<i>Elizabeth II, represented by Howard Cooke</i>	○ Total Energy Supply (kBep)	27,361.40
Energy Authority:	<i>n/d</i>	○ Production (kBep)	1,619.94
Area (km <sup>2</sup> ):	<i>10,991</i>	○ Import (kBep)	26,914.03
Population (Inhab.):	<i>2,650,000</i>	○ Export (kBep)	935.44
Monetary Unit:	<i>Jamaican Dollar</i>	Final Energy Consumption (kBep)	17,528.14
Official Languages:	<i>English</i>	Installed Refining Capacity (kbbbl/day)	35.00
PIB per capita (US\$):	<i>2,933</i>	○ Total Energy Supply (kBep)	810.70

Source: IMF/SIEE-OLADE/Government agencies

Jamaica has a population of 2.6 million inhabitants and a GDP of US\$ 7.7 billion dollars. Its main source of energy is oil, which is imported from Venezuela and Mexico.

### Energy Policy

Energy policy is oriented toward ensuring a supply of energy at the lowest possible price. Every effort is made to diversify the sources of energy. To achieve this goal, it is considering the construction of a LNG terminal to import natural gas, and has held conversations with Trinidad and Tobago, and Algeria. However, the feasibility studies have yet to begin.

A second policy guideline is to continue promoting the development of renewable energies and there are plans to implement solar and wind energy projects.

Finally, the government has begun a program for saving and conserving energy in order to reduce consumption by the population by creating awareness and making better use of energy.

### Hydrocarbons sector

Jamaica is a net importer of energy given that has no proven hydrocarbon reserves. The country, therefore, continues to devise strategies in which to alleviate the problems it faces for its energy supplies, especially in light of the volatility in oil prices over the past months. Jamaica plans to reopen exploration activities off its southern coast, and to proceed with plans for an LNG regasification as announced in October 2003. Apart from having to secure financing of over \$160 million, Jamaica still needs to get a supply market for the proposed LNG regasification terminal. Trinidad and Tobago seems the most suitable source of supply, and the two countries are holding extensive

negotiations, in that regard. If Jamaica succeeds with this ambitious project, it would have a substantially lower power generation cost, particularly for its aluminium and bauxite industries, which consume vast amounts of electricity. The refining capacity of Jamaica is 35.0 thousand barrels of oil per day. The country also recorded imports of petroleum products amounting to some 55.6 thousand barrels per day in 2003.

## **Electricity Sector**

Installed electrical generating capacity including that of self-producers was 811 MW, an increase of 3.6% compared to the previous year.

Regarding electrical power production, 7,146 GWh were generated, an increase of 3.1% over the previous year.

Regarding electrical power consumption, final users utilized 6,516 GWh, an increase of 3.3% compared to the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.15, 0.116 and 0.174 US\$/kWh, respectively. These prices are 3% to 6% higher than in December 2002.

It is estimated that 88% of homes have electricity.

The company, JPSCo, hoped to begin operating a 120 MW expansion at its 83.5 MW Bogue thermoelectric plant in September 2003.

The Government planned to launch a energy saving fund of US\$ 150 million dollars.

## **Renewable energy and environment**

Renewable energy is of great importance to Jamaica. Its energy policies prioritize the energy development of its natural resources, particularly hydropower, biomass, wind energy and solar energy. With regard to hydropower, 2003 reported 353.5 GWh of power generation, produced by plants with an installed capacity of 23.6 MW. In terms of biomass, there is a large consumption of firewood by the residential sector, and the use of bagasse for energy generation in the sugar industry.

Regarding wind energy, the *Empresa Estatal de Petróleo de Jamaica* (PCJ), in collaboration with the company Renewable Energy Systems of Great Britain, began studies for building a 20 MW wind farm in Wigton, Manchester. The wind plant contemplates installing 23 wind generators with a capacity of 900 kW each, to be provided by the company NEG-Micon. Jamaica estimates a wind potential of about 60 MW.

As for solar energy, rural electrification projects with solar photovoltaic energy were developed in remote areas away from the national network.

With regard to the National CDM Authority, it is still in the process of consolidation. Meanwhile, the Ministry of the Land and Environment is acting in the interim.



## MEXICO

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	<i>México D.F.</i>		
President:	<i>Vicente Fox Quesada</i>	o Oil Proven Reserves (Mbbl)	14,119.60
<i>Energy Secretariat</i>	<i>Fernando Elizondo Barragán,</i>	o Natural Gas Proven Reserves (Gm3)	420.51
Area (km2):	<i>1,923,040</i>	o Coal Proven Reserves (Mt)	1,838.40
Population (Inhab.):	<i>103,460,000</i>	Total Energy Supply (kBep))	1,133,460.88
Monetary Unit:	<i>Mexican Peso</i>	o Production (kBep)	1,734,656.78
Official Languages:	<i>Spanish and other native languages</i>	o Imports (kBep)	162,472.09
PIB per capita (US\$):	<i>5,811</i>	o Exports (kBep)	749,905.51
		Final Energy Consumption (kBep)	652,760.23

Source: IMF/SIEE-OLADE/Government agencies

Mexico has a population of about 103.4 million inhabitants and a GDP of US\$ 601 billion dollars. It has the second largest petroleum reserves, the fourth largest natural gas reserves, and third largest coal reserves in the region. It also has the fourth largest hydroelectric reserves in the region. The state oil company, PEMEX, is the fifth largest oil company in the world. Its main export market is United States.

### Energy Policy

After becoming President in 2000, President Vicente Fox undertook an energy policy based on the following principles: Energy sovereignty, secure supply, social commitment, modernization of the sector, greater private participation, orientation toward sustainable development, and commitment to future generations. Based on these principles, an energy policy was designed that includes the following main objectives and actions:

1. To ensure an adequate supply of energy.

It plans to achieve a level of oil production of 3,87 million barrels per day by 2006, and also expects to reach a level of exportation of 1,85 million barrels per day, and produce 7,700 million cubic feet per day of natural gas.

In May, President Fox announced two mega projects to be undertaken by PEMEX. The first is the development of a field in northeast Mexico where it hopes to discover reserves of about 18 billion equivalent barrels of oil. The second project is the development of 47 offshore platforms, as well as the construction of a pipeline, and separation and compression plants. With these projects it is hoped to achieve the goals set for 2006.

In the electrical sector it plans to carry out a vertical separation of the activities of the sector, and also hopes to open it up to national and foreign investment, and establish a national transmission company.

It also plans to promote the establishment of electricity sale/purchase contracts between generators and large users and to diversify the sources of energy by supporting the development of hydroelectric and coal-burning plants.

The goal for rural electrification is to achieve 97% coverage of the population by 2006, and to promote generation based on renewable energy in isolated communities that have no access to the trunk network.

## 2. Policy of Institutional Change.

By 2006, it expects to have a solid and adequate juridical framework for the energy sector that will guarantee the definition of public policy and sectorial strategy, with designs for new industrial organizational structures and operation for the different agencies in the sector.

### 3. To encourage the participation of Mexican companies in energy infrastructure projects

It will facilitate the installation of storage and regassing terminals for liquefied natural gas. It hopes to have two of these terminals, one on the Pacific Coast and one on the Gulf Coast by late 2006.

It plans to increase the number of natural gas connections to the United States market and achieve a capacity of about 500 million cubic feet per day by 2006. It hopes to double private investment in natural gas transportation and assign 10 new zones for distribution networks.

### 4. To increase the use of renewable sources and promote efficient use and energy savings

By 2006, it hopes to achieve national energy savings equivalent to 2.5% of total consumption.

It also hopes to double the use of renewable energies in subsequent years compared to the year 2000. For this purpose, it will install an additional 1,000 MW based on renewable energies such as solar, wind, small hydroelectric, geothermal and biomass.

### 5. To utilize sources of nuclear energy

By 2006, it plans to have two nuclear units operating in accordance with the highest safety standards in order to reduce greenhouse gases and fulfill the Kyoto protocol.

6. To be leaders in the prevention of hazards in productive operations

It will increase the resources that are directed toward strengthening programs for the proper maintenance of facilities, pipelines and transport. It will implement 100% of the industrial safety system, and carry out 21 audits, evaluations, supervisions and technical inspections each year. It will also train 390 industrial safety specialists.

7. To be the sector leader in environmental protection.

To achieve this objective, an environmental energy policy must be developed jointly with the Ministry of Environment that will be contained in a document on energy and the environment. It also hopes by 2006 to have indicators that are commonly accepted by both energy authorities and environmental authorities.

It also plans to mitigate greenhouse gas emissions. By 2005, it hopes to develop a mechanism for validating emissions reduction projects that uses a solid and uniform methodology.

8. Development of scientific knowledge

The Secretariat of Energy will promote the creation of a Center for National Information and Energy Studies. The purpose of this center will be to develop methodologies and tools for strategic planning in the sector, and for carrying out multidisciplinary research and specialized studies of the energy sector

## **Hydrocarbons sector**

Based on its oil and gas reserves, Mexico is, considerably, among the energy leaders in OLADE's 26 member countries in terms of being rich in hydrocarbons. Crude oil proved reserves were some 14.12 billions of bbl, while natural gas proved reserves amounted to 14.9tcf as at January 2003.

