



PART IX



LATIN AMERICA: Recent evolution (1980-1997)

- GDP growth accelerated during the 1990's to peak at 4.3% in 1997
- Increasing final energy consumption, driven by growing economic activities, peaked in 1996
- The sectoral structure of final energy demand remained stable since 1980 though transportation was growing
- Electricity demand has doubled since 1980
- Gross Inland Consumption dominated by oil and renewable energy sources
- Hydrocarbon production boosted by technological improvements and privatisation
- Latin America represented only 3% of world's fossil fuel reserves
- Hydro dominated electricity generation but use of natural gas accelerated
- Privatisation and electricity reform measures continued apace in 1997
- Energy intensity peaked in 1996 at about the world average level
- CO2 emissions have increased by 31% since 1990
- Oil accounted for 93% of increasing exports of energy

GDP growth accelerated during the 1990's to peak at 4.3% in 1997...

Latin America includes all the countries of Central and South America (excluding Mexico) and the Caribbean islands. It is a mix of large and medium sized countries, such as Brazil or Venezuela, located in South America and a multitude of smaller ones with different economic structures and energy resources, mainly located in Central America. Latin America experienced rather modest economic growth during the 1980's of about 1% per annum. GDP growth accelerated during the 1990's to peak at 4.3% in 1997. Economic growth was especially strong in Argentina, Peru, Chile and Venezuela. On the other hand, problems related to fiscal and monetary policies have prevented higher growth in Brazil, which accounts for one third of the region's total GDP. In 1997, the average GDP per capita in Latin America was 2.2 thousand 1990 EUR, or seven times less than the European average, but more than triple that of Asia.

A key aspect of the Latin American economy is the process of trade liberalisation. This has already had significant effects on economic and energy developments in the region. Many countries are striving to stabilise inflation and modernise their indus-

GDP PER CAPITA : REGION COMPARISON

Thousand 1990 EUR / inhabitant	1980	1985	1990	1994	1995	1996	1997	
European Union	11.99	12.76	14.58	14.96	15.27	15.48	15.85	
Middle East	4.08	3.09	2.60	2.54	2.54	2.58	2.59	
Latin America	2.16	1.97	1.97	2.13	2.14	2.17	2.22	
Central and Eastern Europe	1.85	1.92	1.84	1.53	1.61	1.67	1.72	
CIS (1)	2.12	2.38	2.49	1.57	1.48	1.42	1.43	
Asia	0.27	0.34	0.45	0.57	0.61	0.64	0.67	
Africa	0.71	0.68	0.65	0.61	0.61	0.62	0.62	

(1) Including Baltic countries for statistical reasons

1 Excluding Mexico



tries using imported technology and capital. Liberalisation is likely to have a significant impact on energy use, through upgrading the technological infrastructure of the region.

ENERGY OUTLOOK

Increasing final energy demand, driven by growing economic activities, peaked in 1996...

Final energy demand has increased steadily by about 1.4% per year during the 1980's, marked by a depressed economic situation, mainly during the first half of the decade. Since 1990, sustained by economic growth, final energy demand grew by 3.5% per year. The additional consumption was mainly covered by oil (57% of the overall increment), electricity (19%) and gas (13%) although



LATIN AMERICA

biomass consumption stagnated due to the progressive stabilisation of the Brazilian alcohol programme resulting from market deregulation. This programme stimulated the development of biomass but has suffered from low oil prices on the international market since the beginning of the 1990's. One country, Brazil, accounted for about 43% of total final energy demand in Latin America and its share has been relatively stable since 1980. Argentina with 12% of total final consumption and Venezuela with 10% followed it. Therefore, developments in regional final energy demand were largely dominated by the evolution of Brazilian demand, except in the case of natural gas whose evolution was determined by Argentina and Venezuela which are also the region's main gas producers and consumers. In 1996, Brazil accounted for 72% of Latin America's total coal demand, with Colombia, Chile, and Argentina accounting for much of the remainder. In Brazil, the steel industry accounted for almost twothirds of the country's total coal consumption, relying on imports of coking coal to produce coke for use in its blast furnaces.

The sectoral structure of final energy demand remained stable since 1980 though transportation was growing...

The sectoral composition of final energy consumption has remained largely unchanged since 1980. The industrial sector's share went from 39% in 1980 to 37% in 1996; transportation from 30% to 32% and the tertiary-domestic sector remained stable. This is the result of a number of phenomena. The share of industrial production in the gross domestic product remained stable, in spite of a marked reduction in major countries during the economic recession in the first half of the 1980's, although in other less developed regions this share was increasing. The share of energyintensive industries was increasing as a result of the transfer of



Main items

The continued trade liberalisation of many Latin American countries has underpinned their improving economic performance and their progressive transformation into more modern, industrialised economies. In particular, the MERCO-SUR common market agreement - which came fully into force in 1995 - now embraces a free trade area of some 200 million people in Argentina, Brazil, Paraguay and Uruguay, with associate membership of Bolivia and Chile. Many countries are also in the midst of substantial internal reforms as a means of increasing the stability of their economies, reducing inflation and attracting inward investment. Central to these reforms have been moves to liberalise and privatise their energy sectors. Particularly rapid progress is being made to liberalise the electricity and downstream gas industries. Already some two-thirds of the region's electricity generation is based upon hydro power. Yet the region, and especially Brazil, has huge unexploited hydro-electricity potential which is being further developed by several large new projects. Gas production is rising very steeply, based upon expanding reserves in Argentina, Peru and Venezuela. Regional integration of electricity and gas networks is a marked feature of contemporary economic development. Venezuela, an OPEC member, has huge petroleum reserves especially in the form of heavy oil deposits; and Brazil is developing its large Campos off-shore oil basin. Vast, low-cost, near-surface coal deposits exist in Chile which has about 75% of regional coal reserves. Whilst regional coal production still remains low in global terms, exports are rising. This rapid expansion of a more modern energy supply base has reduced the regional significance of traditional biomass consumption, other than in the remoter rural areas. However, a distinctive characteristic of the Latin American regional energy balance (especially that of Brazil) is the industrial use of biomass in various forms - such as charcoal in steel making, bagasse in steam raising and sugar-cane alcohol in the transport sector.

heavy industries from the industrialised countries. The increasing energy consumption per employee in the service sector follows improvements in infrastructure (buildings, computing facilities, air conditioning...). The evolution of tertiary-domestic energy demand depends on per capita income levels, the urbanisation rate and the speed of substitution of non-commercial fuels by commercial energy. In some Latin American countries, there has already been a restructuring of energy prices in recent years to



bring them closer to international levels. In other countries, however, end-use energy prices remain below international levels. As in the OECD, the contribution of transport to final consumption of oil is close to 62%, reflecting traffic growth, especially in major cities (Sao Paulo, Rio de Janeiro and Buenos Aires...).

Transportation is the largest growth market in Central and South America, accounting for more than 80% of incremental oil demand since 1980. About 40% of the region's growth in transport oil demand occurred in Brazil, which has the largest population and economy in the region. Compared to other developing regions, Latin America has a relatively high degree of vehicle ownership, reflecting higher per capita incomes, high levels of urbanisation, a history of low, subsidised prices for transport fuels across the region and the large distance between cities. But there are large differences within the region and a substantial potential for increased vehicle ownership still exists as income rises.

Electricity demand has doubled since 1980...

Electricity demand grew by 4.7% on average since 1980, more than twice as fast as GDP. This growth led to a doubling of electricity demand since 1980. The share of electricity in final energy demand reached 15% in 1996 from 12% in 1985 and only 10% in 1980. In 1996, about 39% of this electricity was consumed in industry and 57% in the tertiary-domestic sector. In both sectors, but mainly in the tertiary-domestic sector, the share of electricity in total final demand was expanding, reflecting rising income levels, urbanisation, structural and technological shifts in the industrial sector and the increasing use of electrical appliances in the residential/commercial sector. In addition, the level of electrification varies widely throughout Latin America, as electricity's share in final energy demand ranged from 1.4% in Haiti to 18.9% in Uruguay. Broadly, electrification was somewhat lower in Central America (Costa-Rica and Jamaica excepted) than in South America.

Gross Inland Consumption dominated by oil and renewable energy sources...

Gross inland energy consumption was dominated by oil (49% of the total in 1997 from 55% in 1980). Renewable energy sources, mainly biomass (81 Mtoe in 1997) and hydro (44 Mtoe in 1997), came second in satisfying 29% of total demand in 1997 as in 1980. Natural gas consumption more than doubled over the last fifteen years, representing 17% of the total in 1997 (11% in 1980). Solid fuels remained marginal with only 5% of the 1997 total, the bulk of consumption (63%) being located in Brazil. There is also some contribution from nuclear energy in Argentina and Brazil, but it represented less than 1% of the total in 1997. Since 1990, the incremental consumption of energy of about 97 Mtoe has been met by oil (55 %), natural gas (26%), hydro (13%) and biomass (5%), respectively, while solid fuels remained stable.

The predominance of oil in the overall energy balance, and the importance of hydro in the generation of electricity, are two striking features of the region as a whole. However, the energy systems of individual countries are quite distinct, with Argentina being one of the most gas-intensive countries in the world, while the energy sectors of the poorest countries are still dominated by biomass. In the near future, gas consumption - which increased by about 7.6% in 1996 and 6.1% in 1997 - will continue to expand rapidly. Several important pipelines were under construction in 1997. The first Uruguay-Argentina connection was at the point of becoming operational. Progress was also made on the Bolivia-to-Brazil line, as well as on two Argentina-to-Brazil lines. Negotiations were underway to build another pipeline connection between Argentina and Brazil via a planned 3,000 km Mercosur Pipeline. There are also several pipelines under construction between Argentina and Chile, in particular the Atacama pipeline which is expected to be used to fuel gas-fired electricity generating plant in Chile.

Hydrocarbon production boosted by technological improvements and privatisation...

Indigenous energy production has grown since 1980 by more than 3.5% per year on average, with an even more noticeable acceleration in 1996 (5.0%) and 1997 (7.0%). Production was dominated by oil (60% of the total in 1997) followed by biomass (14%), natural gas (13%), hydro and wind (8%), solid fuels (5%) and nuclear (less than 1%). In 1997, Venezuela accounted for 52% of oil and 36% of natural gas production in Latin America. Other major oil producers were Brazil (14%), Argentina (13%) and Columbia (10%). Over the past three years, Venezuela has raised both its oil production capacity and output by more than 10 Mtoe each year. The participation of foreign joint venture partners is a key element of Venezuela's plans to increase oil production. The partners are providing both investment capital and technical expertise. Other oil producers in Latin America have significant potential for increasing output over the next decade. Within 5 years, both Brazil and Colombia are expected to join the relatively short list of world-wide producers whose oil output exceeds 1 million barrels per day. Development of natural gas production and infrastructure has accelerated since the early 1990's under the pressure of both privatisation of former state gas companies and increasing private foreign investment in pipelines. At the same time, the libe-



ralisation of energy markets in South America as a whole has given Argentina an opportunity to supply growing gas demand in Brazil, Chile and Uruguay. Brazil was mainly responsible for hydro and biomass production (54% and 48% respectively of the region's production). Finally, several new low-cost coal producers, including Colombia and Venezuela, have expanded coal production in recent years and are rapidly penetrating world coal markets.

Latin America represented only 3% of world's fossil fuel reserves...

Latin America's oil reserves at end 1997 amounted to about 8.3% of world reserves, with a major part (7%) located in Venezuela, the only OPEC member in this region. If its extra-heavy deposits in the Orinoco belt are included in reserves, then its total oil resources are comparable to those of Saudi Arabia. The region's oil reserves/production ratio reached 37.5 years, roughly the world average. 4.4% of world gas reserves are also concentrated in Venezuela, the major regional producer together with Argentina. Finally, coal reserves, mainly located in Colombia and Brazil, accounted for only 1% of world's reserves. As a result of this, Latin America represented only 3% of world's fossil fuel reserves.

Hydro dominated electricity generation but use of natural gas accelerated...