Nearly half of Mexico's total crude reserves are located offshore, and the Mexican government has embarked on a programme to increase exploration in new fields to boost production of its offshore crude oil and gas.

Mexico has the fourth largest proven crude oil reserves in the Western Hemisphere after Canada, Venezuela, and the United States. In 2003, Mexico consumed 2.05 million bbl/d of oil, resulting in approximate net exports of 1.75 million bbl/d, of which, it was given that the United States imported about 1.6 million bbl/d. Not only is the Cantarell estimated as the largest oilfield in Mexico, but it is also regarded as one of the largest in the world, with an estimated 35 billion barrels.



Although possessing a wealth of reserves in natural gas, Mexico's demand has outpaced the country's production. One of the Government's main goals is to increase domestic natural gas production in order to meet domestic demand. In this regard, the Government adopted a strategy to introduce multiple service contracts (MSCs), which are designed to attract private companies to develop non-associated natural gas fields.

There are currently plans to develop LNG import regasification facilities on both coasts of Mexico. Most of the proposed LNG facilities would be located close to the U.S.-Mexican border in Baja California, in order to secure markets both in Northern Mexico and in the South Western United States.

Despite being one of the world's largest producers of crude oil, Mexico still imports petroleum products to meet domestic demand, mainly due to insufficient refining capacity, which is an overall 1.54 million barrels of crude oil per day. Pemex has six refineries within Mexico and is considering adding a new cracker, which would process wet natural gas from the Gulf of Mexico.

## **Electricity Sector**

Installed electrical generating capacity for public service and that of self-producers was 49,538 MW, an increase of 8.3% over the previous year. The largest cogeneration plant, 245 MW, was inaugurated in February 2003 to serve 38 industries.

Regarding electrical power production, 203,735 GWh were generated, an increase of 1.2% over the previous year. In recent years, the growth in industrial demand has been smaller.

Mexico exported 953 GWh to the States of Texas, California and Arizona through existing interconnections, and to Belize. It imported 71 GWh from the United States. There had not been a positive balance in international electrical trade since 1996.

Regarding electrical power consumption, final users utilized 160,384 GWh, a 1% reduction compared to the previous year. CFE projected that power consumption would increase by 75% by 2011, meaning that generation capacity must be increased from 43,000 to 65,000 MW.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.139, 0.070 and 0.081 US\$/kWh, respectively. This represents a small increase in the order of 1% for commercial and industrial users and a reduction of 4.6% for residential customers, compared to December 2002 prices.

It is estimated that 95% of homes have electricity, that is, 98% of urban homes and 86% of rural homes.

## **Renewable energy and environment**

Renewable energy is very important in the energy matrix of Mexico, which exploits water, biomass, geothermal, wind and solar energy. 2003 reported a power generation of

19,753 GWh from hydroelectric plants with an installed capacity of 9,650 MW.

In geothermal generation, Mexico is the main producer of geothermal energy in Latin America and the Caribbean and one of the largest world wide, having reported in 2003 a power generation of 5,940 GWh, produced by plants with an installed capacity of 960 MW.

In terms of wind energy, there is a very small installed capacity (2.7 MW), despite the large potential that exists, so its contribution is not important to Mexico's energy balance. As for solar energy, there are a number of photovoltaic systems installed in the country, as part of rural development projects. However, due to their size they do not have a repercussion on energy supply, although they represent a valuable experience for the region.

Regarding biomass, in 2003 the electricity generated by urban solid waste treatment plants was added to the energy supply, such as the Monterrey Landfill that is being managed by the company "BENLESA", *Bioenergía de Nuevo León S.A. de C.V.*, which is generating 7 MW of electricity with the recovered methane gas. Additionally, there are several projects in the assessment phase in this technological field, which has attracted the interest of several municipalities in private initiatives. They derive from the application of the Clean Development Mechanism (CDM), which has been a financial complement to these projects. Firewood also plays an important part in residential sector consumption (17,723.5 tons), as does cane bagasse for energy generation in the sugar industry.

Among the most important renewable energy programs are the following: a large scale Renewable Energy Project, through a strategic alliance among the Mexican Government, the World Bank and the Global Environment Facility.

Additionally, Mexico has been organizing the institutional aspect for setting up the National CDM Authority. Several projects have been submitted to the approval process under the CDM, including several hydroelectric projects (such as the 30 MW El Gallo plant) and wind projects (such as the 150 MW *Fuerza Eólica del Istmo – La Ventosa* project).



## NICARAGUA

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	<i>Managua</i>	Total Energy Supply (kBep)	20,826.46
President:	<i>Enrique Bolaños</i>		
Executive Secretary of The National Energy Commision	<i>Ernesto Espinoza Maradiaga,</i>	o Production (kBep)	12,492.81
Area (km2):	<i>78,200</i>	o Imports (kBep)	9,485.16
Population (Inhab.):	<i>5,470,000</i>	o Exports (kBep)	116.05
Monetary Unit:	<i>Córdoba Oro</i>	Final Consumption (kBep)	16,308.30
Official Languages:	<i>Spanish</i>	Refining capacity (kbbbl/dia)	20.00
PIB per capita (US\$):	<i>734</i>		

Source: IMF/SIEE-OLADE/Government agencies

Nicaragua has a population of 5.4 million inhabitants and a GDP of about US\$ 4 billion dollars. It is one of the three Central American countries, together with El Salvador and Costa Rica, which have refineries.

### Energy Policy

Nicaragua's energy policy is oriented toward promoting the permanent use of renewable and clean energy sources. The second important point of the energy policy is the promotion of the search for hydrocarbon reserves and the construction of gas pipelines in order to ensure the supply of energy. It has planned the construction of a gas pipeline to connect Mexico to Nicaragua. It also has plans for oil exploration, both offshore and onshore.

The policy also promotes competition and the systematic expansion of the electrical system. It has plans to privatize the state electric company.

### Hydrocarbons sector

After the Nicaraguan Government introduced legislation to open the country to foreign oil exploration for both onshore and offshore blocks in the Atlantic and Pacific Oceans, both Colombia and Honduras claimed portions of the 44,000 square miles off the Caribbean which Nicaragua was offering stemming the country's efforts for exploration, where petroleum imports in 2003 experienced a growth of 7.84% reaching 6.24 million barrels of oil. Nicaragua has a refining capacity of 20 thousand barrels of crude oil per day.

## Electricity Sector

Installed electrical generating capacity for public service and self-production was 693 MW, an increase of 3.1% over 2002. CFE of Mexico signed a contract with the consortium, Hydrocopalar Midamerica, for studies of the 650 MW Copalar hydroelectric project in Nicaragua.

Regarding electrical power production, 2,590 GWh were generated, an increase of 1.4% over the previous year. Exports were 21 GWh and 12 GWh were imported through interconnections with Honduras and Costa Rica. Regarding electrical power consumption, final users utilized 1,653 GWh, which was close to the amount consumed during the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.162, 0.126 and 0.135 US\$/kWh, respectively. These figures are higher than in December 2002 by 28%, 34 % and 3 %, respectively.

Regarding electrical service coverage, it is estimated that 55% of homes have electricity. The World Bank underwrote loans for the Government of Nicaragua as part of a rural electrification scheme valued at US\$ 22.2 million dollars.

The Nicaraguan electrical transmission company, ENTRESA, expected to complete the installation of fiber optics to interconnect its substations by the end of 2003 at a cost of US\$ 13 million dollars.

## Renewable energy and environment

Nicaragua has a variety of natural resources that have enabled it to exploit many renewable energy sources such as geothermal, hydropower, biomass, and solar energy generation. In terms of wind energy, several feasibility studies have been done, and funds are being raised to implement projects, but there are no plants installed.

With regard to geothermal generation, 2003 reported a power generation of 270.7 GWh, produced by plants with an installed capacity of 77.5 MW. In the field of hydropower, 297.4 GWh were generated in plants with an installed capacity of 104.4 MW.

Concerning biomass, an appreciable consumption of firewood is seen in the residential sector (3,360.9 tons). Furthermore, bagasse is used in the sugar industry for the power generation, with surpluses sold to the national network. A municipal solid wastes treatment project is also seeking approval within the framework of the CDM.

As for solar energy, there are several rural electrification projects in remote areas, which use photovoltaic panels. Most of these are promoted by the Government within the *Proyecto de Electrificación de Áreas Remotas* (PERZA).

In the environmental field, the National CDM Authority is the Ministry of the Environment and Natural Resources, through the National Clean Development Office,

which is under the General Department of Biodiversity and Sustainable Use of Natural Resources.



## PANAMA

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	<i>Panamá</i>		
President:	<i>Mireya Moscoso</i>	○ Coal Proven Reserves (Mt)	1.00
Minister of Industry and Commerce	<i>Joaquín Jácome Díaz,</i>	○ Total Energy Supply (kBep)	19,436.69
Area (km <sup>2</sup> ):	<i>78,200</i>	○ Production (kBep)	6,654.99
Population (Inhab.):	<i>3,120,000</i>	○ Import (kBep)	14,126.02
Monetary Unit:	<i>Balboa</i>	○ Export (kBep)	1,481.62
Official Languages:	<i>Spanish</i>	Final Energy Consumption (kBep)	16,550.07
PIB per capita (US\$):	<i>3,915</i>	Installed Refining Capacity (kbbbl/day)	60.00
		○ Total Energy Supply (kBep)	1,555.20

Source: IMF/SIEE-OLADE/Government agencies

Panama has a population of about 3 million inhabitants and a GDP of US\$ 12.2 billion dollars. It is a net importer of energy, both oil and coal. Panama has one of the most important commercial sites, which is the Panama Canal, where 50 ships pass each day, 15% of which carry mostly petroleum and derivatives.

### Energy Policy

Its energy policy objectives include promoting the development of renewable sources, increasing electrical coverage in rural areas, promoting regional integration with Central America, promoting energy saving, and defining subsidy policies that apply to the energy sector.

It plans to increase electrical coverage to 95% over the next 10 to 12 years by creating incentives for the use of solar panels in remote areas and by encouraging the establishment of new hydroelectric plants. Two plants began operation in November (Guasquitas and Canjilones) and it hopes to incorporate a new one into the Bayano III project in order to achieve the established goals.

With regard to integration projects, in October, Panama and Colombia agreed to build an electrical transmission line and they hope to begin construction next year. The company, Endesa de España, is presently carrying out a study of an electrical interconnection from Guatemala to Panama to improve the countries' existing interconnections under the SIEPAC project.

## Hydrocarbons sector

The importance of Panama to world energy markets is primarily through its strategic Panama Canal, which serves as a major transit center for oil shipments. The countries of South and Central America are also quite dependent on the Canal to support their economies. Indeed, as a major transshipments hub, any global recession would ultimately affect Panama's economy. The internal demand of petroleum has been estimated in 2003 around 11 million barrels.

The refining capacity of Panama is 60 thousand barrels of oil per day

## Electricity Sector

Installed electrical generating capacity for public service was 1,555 MW, an increase of 9.3% over the previous year. Official reports do not include facilities for self-generation. The US power company, AES, began operating its 122 MW Esti hydroelectric project in the Gualaca region.

Regarding electrical power production, 5,671 GWh were generated, an increase of 5.4% over the previous year. This indicator is compatible with the GDP of the country, which registered a considerable increase.

Using the interconnection with Costa Rica, 182 GWh were exported and 2 GWh were imported. A Spanish consortium was awarded a contract by ETESA for the construction of 119 km of 230 kV transmission line to the Costa Rican border. Colombia and Panama also approved a 400 km, 300 MW electrical interconnection that has an approximate cost of US\$ 200 million dollars.

Regarding electrical power consumption, final users utilized 4,359 GWh, a variation of 4.8% compared to the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of May 2003, including taxes and expressed in dollars, were 0.121, 0.118 and 0.099 US\$/kWh, respectively. The increases over the year 2002 were basically due to the increase in the price of oil.

Regarding electrical service coverage, it is estimated that 73 % of homes have electricity.

The Government of Panama carried out a public survey about its plans to merge the Public Services Regulatory Body (ERSP) and the Commission for Free Competition and Consumer Affairs (CLICAC).

The Colombian public services company, EPM, paid US\$ 6.6 million dollars for a controlling share of 75% of the 30 MW Bonyic hydroelectric plant.

A Panamanian consortium planned to build a 20 MW hydroelectric project called "Los Estrechos" on the "Río Cobre" for US\$ 30 million dollars.

## **Renewable energy and environment**

Panama has very diverse renewable energy resources, particularly hydropower, biomass and solar energy. Both geothermal generation and wind energy have considerable potential for power generation and several studies have been done aimed at implementing geothermal and wind generation plants. In terms of hydropower, 2003 reported 2,871 GWh of power generation, with an installed capacity of 833 MW.

In biomass, there is considerable firewood consumption by the residential sector. In the sugar industry, cane bagasse is used to self-generate energy and contributes a small surplus to the network.

As for solar energy, there are several rural electrification projects in areas outside the network, which use photovoltaic panels, most executed by the Rural Electrification Office of the Social Investment Fund.

In the environmental field, the National CDM Authority is the National Environmental Authority, through the Mitigation Sub-program of the *Programa Nacional de Cambio Climático*, which is very active in promoting projects, especially in the hydroelectric area.





## PARAGUAY

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	<i>Asunción</i>		
President:	<i>Luis Angel González</i>	o Total Energy Supply (kBep)	32,724.74
Energy Authority:	<i>José Alberto Alderete</i>	o Production (kBep)	56,129.81
Area (km <sup>2</sup> ):	<i>406,750</i>	o Import (kBep)	8,531.93
Population (Inhab.):	<i>5,880,000</i>	o Export (kBep)	27,992.83
Monetary Unit:	<i>Guaraní</i>	Final Energy Consumption (kBep)	26,826.89
Official Languages:	<i>Spanish and guaraní</i>	Installed Refining Capacity (kbbl/day)	7.50
PIB per capita (US\$):	<i>1,079</i>	o Total Energy Supply (kBep)	7,416.10

Source: IMF/SIEE-OLADE/Government agencies

Paraguay has a population of 5.8 million inhabitants and a GDP of about US\$ 6.3 billion dollars. It is a net energy exporter, especially hydroelectric energy from two hydroelectric plants: Itaipu (the biggest hydroelectric plant in the world) and Yacyreta. It should be noted that the two hydroelectric plants are shared; one with Brazil and one with Argentina, and 94% of the energy is exported to those countries.

### Energy Policy

Energy policy is oriented toward promoting and continuing integration with its neighbors.

It plans to develop a natural gas industry by building a gas pipeline between southern Bolivia and Asuncion, Paraguay. The project also includes the construction of thermoelectric plants, the first in Western Paraguay and the second in Asuncion.

Regarding the electrical sector, the policy will continue to center on improving and developing its hydroelectric plants. In August, Paraguay and Brazil will begin operating a new turbine in Itaipu, and they hope to operate a second turbine the following year to increase their capacity to 14,000 MW. Negotiations are also underway with the Argentine government to complete work at the Yacyreta plant so that the reserve will be 83 meters by June 2008.

### Hydrocarbons sector

With no crude oil reserves, Paraguay relies entirely on imports to meet its crude oil and petroleum products demand, which was estimated at 596,000 bbl in 2003. The State-owned oil company, Petroleos Paraguayos (Petropar), is responsible for handling all crude oil and petroleum product imports.

Although Paraguay neither consumes nor produces natural gas, the country has been looking for ways to include natural gas in its energy mix, as a measure of reducing its problem of deforestation, based on its heavy consumption of firewood as a cheap energy source. Previous attempts to develop a natural gas sector in Paraguay have not been successful. Paraguay has a small refining capacity of 8 thousand barrels of crude oil per day.

## **Electricity Sector**

Installed electrical generating capacity was 7,416 MW, and is equal to that of the previous year. No self-generating facilities have been reported.

Regarding electrical power production, 51,762 GWh were generated, an increase of 7.4% over the previous year.

Paraguay is the largest exporter of electricity in the region, and sold 45,173 GWh of electricity, principally to Brazil; it did not import any electricity.

Regarding international transactions, several events took place in 2002. Paraguay made a new agreement with Brazil for the purchase of electrical power from its shared risk hydroelectric company, Itaipu. Argentina was prepared to guarantee new loans to complete the 3,200 MW Yacyreta hydroelectric project on the border between Argentina and Paraguay. A binational commission was established in order to define a financial plan. The government of the Argentine province of Misiones planned to carry out a plebiscite on the construction of the 3,000 MW Corpus Cristi project on the border with Paraguay.

Regarding electrical power consumption, final users utilized 4,315 GWh, a decrease of 2.1% compared to the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.06, 0.038 and 0.056 US\$/kWh, respectively. These figures are higher than in December 2002 by 15%, 12 % and 20 %, respectively.

Electrical service coverage is an important economic and social indicator. It is estimated that 83% of homes have electricity.

The Paraguayan state power company, ANDE, recorded net profits of US\$ 35 million dollars for the first quarter of 2003, following several years of accumulated losses.

## **Renewable energy and environment**

Paraguay has a large renewable energy potential, of which it has exploited its water, biomass and solar resources. There are no on-going wind energy projects. With regard to hydropower, 2003 reported 51,761.1 GWh of power generation, produced by plants with an installed capacity of 7,410 MW. In terms of biomass, 2,779.4 tons of firewood consumption were reported for the residential sector.

As for solar energy, there are several rural electrification projects in remote areas and in indigenous communities, where photovoltaic panels are used, notably the projects of "*Energización de Centros Comunitarios en Comunidades Rurales Aisladas*" and "*Energización Sustentable en Comunidades Rurales Aisladas con Fines Productivos*", both part of a multilateral initiative of the OAS in Argentina, Paraguay and Uruguay.

In the environmental field, the National CDM Authority is being created, but in the interim, it is the Climate Change Office, under the National Climate Change Commission, created by the Ministry of the Environment.