Electricity generation in the region grew steadily by 5.0% per year on average in the period 1980-1996. Hydroelectric dams remained the dominant source of electricity generation in Central and South America with 75% of total output in 1996 (67% in 1980). Brazil supplied more than half of hydro production. Thermal generation, 24% of total generation in 1996, has grown

by 1.7% on average during the 1980's but by 5.4% on average since 1990. Input needs are covered mainly by oil (35% in 1996) and gas (42% in 1996) followed by solid fuels (11%) and biomass (8%). Oil has been a significant fuel in electricity generation but its importance has been declining. Its share of thermal generation fell from about 60% in 1980 to 35% in 1996. In place of oil, gasfired generation is becoming increasingly popular, based on increased exploitation of the region's gas reserves (particularly in Venezuela and Argentina), development of infrastructure to deliver gas across Latin America as well as growing environmental concerns. Because heavy dependence on the hydroelectric resources in the region has led to problems in maintaining electricity supplies in times of drought, major South American countries have been attempting to construct a natural gas infrastructure to develop gas-firing capacity. Several major natural gas-fired projects are currently under construction, and more are planned in anticipation of completion of major gas pipeline agreements signed in 1996 for lines connecting Bolivia and Brazil, Venezuela and Brazil, and Argentina and Chile, as well as other projects expanding gas grids within individual countries.

Privatisation and electricity reform measures continued apace in 1997...

Central and South America was an early pioneer in the privatisation of electricity and the implementation of electricity reforms. In 1997, Brazil followed the path, first of Chile and later of Argentina, in aggressively selling off state-owned electricity assets to the private sector. Several other Latin American countries (Columbia, Peru...) have also privatised electricity assets. Central and South American energy needs have given rise to regional, cross-border investment, development and trade in electricity and natural gas.





Uruguay, in an attempt to establish itself as a hub of regional electricity trade, is promoting a number of transmission and generation projects that would connect Argentina and Brazil through Uruguay. In 1997, the National Grid Company of the United Kingdom announced plans to build a transmission line between the Argentine coast and the Andes. Venezuela also intends to export electricity to Brazil; and Venezuela's Edelca has proposed the construction of a 4,160 km line linking the two countries. There is also a regional electricity grid evolving in Central America, although at a somewhat hesitant pace. In December 1995, the presidents of Costa-Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama endorsed a proposal to construct a 1,500 km transmission line connecting Guatemala, Honduras and Panama.

The total generation capacity reached 153 GWe in 1996, of which 67% was hydro (56% in 1980), 32% thermal units (43% in 1980) and 1% nuclear. Since 1980, new plant commissioning has been shared between hydro for 59 GWe (78% of the total), thermal for 15 GWe and nuclear for 1 GWe. Many countries of Central and South America rely heavily on hydroelectricity for electricity generation. In Brazil, 86% of the installed capacity consists of hydropower. Hydro also accounted for 50% or more of the total installed capacity in Chile, Colombia, Paraguay, Peru and Venezuela. Although many of the region's hydroelectric resources have been developed, there are still plans to add substantial further hydro capacity in the near future: about 5 GWe in Brazil, 0.5 GWe in Argentina and 0.6 GWe in Chile. The region's unexploited hydro potential remains, with Asia, the largest in the world.

Refining capacity increasing slowly...

In 1997, the regional **refinery capacity** (6.37 million barrels or a 3.1% increase over 1996) represented 8.0% of world capacity (9.3% in 1980). Whereas about 2 million barrels day of refining capacity was closed in the first half of the 1980's, since 1985 the installed capacity has grown by about 1.0% per year on average. But the utilisation rate of the refineries (80% in 1997 from 75% in 1985) increased more slowly than the world average (84% in 1997 from 74% in 1985).

COMPETITIVENESS

Energy intensity peaked in 1996 at about the world average level...

The **energy intensity** indicator for the region evolved differently in the period 1980-1997. It increased by 0.7% per year over the period 1980-1985, by 0.5% over the period 1986-1990, decreased by 0.6% on average between 1990 and 1994 but rebounded in 1995 and 1996 by 2.5% to peak at 502 toe/million 1990_, a little above the world average. Energy intensity declined by 1.8% in 1997 to be close to the 1990 value. This reflects contrasting economic conditions in the region since 1980. The economic recession in the early 1980's, through lower utilisation of industrial capacity, induced increasing energy intensity of industry. At the same time, development of services and improving standards of living stimulated energy consumption in the tertiary-domestic sector, although gross domestic production remained flat. Between 1986 and 1990, the restoration of economic growth resulted in a declining industrial energy intensity due to the acceleration of investment. This is despite the development of energyintensive industries which have been relocated from the OECD countries. At the same time, the negative impact of the tertiarydomestic sector continued, reinforced by the transport sector where motorization accelerated. Finally, since 1990, the increasing







LATIN AMERICA : ENERGY INTENSITY

toe/1990 MEUR	1980	1985	1990	1995	1996	1997 (1)
Latin America	462.3	478.4	489.6	489.3	501.7	492.8
Argentina	343.9	377.7	390.1	393.6	396.1	366.2
Brazil	338.4	356.8	361.0	365.7	372.3	371.8
Colombia	847.1	875.0	845.9	777.9	777.5	753.9
Venezuela	995.4	1097.0	1059.9	1070.0	1248.5	1225.1
(1) ostimatos						

(1) estimates

energy intensity of the transport sector compensated largely for the gains observed in the tertiary-domestic sector while energy intensity in industry fluctuated with economic activity.

Energy intensity analysis by country showed significant national differences within the region. Argentina and Brazil, amongst the more developed countries, were characterised by energy intensities of around 375 toe/1990 MEUR, comparable with some OECD countries. In contrast, Venezuela and many Central America countries have energy intensities three to five times higher, in line with levels observed in developing countries. The energy consumption per capita, quite stable during the 1980's, has been increasing since 1990, growing by 4.1% in 1996 and 1.1% in 1997. By sector, increasing trends appeared clearly since 1985 in transport and since 1990 in the tertiary-domestic sector due to improving living standards and greater motorization. Nevertheless, the per capita consumption in 1996 remained well below the European level with only 40% for industry, 32% for transport and only 23% for tertiary and domestic sector.

ENVIRONMENT

CO2 emissions increased by 31% since 1990...