## PERU

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	<i>Lima</i>		
President:	<i>Alejandro Toledo</i>	○ Oil Proven Reserves (Mbbbl)	374.05
Minister of Energy and Mines	<i>Jaime Quijandría Salmón,</i>	○ Natural Gas Proven Reserves (Gm3)	246.79
Area (km2):	<i>1,285,216</i>	○ Coal Proven Reserves (Mt)	58.66
Population (Inhab.):	<i>27,170,000</i>	○ Total Energy Supply (kBep)	87,672.90
Monetary Unit:	<i>Nuevo sol</i>	○ Production (kBep)	77,798.60
Official Languages:	<i>Spanish and quechua</i>	○ Import (kBep)	48,039.02
PIB per capita (US\$):	<i>2,240</i>	○ Export (kBep)	24,801.74
		Final Energy Consumption (kBep)	74,731.10
		Installed Refining Capacity (kbbbl/day)	159.30
		○ Oil Proven Reserves (Mbbbl)	5,970.06

Source: IMF/SIEE-OLADE/Government agencies

Peru has a population of about 27 million inhabitants and a GDP of US\$ 61 billion dollars. It has the third largest hydroelectric reserves in the region, after Brazil and Colombia, and the sixth largest natural gas reserves. To cover its internal oil demand deficit, it imports principally from Ecuador, and to a lesser degree from Nigeria, Colombia, Argentina and Venezuela.

In 2003, the largest petroleum producing company was the Argentine company, Pluspetrol, which accounted for 63% of the total.

In October 2003, Peru LNG signed a memorandum of understanding with Tractabel to sell gas to Mexico through a regasification plant in Lazaro Cardenas. However, the Mexican government authorized Repsol YPF to construct that plant in Lazaro Cardenas, so the definition of the new terminal is still pending. One of the options is a joint venture for exportation with its neighbor, Bolivia.

### Energy Policy

Peru's energy policy on hydrocarbons has the initial goal of carrying out a detailed review of current regulations in the subsector in order to ensure that they are kept up to date and competitive.

Following the drop in crude oil production in recent years, in May 2003, the Peruvian government adopted two methodologies for calculating royalties, and a company can choose which to use after preparing a commercial report. The first is based on different royalty percentages (0-5%, 5-20% and 20%) for different levels of production (0-5,000

bbl/d, 5,000-100,000 bbl/d and over 100,000 bbl/d). Under the second methodology, the royalty varies from 0 to 20% depending on the income and expenses incurred in the previous year.

The second policy involves the development of the Camisea field. It plans to sign contracts to permit not only the exportation of the reserves, but also the construction of pipelines. This project includes the sale of liquefied natural gas to United States and Mexico under a project called Peru LNG. By developing the Camisea field it is also hoped to supply generating plants in Lima and in northeast Peru, as well as large industrial users.

Regarding the electrical sector, it plans to develop an energy efficiency market and a program for expanding electrical frontiers. It is hoped that this expansion will increase the national average of electrification in isolated regions and villages.

The goal is to achieve an electrification coefficient of 91% by 2012, and to reach that goal, it plans to build 33 new transmission lines, and develop 243 small electrical systems and 60 small hydroelectric plants. It also plans to implement 123 electrical generator projects and install 120,000 photovoltaic panels and 124 wind generation plants.

Regarding the expansion of the electrical frontier, Peru has participated in an electrical integration project with Colombia and Ecuador as part of a movement by the Andean Community to create an integrated electrical market among its members. The goal of this agreement is an interconnection with Ecuador in order to export energy during the rainy season and import it during the dry season.

## **Hydrocarbons sector**

In 2003, Peru estimated real gross domestic product (GDP) was 4.0%, down from the previous rate of 4.9%, which has been attributed to lower investment and lack of business confidence.

Peru has an estimated proven crude oil reserves of 374.1 billion barrels. In 2003, Peru produced 91,350 barrels per day (bbl/d) of oil, while consuming 173,000 bbl/d. Unable to meet oil demand from domestic resources, Peru imports oil to make up for the shortfall, mainly from Ecuador, and, to a lesser extent, from Nigeria, Colombia, Argentina, and Venezuela.

During the first period of 2003, Peru, in an attempt to boost its oil exploration and production activities, adopted a new legislation with a revised formula for calculating royalties based on production levels and on economic rate of return. The government also included other incentives to attract investment, such as making technical information on fields available for free, refunding value added taxes incurred during exploration stages; and accelerating the bidding process. These new terms created renewed interest in upstream activities for Peru.

Peru, with proven natural gas reserves of about 8.7 trillion cubic feet (Tcf) is self-sufficient in natural gas. Peru's biggest boost to its reserves came from discoveries in the Camisea field. Government officials believe that the Camisea project will lower

energy costs, replace dirtier fuels and create jobs. Nonetheless, the Camisea project has been confronted with serious opposition, mainly from environmental groups arguing, *inter alia*, that extraction processes and pipeline construction will cause irreversible damage to the rainforest, to the lifestyle of indigenous people living in the region, and to marine life in the Paracas Bay, where a LPG fractionation plant is being constructed.

It is widely felt that the proposed Peru LNG project can only succeed if the investors can secure LNG buyers. The recent Memorandum of Understanding (MOU) between Peru LNG and Tractebel for 2.7 million metric tons per year of LNG over 18 years is a positive development, in this regard. There is also a proposal by the Government for Peru and Bolivia to combine their individual natural gas development efforts, including LNG exports, and for the construction of a petrochemical complex, with gas from the two countries via the Peruvian port of Ilo. This could be a major gas integration initiative.

Peru has six refineries, with an overall capacity of 159.3 thousand barrels of crude oil per day. Plans by the Peruvian government for the involvement of private participation in refining operations have met with much public opposition. This is unfortunate, since the existing state-owned refineries are in need of expansion and upgrading, which the government is unable to finance.

## Electricity Sector

Installed electrical generating capacity including that of self-producers was 5,970 MW, an increase of 0.6% over the previous year. The failed privatizations of 2002 created uncertainty, according to investors, but the Camisea gas development created new incentives for resuming the expansion and modernization of electrical generation.

Regarding electrical power production, 22,926 GWh were generated, a variation of 4.3% compared to the previous year.

There are no important interconnections with neighboring countries. In late 2004, it is to be linked to Ecuador (Stage 1); the transmission company, REP, was awarded the contract for the construction of a line, that will link Peru and Ecuador, to a consortium made up of the Colombian company, “Eléctrica de Medellín” (EM), and the Peruvian company, Proansa. No date has yet been set for interconnection with Bolivia.

Regarding electrical power consumption, final users utilized 20,209 GWh, a 4.5% variation compared to the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.076, 0.072 and 0.0114 US\$/kWh, respectively. These figures are lower than in December 2002 by 1.7%, 1.6 % and 0.6 %, respectively.

It is estimated that 76% of homes have electricity. Agencies are continuing their efforts to increase this percentage.

The Norwegian company, SN Power, purchased the Peruvian hydroelectric plants at Cahua and Energia Pacasmayo from the US company, NRG Energy.

According to the regulator of the energy sector, Osinerg, generators will have to increase their efficiency to be able to maintain their share of the market once the Camisea project begins to offer gas for power generation. The Mantaro hydroelectric complex that has a capacity of 1,008 MW belongs to Electroperu, and needs an investment of US\$ 1,000 million dollars in the long term in order to continue being competitive.

## **Renewable energy and environment**

Renewable energy has been used by Peru for many years, especially exploiting water resources, biomass, wind energy, and solar energy. In terms of geothermal generation, no plants have been built despite the existence of much potential, several pre-feasibility studies, and having a specific law to promotion this energy resource.

With regard to hydroelectric generation, 2003 reported 18,537.5 GWh of power generation from plants with an installed capacity of 3,032.3 MW. In biomass, there is an appreciable consumption of firewood in the residential sector, with a value of 4,433 tons. The sugar industry has been using bagasse for power generation.

Regarding wind energy, there are 2 small plants with a total of 0.7 MW of installed capacity, and several other projects in different stages of development. As for solar energy, several rural electrification projects use photovoltaic panels and micro-hydroelectric plants.

In the environmental field, the *Consejo Nacional Ambiental* (CONAM) is the National CDM Authority, promoted with the support of the *Fondo Nacional del Ambiente* (FONAM), which is very active in developing methodologies for presenting projects and in project management, especially hydropower.



## ***DOMINICAN REPUBLIC***

<b>GENERAL DATA:</b>		<b>ENERGY SECTOR:</b>	<b>2003</b>
Capital:	<i>Santo Domingo</i>		
President:	<i>Rafael Hipólito Mejía</i>	o Total Energy Supply (kBep)	55,356.52
Energy Authority:	<i>n/d</i>	o Production (kBep)	11,400.13
Area (km <sup>2</sup> ):	<i>48,730</i>	o Import (kBep)	44,056.88
Population (Inhab.):	<i>8,740,000</i>	o Export (kBep)	0.00
Monetary Unit:	<i>Dominican Peso</i>	Final Energy Consumption (kBep)	38,195.63
Official Languages:	<i>Spanish</i>	Installed Refining Capacity (kbbbl/day)	52.00
PIB per capita (US\$):	<i>1,566</i>	o Total Energy Supply (kBep)	5,530.30

Source: IMF/SIEE-OLADE/Government agencies

The Dominican Republic has a population of 8.7 million inhabitants and has a GDP of about US\$ 13.6 billion dollars. It is the largest producer of electrical energy in the Caribbean.