In broad terms, CO2 emissions have been continuously increasing since 1980 (781 million tonnes of CO2 in 1997, compared to 595 million tonnes in 1990, 529 million tonnes in 1985 and 541 million tonnes in 1980). Major contributors were Brazil (33% of the total in 1996), Argentina (16%) and Venezuela (16%). Whereas CO2 emissions increased annually by 1.0% on average during the 1980's, emissions growth has accelerated significantly to reach 4.0% per year on average since 1990 due to the fact that fossil fuels have accounted for 82% of the region's incremental energy consumption since 1990. This evolution, quite disturbing in the post-Kyoto context, was reinforced by other indicators. CO2 emissions per capita decreased by 1.0% per year during the 1980's but increased by 2.5% since 1990 and the movement was accelerating. CO2 intensity per unit of GDP, quite stable during the 1980's,

grew by about 0.8% per year on average over the last six years. Finally, only the carbon intensity has been stable since 1980.

PART IX

Looking at CO₂ emissions by sector at a regional level, the largest sector is transport. It easily occupied the first place with about 38% of total emissions in 1996 against 36% in 1980. Industry accounted for about 24%, decreasing slowly since 1980 (26%). The tertiary-domestic sector was quite stable at about 15%, the same share as the electricity generation sector. Since 1990, about 44% of incremental CO2 emissions have arisen from the transport sector, 24% from industry, 12% from the power sector, 10% from the tertiary-domestic sector and 10% from the energy branch (hydrocarbon production and transformation).





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GLOBAL MARKETS

Oil accounted for 93% of increasing exports of energy...

Over the whole period, Latin America was increasingly a net exporter of energy. Oil accounted for 93% of total energy exports in 1997 (123 Mtoe compared with 28 Mtoe in 1980), of which three quarters consisted of crude oil and one quarter of refined products. Since 1980 crude exports have multiplied by four, although exports of refined products have halved. In 1997, net oil exports of Venezuela, a founding member of OPEC, represented more than the net total oil exports of the region, with Argentina and Colombia also increasing their contribution since the beginning of the 1990's. Oil exports are mainly oriented towards the United States (83% of the total), Western Europe being the second largest export destination with only 7% in 1997. Brazil, the second largest oil producer of the region, still imports almost twice its own national production mainly from the Middle East and West Africa. Despite the limited production of solid fuels, the region became a net exporter in 1990, due to the efforts made by Columbia to exploit its reserves. But net regional exports of coal remained small as Brazil absorbed a large part of the coal available on the regional market.

1985	1990	1995	1996	1997
-43.5 -3.7 23.3 -0.7 -71.7	-51.0 -4.8 30.7 -11.5 -86.2	-101.5 -14.4 35.9 -17.0 -134.4	-99.3 -18.1 41.5 -18.5 -135.4	-122.7 -21.7 40.2 -20.0 -155.7
	-43.5 -3.7 23.3 -0.7 -71.7	-43.5 -51.0 -3.7 -4.8 23.3 30.7 -0.7 -11.5 -71.7 -86.2	-43.5-51.0-101.5-3.7-4.8-14.423.330.735.9-0.7-11.5-17.0-71.7-86.2-134.4	-43.5-51.0-101.5-99.3-3.7-4.8-14.4-18.123.330.735.941.5-0.7-11.5-17.0-18.5-71.7-86.2-134.4-135.4

(1) estimates

LATIN AMERICA : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1995	1996	1997(2)	85/80	90/85	95/90	96/95	97/96	
	•••••		• • • • • • • • • • • •				Annual % Change					
Primary Production	319.9	350.8	403.8	513.5	539.4	577.0	1.9%	2.9%	4.9%	5.0%	7.0%	
Solids	6.2	10.5	18.3	22.6	24.4	27.7	11.2%	11.6%	4.3%	8.3%	13.3%	
Oil	194.0	192.0	222.9	299.9	316.8	344.0	-0.2%	3.0%	6.1%	5.6%	8.6%	
Natural gas	32.8	43.1	52.0	67.3	/2.2	/6./	5.6%	3.9%	5.3%	7.4%	6.2%	
Hydro & Wind	0.6 17.2	2.4 24.6	2.5 31.2	2.5 40.2	2.0 42.0	2.9 43.6	31.3% 7.4%	0.8% 4.8%	0.1%	3.2% 4.7%	14.1%	
Geothermal	0.4	0.8	0.9	0.8	0.8	0.8	14.1%	1.2%	-0.6%	-2.7%	0.0%	
Other	68.7	77.4	76.1	80.2	80.4	81.4	2.4%	-0.3%	1.0%	0.3%	1.2%	
Net Imports	-22.6	-38.8	-51.7	-103.7	-103.5	-132.8	11.4%	5.9%	14.9%	-0.2%	28.4%	
Solids	5.1	5.0	-0.6	-2.0	-4.2	-10.0	-0.4%	-	26.3%	112.8%	141.1%	
Oll Crude oil	-27.7 31.2	-43.5	-51.0 -14.0	-101.5	-99.3	-122.7 na	9.4%	3.2% 16.9%	14.7% /1.2%	-2.2%	23.6% na	
Oil products	-58.9	-37.1	-37.1	-23.1	-23.1	na	-8.8%	0.0%	-9.0%	0.2%	na	
Natural gas	0.0	-0.1	-0.2	-0.1	0.0	0.0	30.5%	34.8%	-8.6%	-94.1%	327.6%	
Electricity	0.0	-0.3	0.2	0.0	0.0	0.0	90.3%	-	-	-23.3%	30.3%	
Gross Inland Consumption	288.8	302.4	339.1	400.9	423.9	435.8	0.9%	2.3%	3.4%	5.7%	2.8%	
Solids	11.0	15.7	17.2	19.3	20.2	17.7	7.5%	1.7%	2.4%	4.6%	-12.3%	
UII Natural das	158.2	138.8	159.5 51.8	190.8 67.1	205.7	212.8	-2.6% 5.6%	2.8%	3.6% 5.3%	7.8% 7.6%	3.5% 6.1%	
Other (1)	86.9	104.9	110.6	123.7	125.9	128.7	3.8%	1.1%	2.3%	1.7%	2.2%	
Electricity Generation in TWh	299.4	396.0	486.5	620.1	656.1	na	5.7%	4.2%	5.0%	5.8%	 na	
Nuclear	2.3	9.1	9.5	9.6	9.9	na	31.3%	0.8%	0.1%	3.2%	na	
Hydro & wind	199.9	286.0	362.3	467.2	489.0	na	7.4%	4.8%	5.2%	4.7%	na	
Thermal	97.2	100.8	114.7	143.4	157.3	na	0.7%	2.6%	4.6%	9.7%	na	
Generation Capacity in GWe	77.4	106.9	129.5	146.1	152.6	na	6.7%	3.9%	2.4%	4.5%	na	
Nuclear Hydro & wind	0.4	1.7	1./ 85.2	1./ 96.7	1./	na	35.3%	0.0%	0.0%	0.0% 5.7%	na	
Thermal	33.6	42.7	42.6	47.7	48.8	na	4.9%	0.4%	2.0%	2.2%	na	
Average Load Factor in %	44.2	42.3	42.9	48.5	49.1	na	-0.9%	0.3%	2.5%	1.3%	na	
Fuel Inputs for Thermal Power Generation	31.4	31.6	34.0	39.0	41.8	na	0.1%	1.5%	2.8%	7.0%	na	
Solids	2.3	3.1	4.1	4.7	4.8	na	5.9%	5.7%	2.9%	2.9%	na	
Oil	18.5	13.2	13.2	14.0	14.8	na	-6.5%	0.0%	1.1%	6.0%	na	
Gas	8.2	11.9	13.1	16.3	17.7	na	7.6%	1.9%	4.5%	8.9%	na	
Other	0.4 1.9	0.8	0.9	0.8	0.8	na	14.1% 6.0%	1.2%	-0.0% 3.1%	-2.7% 10.2%	na	
Average Thermal Efficiency in %	26.6	27.4	29.0	31.6	32.4	na	0.6%	1.1%	1.7%	2.5%	na	
Non-Energy Uses	12.2	18.5	22.1	26.6	27.8	na	8.6%	3.7%	3.7%	4.5%	na	
Total Final Energy Demand	222.4	234.2	254.9	304.5	313.4	na	1.0%	1.7%	3.6%	3.0%	na	
Solids	7.0	10.4	11.2	13.2	13.8	na	8.3%	1.6%	3.3%	4.1%	na	
Oil	111.2	100.8	114.6	142.3	147.9	na	-1.9%	2.6%	4.4%	4.0%	na	
Gas Electricity	15.9 21.6	20.1	21.8	28.9 43.1	29.0 45.2	na	4.8% 5.3%	1.0%	5.7% 49%	2.0% 5.0%	na	
Heat	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na	
Other	66.7	74.8	73.2	77.0	76.9	na	2.3%	-0.4%	1.0%	-0.1%	na	
CO ₂ Emissions in Mt of CO ₂	541.1	529.2	595.1	726.0	762.5	781.3	-0.4%	2.4%	4.1%	5.0%	2.5%	
Indicators	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	
Population (Million)	289.29	320.76	352.34	383.71	389.93	396.41	2.1%	1.9%	1.7%	1.6%	1.7%	
GDP (index 1985=100)	98.8	100.0	109.6	129.6	133.7	139.9	0.2%	1.8%	3.4%	3.1%	4.6%	
Gross Ini Cons /Capita (toe/inhabitant)	402.3 1.00	478.4 094	489.0 0.96	489.3	1 09	492.8 1 10	0.7% -1.1%	0.5%	0.0% 1.7%	2.5% 4.1%	-1.8% 1.1%	
Electricity Generated/Capita (kWh/inhabitant)	1035	1234	1381	1616	1683	na	3.6%	2.3%	3.2%	4.1%	na	
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	1.9	1.6	1.7	1.9	2.0	2.0	-2.5%	0.5%	2.3%	3.3%	0.8%	
Import Dependency (%)	-7.6	-12.5	-15.0	-25.4	-24.0	-30.1	10.4%	3.7%	11.1%	-5.5%	25.5%	

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates

G.