### **Energy Policy**

Its energy policy in recent years has been oriented toward improving the supply of energy by privatizing and deregulating the market, which involved a series of measures (subsidies and debts with the private sector, among others) that were in opposition to the market; as a result, in September 2003, it had to intervene and repurchase the recently privatized electric companies. However, despite that intervention, the situation and the energy crisis has continued due to the lack of funds for operations and the purchase of supplies.

### **Hydrocarbons sector**

The Dominican Republic is a net importer of petroleum. Faced with a growing energy bill, the country took the initiative to introduce natural gas as part of its energy mix with the construction of an LNG regasification terminal, which sources its supplies from the Trinidad and Tobago LNG facility. Through the San José Accord, Mexico and Venezuela meet about one-third of the country's oil needs at concessional rates. The refining capacity of the Dominican Republic is 52 thousand barrels of crude oil per day.

### **Electricity Sector**

Installed electrical generating capacity including that of self-producers, which have a large capacity of 2,106 MW, was 5,530 MW, an increase of 8.2% over the previous year. The Canadian engineering firm, Dessau Soprin, hoped to complete two hydroelectric projects with a combined installed capacity of 5.4 MW.



Regarding electrical power production, 13,489 GWh were generated, a variation of 4.6% compared to the previous year. There are no electrical interconnections as yet with Haiti or any other countries.

Regarding electrical power consumption, final users utilized 11,893 GWh, an increase of 4.7% over the previous year. Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.106, 0.108 and 0.095 US\$/kWh, respectively. These figures are lower than in December 2002 by 25%, 34 % and 69 %, respectively.

It is estimated that 92% of homes have electricity, with 99% in urban areas and 81% in rural areas. CDEEE will build a transmission line to supply power to the north of the capital, Santo Domingo

The President issued a decree for the creation of a commission to study the privatization of 75% of all state power companies, with the exception of hydroelectric generation.

The Government suspended payments to the US generator, Cogentrix, until it agrees to allow a review of its power purchase agreement (PPA) with the state power company, CDEEE.

An International Monetary Fund (IMF) report concludes that the decision of the Dominican Republic to repurchase Union Fenosa's 50% share of the distributors, Edesur and Edenorte, in October 2003, increased public sector debt by US\$ 693 million dollars, which reached a record figure of US\$ 7,690 million dollars.

## **Renewable energy and environment**

The renewable energy sources that are used in the Dominican Republic are hydropower, biomass and solar energy. A study of wind energy potential was done with support from the government of France, and there are several projects of interest. Regarding hydropower, in 2003, 1,562.2 GWh were generated in plants with an installed capacity of 542.1 MW.

In terms of biomass, there are two large energy sources: firewood that reported a consumption of 1,557.5 tons in the residential sector, and bagasse that is used by the sugar industry for energy self-production.

As for solar energy, there are several rural electrification projects with photovoltaic panels for areas outside of the national network. One of these, carried out by the company *Enersol*, achieved good community acceptance as it was a rotating fund managed by the community itself. This experience was transferred to Honduras.

In the environmental field, the National CDM Authority has not yet been created, and is in the consolidation phase.



## ***SURINAME***

<b>GENERAL DATA:</b>		<b>ENERGY SECTOR:</b>	<b>2003</b>
Capital:	<i>Paramaribo</i>		
President:	<i>Runaldo Ronald Venetiaan</i>	○ Oil Proven Reserves (Mbbli)	110.00
<i>Minister of Natural Resources</i>	<i>F.R. Demon</i>	○ Total Energy Supply (kBep)	6,735.48
Area (km <sup>2</sup> ):	<i>163,270</i>	○ Production (kBep)	5,824.86
Population (Inhab.):	<i>440,000</i>	○ Import (kBep)	1,930.68
Monetary Unit:	<i>Surinam Florin</i>	○ Export (kBep)	1,020.06
Official Languages:	<i>Dutch</i>	Final Energy Consumption (kBep)	4,131.18
		Installed Refining Capacity	7.00
PIB per capita (US\$):	<i>2,225</i>	(kbbli/day)	

Source: IMF/SIEE-OLADE/Government agencies

Surinam has a population of about 440 thousand inhabitants and a GDP of about US\$ 979 million dollars. It has petroleum reserves that supply its own needs. Surinam has the largest artificial lake built by man (600 km<sup>2</sup>) that was built for generating electricity.

### **Energy Policy**

Its energy policy is oriented toward ensuring an abundant supply of energy. It has plans for attracting investment and increasing the generating capacity of the state electric company to reduce dependence on the company, SURALCO, which has a monopoly on generation; last year there was a major blackout that lasted 48 hours, and left the city of Paramaribo without power or alternative sources of supply. It also has plans to encourage the use of renewable energy.

### **Hydrocarbons sector**

Its oil production matches its oil consumption. The country's proved oil reserves stand at 110 million bbls and there are no natural gas finds to date.

The refining capacity of Surinam is 7 thousand barrels of crude oil per day. The country had imports of petroleum products amounting to 5.7 thousand barrels per day in 2003.

### **Electricity Sector**

Installed electrical generating capacity for public service was 60 MW. Moreover, according to official reports, self-generators had installed 329 MW to give a total of 389 MW.

Regarding electrical power production, 1,496 GWh were generated, a variation of 0.9% compared to the previous year.

There are no electrical interconnections with neighboring countries.

Regarding electrical power consumption, final users utilized 1,339 GWh, an increase of 0.8% over the previous year.

Average internal electricity prices for commercial, industrial and residential customers, as of May 2003, including taxes and expressed in dollars, were 0.173, 0.131 and 0.171 US\$/kWh, respectively.

Regarding the electrical service coverage for homes, official reports state that it is 97%

### **Renewable energy and environment**

The contribution of renewable energy is limited to exploiting hydropower, biomass and solar energy. Wind potential is appreciable but unused. For hydropower, 2003 reported 959.7 GWh produced by plants with an installed capacity of 189 MW.

In terms of biomass, the main use is firewood for cooking in the residential sector and bagasse for energy self-production in the sugar sector. As for solar energy, there are electrification projects with photovoltaic panels in areas outside of the national network.



## TRINIDAD Y TOBAGO

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	<i>Puerto España</i>		
President:	<i>George Maxwell Richards</i>	○ Oil Proven Reserves (Mbbl)	990.00
<i>Minister Of Energy And Energies Industries</i>	<i>Eric Williams,</i>	○ Natural Gas Proven Reserves (Gm3)	587.90
Area (km2):	<i>5,128</i>	○ Coal Proven Reserves (Mt)	325,526.53
Population (Inhab.):	<i>1,304,000</i>	○ Total Energy Supply (kBep)	222,139.61
Monetary Unit:	<i>Trinidad Dollar</i>	○ Production (kBep)	38,347.47
Official Languages:	<i>English</i>	○ Import (kBep)	150,685.76
PIB per capita (US\$):	<i>8,267</i>	○ Export (kBep)	32,218.07
		Final Energy Consumption (kBep)	175.00
		Installed Refining Capacity (kbbl/day)	1,416.00

Source: IMF/SIEE-OLADE/Government agencies

Trinidad and Tobago have a population of about 1.3 million inhabitants and a GDP of about US\$ 10.7 billion dollars. It has the fifth largest natural gas reserves in Latin America, the largest producer of oil and gas in the Caribbean, and the largest exporter of LNG to United States.

It should be noted that the Atlantic Company LNG plant in Trinidad and Tobago is considered to be the largest LNG train ever built, and is the first in Latin America.

In July, the Kapok field began producing with a maximum capacity of 1 billion cubic feet per day.

### Energy Policy

Trinidad and Tobago's new energy policy seeks to transform a petroleum-based economy, as it was initially, into a natural gas based economy.

The first measure it hopes to apply is the restructuring and implementation of a new taxation system for the petroleum and gas sector, since previously the system was devised for a country with intensive oil production. It will continue developing and promoting the natural gas market. In August, it signed a memorandum of understanding with the Republic of Venezuela for the construction of a gas pipeline between the two countries.

In June, it approved the construction of the fourth LNG train, which it hopes will double its gas production and exportation capacity. Other industrial activities include the

construction of a new ammonia and methanol plant, and feasibility studies have been initiated for the construction of a Liquid Gas plant and an Aluminum plant in 2004. It should be noted that next year it expects to complete the construction of one of the largest methanol plants with a capacity of 1.7 million tons per year.

The guidelines also include promoting the exploration of new fields and encouraging local participation. Next year it expects to grant nine licenses for new exploration contracts.

The country's downstream activities are focused on increasing the value added from its natural gas production capacity. This involves participation at every stage of the value chain including shipping, re-gasification terminals, the pipeline system and even the market place. New petrochemical plants, such as CNC II ammonia and the Atlas methanol, among the largest in the world, came on stream over the period, and efforts are being pursued for the construction of an ethylene petrochemical complex with a minimum of four plants, and a gas refinery complex of at least five plants. The country is aiming at moving from first stage processing in the natural gas industry into second stage processing of petrochemicals. Not only are more petrochemical plants being proposed, but there are also plans to expand into areas of melamine production, nitric acid and urea ammonia nitrate.

In order to accommodate some of these additional petrochemical plants, including the aluminium smelter and the associated power plant, the Government is pursuing the development of a new 750-acre industrial estate at Union Estate in the South/Western part of the island. In general, additional sites are being explored for the location of the country's proposed energy-based industries. Trinidad and Tobago's energy expansion programme has propelled other associated infrastructural developments such as the LABIDCO fabrication yard that was designed for the construction of platforms and other equipment to support the increase in offshore activities, and to promote local participation in the energy sector. Such platforms would have been imported in the past.

In recognition of the need to develop its human capital to meet the needs of the expanding energy sector, the Government had established National Energy Skills Centers and an Institute of Technology, in the past. It is now considered expedient to move towards the tertiary stage in capacity building through the University of Trinidad and Tobago (UTT), with a major focus on energy technologies.

The construction of the aluminium smelter, which is predicated on the sourcing of alumina from both Jamaica and Suriname; the Trinidad and Tobago and Venezuelan partnership for an OEM facility and unitization of the contiguous maritime fields of the two countries; the proposed gas pipeline to the Eastern Caribbean region, coupled with the existing LNG exports to the Dominican Republic, are all part of its vision of a regional energy integration policy.

In the electrical sector the policy has been oriented toward increasing generating capacity in order to cover the future energy demands of the natural gas industrialization projects. It plans to increase transmission, sub transmission and generating capacity, to extend transmission and distribution lines, and to introduce renewable energy in order to support electrification in remote areas.

## Hydrocarbons sector

The twin-island Republic of Trinidad and Tobago has not only been described as the leader in Caribbean energy, but it is also regarded as a world leader in the production and exports of fertilizers and petrochemicals such as urea, ammonia and methanol. Its success in LNG production in just a decade, since conception, is now known worldwide as “**The Trinidad Model**”, attracting many to its shores for advice on the LNG business and to view its template. It is significant that Trinidad and Tobago was the last entrant into the LNG industry after a lull of 25 years and the first in the Western Hemisphere. The country now boasts of an LNG facility of three Trains and a fourth under construction, which when completed will be the largest single train in the world, placing the country as the sixth largest producer of LNG. Its export markets are mainly in the USA, Spain, Puerto Rico and the Dominican Republic. It is a little known fact that Trinidad and Tobago plays a critical role in the energy matrix of the USA, as it accounts for almost 80% of that country’s LNG needs.

The country’s oil reserves climbed at 990 billions of bbl in 2003, an increase of 20%. In 2003, Trinidad and Tobago exported crude and petroleum products to the USA, amounting to 98,000 bbl/d. Recognizing that the country needs to maintain its high level of activities in the energy sector, particularly in its downstream operations, the Government has intensified its efforts at attracting foreign investment to explore and increase the level of its hydrocarbon reserves. In this regard, ten blocks (10) blocks were offered for exploration in a 2003 in a Competitive Bid Round. Oil production is expected to grow from approximately 125,000 barrels of oil per day to about 203,000 barrels of oil per day over the next two years. Additionally, in 2003, Trinidad and Tobago signed a Memorandum of Understanding with Venezuela for the unitization of the fields that straddle their maritime boundaries.

The Atlantic LNG company commenced construction of its fourth LNG Train at an estimated cost of US\$1.1 Billion, during the second half of 2003. The construction of this 5.2 Million tonnes per annum plant is scheduled for completion in first quarter 2006, and will be a significant milestone in the country’s LNG development. It is expected that the production of natural gas will grow exponentially, in light of the many new proposed gas-based plants, and with LNG Train IV becoming fully operational. The overall LNG production level is projected at 15.6 million tonnes per annum.

Currently, the country’s State-owned PETROTRIN refinery operates at a capacity of approximately 175 thousand bbl/d. There are plans for a gasoline optimisation programme and a gas-to-liquids facility, which will produce high quality, clean burning and environmentally friendly diesel fuel. Diesel fuel produced from the GTL plant will be blended with the refinery’s diesel stream.

## Electricity Sector

Installed electrical generating capacity was 1,416 MW, which is identical to the previous year. There are no reports of self-generating facilities.

Regarding electrical power production, 6,437 GWh was generated, an increase of 14% over the previous year. This country consists of islands and as yet has no interconnections with neighboring countries.

Regarding electrical power consumption, final users utilized 5,876 GWh, a variation of 18.6% compared to the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.037, 0.046 and 0.035 US\$/kWh, respectively. These figures are lower than in December 2002 by 3 %, 53 % and 0.6 %, respectively.

Electrical service coverage of 97% was reported.

The Ministry of Power and Power Industries of Trinidad and Tobago studied the possible construction of a 40 to 45 MW gas electrical generating plant valued at US\$ 100 million dollars on Tobago.

The Trinidad and Tobago Electrical Commission (T&TEC) completed the documents for the prequalification of companies interested in implementing a project under a Power Purchase Agreement (PPA), involving a new natural gas electrical generating plant of 200 to 250 MW that would be located in Union State, and would supply the T&TEC system.

Documents were also prepared for a similar process to allow an independent producer to design, build and operate a natural gas power generating plant of 600 to 770 MW, to supply an aluminum plant.

## **Renewable energy and environment**

Given its condition as a country with large oil and gas resources, renewable energy has not been greatly developed in this country. There are various rural electrification projects in remote areas using photovoltaic panels. Additionally, there is a project to provide electricity to the hotel sector on the island of Tobago with solar panels.

In the environmental field, there is already a National CDM Authority, which is the Ministry of Utilities and the Environment.



## URUGUAY

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	<i>Montevideo</i>		
President:	<i>Jorge Batlle</i>	○ Total Energy Supply (kBep)	18,432.09
<i>Minister of Industry, energy and Mining</i>	<i>José Ignacio Villar Terradas,</i>	○ Production (kBep)	10,710.48
Area (km <sup>2</sup> ):	<i>176,220</i>	○ Import (kBep)	15,077.86
Population (Inhab.):	<i>3,420,000</i>	○ Export (kBep)	4,343.56
Monetary Unit:	<i>Uruguayan Peso</i>	Final Energy Consumption (kBep)	15,678.00
Official Languages:	<i>Spanish</i>	Installed Refining Capacity (kbbbl/day)	50.00
PIB per capita (US\$):	<i>3,148</i>	○ Total Energy Supply (kBep)	2,171.00

Source: IMF/SIEE-OLADE/Government agencies

Uruguay has a population of 3.4 million inhabitants and a GDP of about US\$ 10.7 billion dollars. Uruguay imports oil to meet the demand of the internal market, and has gas pipelines that interconnect it with Argentina for the supply of natural gas.

### Energy Policy

Energy policy is oriented toward guaranteeing the supply of energy. For some time the goal has been mass consumption of natural gas to cover 30% of its energy needs. It plans to build new gas pipelines to Argentina and Brazil, promote the development of natural gas networks, and convert vehicles to natural gas. The necessary technical regulations were prepared during the course of this year.

In recent years it has attempted to privatize units of the oil sector, but due to strong opposition from the workers this has been suspended. Other policy objectives include expanding the presence of its companies outside the country. Thus, the company, Administradora Nacional de Combustibles, announced in April that it would buy shares in the distributing company, Argentina Sol Petroleo, and also on the table is the management of the Argentine company, Petrolera del Conosur.

Finally, it also has a policy for lowering energy costs in order to promote the competitiveness of the country. It plans to promote the reconversion of thermal plants.

### Hydrocarbons sector

Faced with economic decline, Uruguay had to embark upon serious reform measures, including the opening up of investment to private companies. It is proposed that the state owned enterprise (ANCAP), which controls the oil sector would be demonopolised and opened to investment by private companies. Uruguay has no known oil resources, and its oil consumption was estimated at 11.992 thousand barrels in 2003, representing an important growth over 2002.



ANCAP, owns Uruguay's only refinery with a capacity of 50,000-bbl/d. External investors are also showing some interest in becoming involved in refining in Uruguay, but there is no significant development to date.

## **Electricity Sector**

Installed electrical generating capacity including that of self-producers was 2,171 MW, which is practically identical to that of 2002.

Regarding electrical power production, 8,578 GWh were generated, a decrease of 10.7% compared to the previous year.

Regarding international electricity transactions, 1,139 GWh were exported and 434 GWh were imported through interconnections with Brazil and Argentina.

Regarding electrical power consumption, final users utilized 5,970 GWh, a decrease of 3.1% compared to the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of December 2003, including taxes and expressed in dollars, were 0.070, 0.039 and 0.106. US\$/kWh, respectively. These figures are approximately 10% greater than in December 2002.

Regarding electrical service coverage, it was reported that 97% of homes have service.

The Government established a single regulator for the activities of companies in the natural gas, petroleum and derivatives, electricity, water and sanitation markets.

The power company, UTE, offered discounts of up to 20% to customers that are small and medium companies which increase their levels of consumption. It also recovered customers' overdue accounts worth US\$ 1.8 million dollars through a refinancing plan.