LATIN AMERICA : MAIN INDICATORS

	1980	1985	1990	1994	1995	1996	85/80	90/85	95/90	96/95
							1	Annual %	Change	
Gross Inland Consumption (Mtoe)	288.8	302.4	339.1	383.6	400.9	423.9	0.9%	2.3%	3.4%	5.7%
Public Thermal Power Generation	22.6	21.8	24.0	25.7	28.5	30.7	-0.7%	1.9%	3.5%	7.8%
Autoprod. Thermal Power Generation	8.4	9.0	9.2	10.3	9.7	10.2	1.2%	0.5%	1.2%	5.3%
Energy Branch	17.1	17.7	21.0	26.6	24.4	27.7	0.7%	3.5%	3.0%	13.4%
Final Energy Consumption	214.0	220.4	241.1	2/5.5	291.1	300.1 111.5	0.6%	1.8%	3.8%	3.1% 2.2%
Transport	63.8	62.5	70.1	82.7	90.7	94.3	-0.4%	2.3%	5.7%	4.0%
Tertiary-Domestic	72.4	74.6	81.0	88.9	91.5	94.3	0.6%	1.7%	2.5%	3.0%
Energy Intensity (toe/1990 MEUR)	462.3	478.4	489.6	477.3	489.3	501.7	0.7%	0.5%	0.0%	2.5%
Public Thermal Power Generation	36.2	34.6	34.6	32.0	34.8	36.3	-0.9%	0.0%	0.1%	4.5%
Autoprod. Thermal Power Generation	13.5	14.2	13.2	12.9	11.8 122.0	12.1	1.0%	-1.4%	-2.2%	2.2%
Transport	124.0	08.0	101.0	129.2	132.9	131.9	-0.7%	-0.2%	0.4%	-0.0%
Tertiary-Domestic	115.8	117.9	116.9	110.6	111.6	111.5	0.4%	-0.2%	-0.9%	-0.1%
•••••••		••••••							••••••	
Energy per Capita (Kgoe/inhabitant)	998	943	963	1016	1045	1087	-1.1%	0.4%	1.7%	4.1%
Industry	269	260	256	275	284	286	-0.7%	-0.3%	2.1%	0.7%
Transport	221	195	199	219	236	242	-2.4%	0.4%	3.6%	2.3%
Tertiary-Domestic	250	232	230	236	238	242	-1.5%	-0.2%	0.7%	1.4%
Flectricity Share (%)	• • • • • • • • • • • •	• • • • • • • • • • • •	•••••		•••••	•••••		•••••	•••••	•••••
Final Energy Consumption	10.1%	12.7%	14.1%	14.7%	14.8%	15.1%	4.7%	2.1%	1.0%	1.8%
Industry	14.4%	17.6%	18.5%	18.6%	18.3%	18.5%	4.0%	1.1%	-0.3%	0.8%
Transport	0.2%	0.2%	0.3%	0.2%	0.2%	0.2%	6.3%	1.4%	-7.0%	3.6%
Tertiary-Domestic	14.1%	17.7%	21.1%	23.7%	25.1%	25. 9 %	4.6%	3.5%	3.5%	3.3%
			100.0	1105			•••••	1 00/	•••••	1 70/
Iotal Renewable Consumption (Mitoe)	86.3 17.2	102.8	108.0	118.5	121.2	123.3	3.6%	1.0%	2.3%	1.7%
Biomass	68.7	24.0 77.4	75.9	78.9	40.2 80.2	42.0 80.4	7.4 % 2.4%	-0.4%	0.2 % 1 1%	4.7 %
Other	0.4	0.8	0.9	0.9	0.8	0.8	14.1%	1.2%	-0.6%	-2.7%
Renewable intensity (toe/1990MEUR)	138.1	162.7	155.9	147.5	148.0	145.9	3.3%	-0.8%	-1.0%	-1.4%
Renewable per capita (Kgoe/inhabitant)	298.2	320.6	306.5	314.0	316.0	316.2	1.5%	-0.9%	0.6%	0.1%
	•••••	• • • • • • • • • • • • •	•••••	• • • • • • • • • • • •	•••••	•••••	•••••	•••••	•••••	•••••
CO ₂ Emissions (Mt of CO ₂)	541.1	529.2	595.1	692.3	726.0	762.5	-0.4%	2.4%	4.1%	5.0%
Autoprod Thermal Power Concration	0/.4 10.2	03.7 10.0	10.2	74.4	82.9	89.3	-1.1%	1.9%	3.4%	7.8% 1.4%
Energy Branch	19.5	19.0	19.3 54.6	21.9 60 /	19.0 62.2	19.9 70.5	-0.3%	0.4%	0.3%	13.3%
Industry	141.2	131.3	142.2	166.7	175.4	182.4	-1.4%	1.6%	4.3%	4.0%
Transport	195.6	191.4	214.0	252.9	277.4	288.4	-0.4%	2.3%	5.3%	4.0%
Tertiary-Domestic	71.9	78.1	94.6	107.0	108.5	111.9	1.7%	3.9%	2.8%	3.1%
	•••••	•••••	•••••	•••••	•••••	•••••	• • • • • • • • • • • •	•••••	•••••	•••••
Carbon Intensity (tn of CO ₂ /toe)	1.9	1.7	1.8	1.8	1.8	1.8	-1.4%	0.1%	0.6%	-0.7%
Public Power Generation	1./	1.3	1.2	1.1	1.2	1.2	-4.9%	-1.4%	-0.9%	1.9%
Autoprod Power Ceneration	3.0	2.9	2.9	2.9	2.9	2.9 1.9	-0.5% 1.6%	0.1%	-0.1%	-0.1%
Autoprod. Thermal Power Generation	2.2	2.0	2.0	2.0	2.0	1.0	-1.5%	-0.1%	-0.9%	-3.6%
Energy Branch	2.7	2.6	2.6	2.6	2.6	2.5	-0.7%	0.1%	-0.3%	-0.1%
Industry	1.8	1.6	1.6	1.6	1.6	1.6	-2.8%	0.0%	0.4%	1.6%
Transport	3.1	3.1	3.1	3.1	3.1	3.1	0.0%	0.0%	0.0%	0.0%
Tertiary-Domestic	1.0	1.0	1.2	1.2	1.2	1.2	1.1%	2.2%	0.3%	0.1%
$CO_{\rm rest}$ Consists (less of $CO_{\rm r}$ /indebitourt)	1070	1/50	1/00	1024	1002	1055	2 5 0/	0.50/	2 20/	2 20/
Industry	1870	409	404	1834	1892	1955	-2.5% -3.5%	0.5% -0.3%	2.3% 2.5%	3.3% 2.3%
Transport	676	597	608	670	723	740	-2.5%	0.4%	2.5%	2.3%
Tertiary-Domestic	248	243	269	283	283	287	-0.4%	2.0%	1.0%	1.5%
		•••••		•••••	•••••	•••••	• • • • • • • • • • •			
CO2 per unit of GDP (tn of CO2/1990 MEUR	8) 866	837	859	862	886	902	-0.7%	0.5%	0.6%	1.8%
Public Thermal Power Generation	108	101	101	93	101	106	-1.3%	0.1%	0.0%	4.5%
Autoprod. Inermal Power Generation	31	30	28	27	24	24	-0.6%	-1.4% 1.00/	-3.0%	-1.5%
Industry	226	208	205	207	70 214	83 216	-0.3%	-0.2%	-0.0% 0.8%	9.9%
Transport	313	303	309	315	339	341	-0.7%	0.4%	1.8%	0.8%
Tertiary-Domestic	115	123	137	133	132	132	1.4%	2.0%	-0.6%	0.0%