UTE refused to pay for power purchased in Argentina and once again took the dispute to the courts in that country.

UTE was involved in advanced conversations with six firms for the construction of a 370 MW combined cycle thermoelectric plant, and the Government Accounts Tribunal has approved the plans to take bids for a contract to build it.

It was expected that the Uruguayan Government will increase public service rates by 6% to 10%.

## **Renewable energy and environment**

The renewable energies used are hydropower, biomass, wind energy and solar energy. Regarding hydropower, in 2003, power generation represented 8,529.1 GWh produced by plants with an installed capacity of 8,529.1 MW. For biomass, two energy products are primarily used: firewood and charcoal, consumed by the residential sector, with values of 1,117.4 tons and 1.07 tons, respectively. As for solar energy, there are several rural electrification projects with photovoltaic panels.

In terms of wind energy, there is a small plant with an installed capacity of 150 KW, but the actual wind potential is very great. By year-end 2003, the electric company *Usinas y Transmisiones Eléctricas* (UTE) launched an international tender for designing a 5 to 30 MW wind power generation project, and 18 wind farm supply and installation companies responded.

In the environmental field, the National CDM Authority is the Ministry of Housing, Land use Planning and the Environment, which acts through its Climate Change Unit, which is very active in promoting projects.



## VENEZUELA

GENERAL DATA:		ENERGY SECTOR:	2003
Capital:	<i>Caracas</i>		
President:	<i>Hugo Chávez Frías</i>	○ Oil Proven Reserves (Mbbbl)	77,383.31
Minister of Energy and Mines	<i>Rafael Ramírez,</i>	○ Natural Gas Proven Reserves (Gm3)	4,147.45
Area (km2):	<i>912,050</i>	○ Coal Proven Reserves (Mt)	1,288.39
Population (Inhab.):	<i>25,700,000</i>	○ Total Energy Supply (kBep)	511,273.32
Monetary Unit:	<i>Bolívar</i>	○ Production (kBep)	1,423,779.65
Official Languages:	<i>Spanish</i>	○ Import (kBep)	870,808.73
PIB per capita (US\$):	<i>2,697</i>	○ Export (kBep)	247,798.06
		Final Energy Consumption (kBep)	1,294.40
		Installed Refining Capacity (kbbbl/day)	20,577.00

Source: IMF/SIEE-OLADE/Government agencies

Venezuela has a population of about 25.7 million inhabitants and a GDP of about US\$ 69 billion dollars. Venezuela has the largest oil reserves in the region and the fifth largest in the world. It is a founding member of the Organization of Petroleum Exporting Countries (OPEC). It also has the largest natural gas reserves in the region, the fourth largest coal reserves, and fifth largest hydroelectric reserves.

Venezuela has the largest Refining complex in the world (Paraguana) with a capacity of 940,000 Bbl/d, and the second largest hydroelectric complex in the world (Raul Leoni) after Itaipu (Paraguay-Brazil). Its principal crude oil exports (60%) are to United States, and it supplies 11.3% of its needs.

### Energy Policy

Energy policy for the internal market is oriented toward the development of the natural gas industry, the recomposition of crude oil reserves to increasing the proportion of light and medium oil, and the maximization of the participation of private national capital in petroleum investment projects. Its goals are to explore and develop free gas reserves, to support and encourage municipalities to build gas networks in the principal urban centers, to expand gas transmission systems, and to promote industrialization projects including liquefied natural gas (LNG) plants, petrochemical plants, and gas to liquid conversion (GTL) plants. Under this policy, PDVSA announced that between 2004 and 2009, it would invest US\$ 26 billion dollars to increase the production capacity of its current producing fields, and to explore for natural gas reserves.

The policy guidelines include improving the productivity and competitiveness of the sector to make it more efficient. Thus in January 2003, the government decided to restructure the oil company, PDVSA, and divide the company into two regional

operation units. The first is in charge of activities in Eastern Venezuela, and the other in the West.

With respect to the external market, the policy is oriented toward maintaining and strengthening OPEC's market stabilization policy, as well as decisive action and commitment of the government to respect the decisions of the Organization. Energy policy also includes promoting the regional and subregional energy integration processes in Latin America and the Caribbean. In July, Venezuela and Ecuador agreed to facilitate government-to-government trade in LPG, diesel, naphtha, asphalt and lubricants, and also agreed that Venezuela would assist with the modernization of the state corporation, Petroecuador. Moreover, in April, Colombia and Venezuela agreed to build a gas pipeline so that Venezuela could import gas until such time as it develops its own gas reserves, which would then be exported to Colombia through the same pipeline.

Finally, it should be noted that this policy includes the establishment of PETROAMERICA integrated by PETROSUR and PETROCARIBE, with the objective of joint together the state oil companies of Latin America and the Caribbean to invest in oil and natural gas exploration, production, and marketing. The basic premise is that the state company should be an ally of national companies, which, while respecting sovereign decisions and the legal framework of each country, can promote the development of the entire energy production and marketing chain.

## Hydrocarbons sector

In 2003, Venezuela's total oil production was an estimated 2.4 million barrels per day (bbl/d), while consumption ranged between 350,000 and 400,000 bbl/d. Venezuela's net oil exports were approximately 2.25 million bbl/d of which 1.39 million bbl/d were shipped to the United States.

Venezuela has proven natural gas reserves of 147 trillion cubic feet (Tcf), the second largest in the Western Hemisphere, after the United States (*Oil and Gas Journal*). PdVSA has been the monopoly of Venezuelan natural gas production, allowing for only a few joint ventures.

In February 2003, PdVSA awarded ChevronTexaco and Statoil 35-year licenses to appraise and develop two of its five offshore blocks located in the Plataforma Deltana. These blocks are on the maritime border of Trinidad and Tobago, and are estimated to contain proven natural gas reserves up to 40 Tcf.. The two countries are currently negotiating for the unitization of the contiguous fields that straddle the boundary.

Another gas integration effort is an agreement in 2003 between Colombia and Venezuela to build a \$120 million pipeline, allowing Colombia to export natural gas from its Guajira basin to the Zulia state, located on the eastern shore of Lake Maracaibo. The project involves a 92-mile pipeline, with an expected capacity of 300 Mmcf/d.

According to ChevronTexaco, if there is commercial gas in sufficient quantities from its two blocks, the company will build an LNG liquefaction terminal in Venezuela. Additionally, through a joint venture agreement between PdVSA, Royal Dutch/Shell,

and Mitsubishi there are plans for the construction of a 672 Mmcf/d terminal – the Mariscal Sucre LNG project, which is to be located on the Paria Peninsula.

Venezuela's domestic refinery capacity is estimated at 1,29 million bbl/d with approximately one-third of its refined products being sold to the United States.

## **Electricity Sector**

Installed electrical generating capacity, including self-producers, was 20,577 MW. No changes were reported in 2003.

Regarding electrical power production, 89,817 GWh were produced, an increase of 2.8% compared to the previous year.

No imports or exports of electrical power were reported, since the existing interconnections with Colombia are used only for contingencies, and the links with Brazil were used very little.

Regarding electrical power consumption, final users utilized 62,477 GWh, an increase of 0.2% compared to the previous year.

Average internal electricity prices for commercial, industrial and residential customers as of May 2003, including taxes and expressed in dollars, were 0.079, 0.028 and 0.055 US\$/kWh, respectively.

Regarding the coverage of electrical service, it is estimated that 94% of homes have electricity.

The structuring of all the agencies specified in the Organic Law of Electrical Service has not yet been completed.

To meet the increased demand at Falcon and Delta Amacuro, work will continue with the goal of placing four mobile units in service (a total of 20 megawatts) at the Dabajuro Plant, which is the result of a 12 million dollar investment by ELEOCCIDENTE, a subsidiary of CADAFE.

Edelca resumed the operation of a turbine at its 10,000 MW Guri hydroelectric plant, after replacing several parts to improve its efficiency.

Cadafe awarded Siemens-Westinghouse a contract for the supply and installation of turbines for the 450 MW Pedro Camejo combined cycle project in the state of Carabobo.

The Ministry of Energy and Mines awarded a contract to the distributor of Zulia, Enerven, for overhauling five 400 kV transmission lines in the western region, and authorized the state company, Enelven, to begin generating power at its 300 MW Termozulia thermoelectric project.

Edelca began operating the fourth turbine at the 2,160 MW Caruyachi hydroelectric plant located on the Caroni River. It also began conversations with PDVSA about supplying gas for a 450 MW project.

The Corporación Andina de Fomento (CAF) [Andean Development Corporation] approved a US\$ 100 million dollar loan for financing part of the Edelca transmission plan.

## **Renewable energy and environment**

The renewable energies used are hydropower, biomass and solar energy. There is considerable potential wind energy, and various power generation projects have been identified and are being developed. As for hydropower, 60,177.3 GWh of electricity were generated in 2003 by plants with an installed capacity of 12,491 MW.

In terms of biomass, primarily two energy products are used: firewood for consumption in the rural residential sector and bagasse, which is used in the sugar industry for energy self-production. As for solar energy, there are various projects using of photovoltaic panels for electrification of remote rural areas.

In the environmental field, Venezuela has not signed the Kyoto Protocol, because it is waiting to take a joint position with the oil producing countries.