BRAZIL : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1995	1996	1997(2)	85/80	90/85	95/90	96/95	97/96
			•••••		•••••			Annı	ual % Cha	inge	
Primary Production	62.1	95.2	99.1	106.4	112.3	116.3	8.9%	0.8%	1.4%	5.5%	3.5%
Solids	2.5	3.5	1.9	2.0	1.9	2.1	7.1%	-11.5%	1.2%	-7.1%	15.1%
Oil Natural gas	9.3	28.6	35.2	37.9	42.9	45.1	25.1%	4.2%	1.5%	13.4%	4.9%
Nuclear	1.0	2.2	3.3 0.6	4.3	4.8	5.U 0.8	17.4%	8.3% -7.9%	5.0% 2.4%	-3.6%	5.0% 30.4%
Hydro & Wind	11.1	15.3	17.8	21.8	22.9	24.0	6.7%	3.0%	4.2%	4.7%	5.0%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-
Other	38.2	44.7	40.4	39.8	39.3	39.2	3.2%	-2.0%	-0.3%	-1.4%	-0.2%
Net Imports	48.2	29.5	40.9	48.9	54.7	53.4	-9.4%	6.8%	3.6%	11.9%	-2.3%
Solids	3.7	5.9	7.9	9.9	10.0	9.9	10.2%	5.7%	4.8%	1.0%	-1.1%
Crude oil	44.0 43.4	23.3 27.4	30.7	35.9 26.8	41.5 30.5	40.2 na	-12.1%	5.7% 2.5%	3.1% -2.9%	15.0% 14.0%	-3.0% na
Oil products	1.2	-4.1	-0.2	20.0 9.1	11.0	na	-0.070	-43.1%	-2.770	20.3%	na
Natural gas	0.0	0.0	0.0	0.0	0.0	0.2	-	-	-		-
Electricity	0.0	0.2	2.3	3.0	3.1	3.0	-	69.2%	5.9%	3.4%	-3.3%
Gross Inland Consumption	109.6	122.1	135.9	155.7	163.1	168.1	2.2%	2.2%	2.8%	4.8%	3.1%
Solids	5.8	9.9	9.4	11.7	12.1	12.1	11.1%	-0.9%	4.5%	2.9%	0.0%
Oil Natural and	53.5	48.9	62.1	74.3	80.4	83.8	-1.8%	4.9%	3.6%	8.1%	4.2%
Natural gas Other (1)	1.0	2.2 61.1	3.3 61.0	4.3	4.8	5.Z 67.0	17.4%	8.3%	5.0% 1.4%	12.0%	9.0% 1.8%
	47.J	•••••	•••••	•••••	•••••		4.470	•••••	1.470	0.770	1.070
Electricity Generation in TWh	139.4	193.7	222.8	275.6	289.8	na	6.8%	2.8%	4.3%	5.1%	na
Nuclear	0.0	3.4	2.2	2.5	2.4	na	-	-7.9%	2.4%	-3.6%	na
Thermal	128.9	178.4	206.7	253.9 19.2	205.8 21.6	na	0.7% 2.6%	3.0% 3.1%	4.2% 6.7%	4.7% 12.4%	na
Concration Canacity in GW/o	······································		Б2 1	 50 0	۰۰۰۰ ۵ مه	·····	Б 0%	2 00/	ייייי 1 חסע	2 0%	·····
Nuclear	33.3 0.0	44.1	07	09.0 07	00.0	na	J.070	3.0% 0.0%	2.2%	2.9%	na
Hydro & wind	27.5	37.1	45.6	51.3	53.1	na	6.1%	4.2%	2.4%	3.4%	na
Thermal	5.8	6.4	6.8	7.1	7.0	na	2.0%	1.4%	0.7%	-0.3%	na
Average Load Factor in %	47.8	50.1	47.9	53.3	54.5	na	1.0%	-0.9%	2.1%	2.2%	na
Fuel Inputs for Thermal Power Generation	2.6	3.1	3.5	4.9	5.3	na	3.7%	2.5%	6.9%	9.2%	na
Solids	0.8	1.2	1.1	1.4	1.4	na	8.8%	-2.3%	5.6%	-0.5%	na
Oil	1.3	1.0	1.3	1.9	2.2	na	-4.7%	4.4%	9.0%	13.9%	na
Gas	0.0	0.0	0.1	0.2	0.2	na	-	-	19.9%	24.0%	na
Other	0.5	0.9	1.1	1.3	1.5	na	12.0%	4.8%	4.3%	10.5%	na
Average Thermal Efficiency in %	35.1	33.3	34.2	34.0	35.0	na	-1.0%	0.5%	-0.1%	3.0%	na
Non-Energy Uses	6.7	12.3	14.9	16.5	17.2	na	13.1%	3.9%	2.1%	4.3%	na
Total Final Energy Demand	96.9	102.6	110.1	127.3	132.2	na	1.2%	1.4%	2.9%	3.9%	na
Solids	4.1	7.0	7.4	9.6	10.0	na	11.3%	0.9%	5.5%	3.9%	na
	44.2	36.1	43./	54.9	58.7	na	-4.0%	3.9%	4.6%	7.0% 15.0%	na
Electricity	10.2	14.4	18.1	2.3	2.0	na	7.1%	4.7%	4.0%	4.5%	na
Heat	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Other	37.7	43.9	39.3	38.5	37.8	na	3.1%	-2.2%	-0.4%	-1.8%	na
CO ₂ Emissions in Mt of CO ₂	167.9	158.4	189.5	238.5	254.2	na	-1.2%	3.7%	4.7%	6.6%	na
Indicators											
Population (Million)	121.29	135.26	148.00	159.22	161.37	163.60	2.2%	1.8%	1.5%	1.3%	1.4%
GDP (index 1985=100)	94.7	100.0	110.0	124.4	128.0	132.1	1.1%	1.9%	2.5%	2.9%	3.2%
Gross Inl Cons./GDP (toe/1990 MEUR)	338.4	356.8	361.0	365.7	372.3	371.8	1.1%	0.2%	0.3%	1.8%	-0.1%
Gloss Ini Cons./Capita (Toe/Innabitant)	0.90	0.90	0.92	0.98	1704	1.03	0.0%	0.3%	1.3%	3.4% 2.7%	1.6%
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	149	1432	1306	1/31	1.6	na	-3.3%	1.0%	2.0%	5.7%	na
Import Dependency (%)	43.3	23.6	29.7	31.0	33.1	31.3	-11.5%	4.7%	0.8%	6.7%	-5.3%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates

VENEZUELA : SUMMARY ENERGY BALANCE

Mtoe	1980	1985	1990	1995	1996	1997(2)	85/80	90/85	95/90	96/95	97/96
		•••••		• • • • • • • • • • • •	•••••	•••••					
Primary Production	132.9	111.2	130.8	 187.1	194.0	216.9	-3.5%	3.3%	7.4%	3.7%	11.8%
Solids	0.0	0.0	1.3	2.9	2.1	3.4	0.0%	120.5%	16.2%	-24.9%	59.4%
Oil	116.8	91.0	105.7	154.2	160.4	180.6	-4.9%	3.1%	7.8%	4.1%	12.6%
Natural gas	14.8	18.3	20.2	25.1	26.3	27.4	4.3%	2.0%	4.5%	4.7%	4.2%
Hydro & Wind	0.0	0.0 1 9	0.0	0.0	0.0	0.0 5.0	9.2%	- 10 3%	- 6.8%	- 4 7%	- 7.0%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	-		-	-	-
Other	0.0	0.0	0.3	0.5	0.5	0.6	-15.1%	118.9%	10.1%	0.0%	10.1%
Net Imports	-98.1	-71.6	-87.3	-137.1	-137.4	-159.0	-6.1%	4.0%	9.4%	0.2%	15.7%
Solids	0.1	0.1	-1.1	-2.6	-1.9	-3.2	3.3%	-	18.5%	-26.5%	66.0%
Crude oil	-98.2 -69.6	-/1./	-80.2 -54 8	-134.4	-135.4	-155.7 na	-0.1%	3.7% 4.0%	9.3% 12.4%	0.8%	15.0% na
Oil products	-28.6	-26.8	-31.4	-36.0	-36.7	na	-1.3%	3.2%	2.8%	2.0%	na
Natural gas	0.0	0.0	0.0	0.0	0.0	-0.1	-	-	-	-	-
Electricity	0.0	0.0	0.0	0.0	0.0	0.0	-100.0%	-	-	-23.6%	30.8%
Gross Inland Consumption	35.0	36.9	40.5	47.9	55.0	56.7	1.0%	1.9%	3.4%	14.8%	3.1%
Solids	0.1	0.2	0.2	0.2	0.2	0.2	2.8%	5.9%	-0.5%	-5.2%	-4.3%
UII Natural das	18.8	16.4 18.3	16.8	17.6 25.1	23.3	23.6	-2.1%	0.4%	1.0%	32.3% 1.7%	1.4%
Other (1)	14.0	2.0	3.3	4.9	5.2	5.5	9.1%	11.2%	4.3 <i>%</i> 8.3%	4.7%	7.2%
	•••••					•••••				•••••	•••••
Electricity Generation in TWh	36.9	49.0	59.3	/3.4	/5.4	na	5.9%	3.9%	4.4%	2.6%	na
Hydro & wind	14.6	22.6	37.0	51.4	53.8	na	9.2%	- 10.3%	- 6.8%	4.7%	na
Thermal	22.3	26.3	22.3	22.0	21.5	na	3.4%	-3.2%	-0.3%	-2.1%	na
Generation Capacity in GWe	8.5	15.5	18.5	20.0	21.5	na	12.9%	3.6%	1.5%	7.8%	na
Nuclear	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
Hydro & wind	2.7	5.0	10.0	10.7	12.2	na	12.9%	15.0%	1.3%	14.6%	na
inermai	5.8 ••••••	10.5	8.5	9.3	9.3	na •••••	12.8%	-4.2%	1.8%	0.0%	na
Average Load Factor in %	49.7	36.0	36.6	42.0	40.0	na	-6.2%	0.3%	2.8%	-4.8%	na
Fuel Inputs for Thermal Power Generation	7.6	8.6	7.0	6.4	6.5	na	2.5%	-4.0%	-1.7%	1.0%	na
Solids	0.0	0.0	0.0	0.0	0.0	na	-	-	-	-	na
	3.7	2.7	1.9	0.9	0.8	na	-6.2%	-6.6%	-14.3%	-10.9%	na
Geothermal	0.0	0.0	0.0	0.0	0.0	na	0.770	-3.078	1.070	- 3.070	na
Other	0.0	0.0	0.0	0.0	0.0	na	8.4%	35.4%	-100.0%	-	na
Average Thermal Efficiency in %	25.3	26.4	27.5	29.5	28.6	na	0.9%	0.8%	1.4%	-3.1%	na
Non-Energy Uses	1.2	1.1	1.4	1.4	1.4	na	-0.3%	3.8%	0.8%	0.1%	na
Total Final Energy Demand	22.6	24.9	25.6	32.8	32.0	na	2.0%	0.6%	5.1%	-2.4%	na
Solids	0.1	0.2	0.2	0.2	0.2	na	2.8%	5.9%	-0.5%	-5.2%	na
Oil	11.4	12.4	13.1	17.1	16.2	na	1.6%	1.2%	5.5%	-5.5%	na
Gas Electricity	8.4 2.6	9.1 3.3	ზ.პ ვე	10.3	10.3	na	1.0%	-1.0% 3.0%	4.2% 4.1%	0.8%	na
Heat	0.0	0.0	0.0	0.0	0.0	na	-	- 3.070	-	-	na
Other	0.0	0.0	0.1	0.5	0.5	na	-34.3%	143.0%	35.3%	0.0%	na
CO ₂ Emissions in Mt of CO ₂	88.5	97.6	95.7	118.3	119.8	na	2.0%	-0.4%	4.3%	1.2%	na
Indicators	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••
Population (Million)	14.87	17.14	19.50	21.84	22.31	22.80	2.9%	2.6%	2.3%	2.1%	2.2%
GDP (index 1985=100)	104.8	100.0	113.6	133.2	131.1	137.7	-0.9%	2.6%	3.2%	-1.6%	5.1%
Gross InI Cons./GDP (toe/1990 MEUR)	995.4	1097.0	1059.9	1070.0	1248.5	1225.1	2.0%	-0.7%	0.2%	16.7%	-1.9%
GIUSS INI CONS./CAPITA (TOE/INhabitant)	2.36	2.15	2.07	2.19	2.46	2.49	-1.8%	-0.7% 1.2%	1.1%	0.5%	0.9%
CO ₂ Emissions/Capita (t of CO ₂ /inhabitant)	6.0	5.7	4.9	5.4	5.4	na	-0.9%	-2.9%	2.0%	-0.9%	na
Import Dependency %	-275.4	-191.5	-212.0	-282.5	-247.1	-276.5	-7.0%	2.1%	5.9%	-12.5%	11.9%

(1) Includes nuclear, hydro and wind, net imports of electricity, and other energy sources.

(2) Estimates