## 4. STATISTICAL ANNEX

### ANNEX 1. TABLES AND CHARTS OF THE ENERGY REPORT

#### 1. WORLD CONTEXT

##### 1.1 Crude Oil

1.1.1 [World Crude Oil Proven reserves](#)

1.1.2 [World crude oil production](#)

1.1.3 [International crude oil prices](#)

##### 1.2 Natural gas

1.2.1 [World natural gas proven reserves](#)

1.2.2 [World natural gas production](#)

##### 1.3 Coal

1.3.1 [World coal reserves](#)

1.3.2 [World coal production](#)

#### 2. LATIN AMERICA AND THE CARIBBEAN

##### 2.1 [Latin American and the Caribbean Energy Balances](#)

2.1.1 [Energy Balance of Argentina](#)

2.1.2 [Energy Balance of Barbados](#)

2.1.3 [Energy Balance of Bolivia](#)

2.1.4 [Energy Balance of Brazil](#)

2.1.5 [Energy Balance of Chile](#)

2.1.6 [Energy Balance of Colombia](#)

2.1.7 [Energy Balance of Costa Rica](#)

2.1.8 [Energy Balance of Cuba](#)

2.1.9 [Energy Balance of Ecuador](#)

2.1.10 [Energy Balance of El Salvador](#)

2.1.11 [Energy Balance of Grenada](#)

2.1.12 [Energy Balance of Guatemala](#)

2.1.13 [Energy Balance of Guyana](#)

2.1.14 [Energy Balance of Haiti](#)

2.1.15 [Energy Balance of Honduras](#)

2.1.16 [Energy Balance of Jamaica](#)

2.1.17 [Energy Balance of México](#)

2.1.18 [Energy Balance of Nicaragua](#)

2.1.19 [Energy Balance of Panama](#)

2.1.20 [Energy Balance of Paraguay](#)

2.1.21 [Energy Balance of Peru](#)

2.1.22 [Energy Balance of Dominican Republic](#)

2.1.23 [Energy Balance of Suriname](#)

2.1.24 [Energy Balance of Trinidad and Tobago](#)

2.1.25 [Energy Balance of Uruguay](#)

2.1.26 [Energy Balance of Venezuela](#)

## **2.2 CRUDE OIL**

- 2.2.1 [Crude oil proven reserves](#)
- 2.2.2 [Crude oil production](#)
- 2.2.3 [Crude oil imports](#)
- 2.2.4 [Crude oil exports](#)
- 2.2.5 [Installed capacity of refineries](#)
- 2.2.6 [Domestic oil supply](#)

## **2.3 NATURAL GAS**

- 2.3.1 [Natural gas reserves](#)
- 2.3.2 [Natural gas production](#)

## **2.4 COAL**

- 2.4.1 [Coal proven reserves](#)
- 2.4.2 [Coal production](#)
- 2.4.3 [Coal imports](#)
- 2.4.4 [Coal exports](#)

## **2.5 NEW AND RENEWABLE SOURCES**

- 2.5.1 [Firewood production](#)
- 2.5.2 [Bagasse production](#)
- 2.5.3 [Geothermal supply](#)
- 2.5.4 [Share of firewood in final energy demand of the residential sector](#)
- 2.5.5 [Share of firewood in final energy demand](#)
- 2.5.6 [Per capita firewood consumption](#)

## **2.6 ELECTRICITY**

- 2.6.1 [Electricity generation by type of plant](#)
- 2.6.2 [Electricity generation](#)
- 2.6.3 [Installed capacity electric power sector](#)
- 2.6.4 [Installed capacity for power generation by type of plant](#)
- 2.6.5 [Share of hydro energy in total installed capacity](#)
- 2.6.6 [Per capita electricity consumption](#)

## **2.7 ECONOMIC SECTORS**

- 2.7.1 [Energy demand of the industrial sector](#)
- 2.7.2 [Energy demand of the residential sector](#)
- 2.7.3 [Energy demand of the commercial sector](#)
- 2.7.4 [Energy demand of the transport sector](#)
- 2.7.5 [Share of energy products in final energy demand of the industrial sector](#)
- 2.7.6 [Share of energy products in final energy demand of the residential sector](#)



- 2.7.7 [Share of energy products in final energy demand of the commercial and services sector](#)
- 2.7.8 [Share of energy products in final energy demand of the transport sector](#)

## **2.8 ENVIRONMENTAL IMPACT**

- 2.8.1 [Total emissions of CO<sub>2</sub>](#)
- 2.8.2 [Total emissions of Sulfur oxide SO<sub>x</sub>](#)
- 2.8.3 [Total emissions of carbon monoxide CO](#)
- 2.8.4 [Total emissions of nitrogen oxide NO<sub>x</sub>](#)
- 2.8.5 [Total emissions of the hydrocarbons CH](#)
- 2.8.6 [Evolution of CO<sub>2</sub> emissions in industrial sector](#)
- 2.8.7 [Evolution of CO<sub>2</sub> emissions in residential sector](#)
- 2.8.8 [Evolution of CO<sub>2</sub> emissions in transport sector](#)
- 2.8.9 [Evolution of CO<sub>2</sub> emissions in energy production and own consumption](#)

## **2.9 PRICES**

- 2.9.1 Residential Sector
  - 2.9.1.1 [Electricity prices in residential sector](#)
  - 2.9.1.2 [Natural gas prices in residential sector](#)
  - 2.9.1.3 [LPG prices residential sector](#)
- 2.9.2 Industrial Sector
  - 2.9.2.1 [Electricity prices in Industrial sector](#)
  - 2.9.2.2 [Natural gas prices in residential sector](#)
  - 2.9.2.3 [Fuel oil prices in industrial sector](#)
- 2.9.3 Transport Sector
  - 2.9.3.1 [Gasoline prices in transportation sector](#)
  - 2.9.3.2 [Diesel oil prices in transportation sector](#)
  - 2.9.3.3 [Jet fuel prices in transportation sector](#)
- 2.9.4 Commercial Sector
  - 2.9.4.1 [Electricity prices in commercial sector](#)

## **2.10 INDICATORS**

- 2.10.1 [Demand- GDP elasticity](#)
- 2.10.2 [Energy intensity](#)
- 2.10.3 [Energy intensity of the industrial sector](#)
- 2.10.4 [Energy intensity of the transport sector](#)
- 2.10.5 [Energy consumption diversification in the residential sector](#)
- 2.10.6 [Energy consumption diversification in the industrial sector](#)
- 2.10.7 [Per capita energy end use](#)
- 2.10.8 [Per capita residential energy consumption](#)
- 2.10.9 [Per capita residential electric consumption](#)
- 2.10.10 [External balance](#)
- 2.10.11 [Total efficiency of useful consumption in residential sector](#)
- 2.10.12 [Per capita useful energy consumption in residential sector](#)

- 2.10.13 [Electricity service coverage](#)
- 2.10.14 [Per capita CO2 emissions](#)
- 2.10.15 [Intensity of CO2 emissions](#)
- 2.10.16 [CO2 emissions / Final demand](#)
- 2.10.17 [CO2 emissions in power sector / Electric power generation](#)
- 2.10.18 [CO2 emissions in transportation / Consumption in transportation](#)
- 2.10.19 [Durability of oil reserves](#)
- 2.10.20 [Durability of natural gas reserves](#)
- 2.10.21 [Share of self generation in total generation](#)

## **ANEXO II – FIGURES AND CHARTS - ENERGY REPORT**

### **WORLD AND REGIONAL FIGURES**

- Figure 1 [World Primary Energy Production by Energy Source](#)
- Figure 2 [World Primary Energy Consumption](#)
- Figure 3. [World Oil Consumption](#)
- Figure 4. [World Oil Production by Region](#)
- Figure 5. [Primary Energy Supply in Latin America and the Caribbean](#)
- Figure 6. [Total Energy Supply in Latin America and the Caribbean](#)
- Figure 7. [Oil Production and Reserves in Latin America and the Caribbean](#)
- Figure 8. [Natural Gas Production and Reserves in Latin America and the Caribbean](#)
- Figure 9 [Electricity Generation and Installed Capacity in Latin America and the Caribbean](#)
- Figure 10 [Energy Consumption by Economic Sector](#)
- Figure 11 [Energy Consumption by type of Sources](#)
- Figure 12 [Energy Consumption in Industry by type of Sources](#)
- Figure 13 [Energy Consumption in the Transportation Sector by type of Sources \(mboe\)](#)
- Figure 14 [Energy Consumption in the Residential sector by type of Sources](#)
- Figure 15 [Consumption of useful Energy in the Residential Sector by type of Sources](#)
- Figure 16 [Energy Consumption in the Commercial Sector by type of sources](#)
- Figure 17 [Total Emissions of CO2 in Latin America and Caribbean - \(gg\)](#)
- Figure 18 [Total Emissions of other Pollutants in Latin America and the Caribbean \(gg\)](#)
- Figure 19 [Average Energy Prices in Latin America and the Caribbean](#)
- Figure 20 [Relative Energy Prices in Latin America and the Caribbean](#)
- Figure 21 [Sustainability Indicators](#)