



Geopolítica del gas en los países del Mercosur



Gas geopolitics in the Mercosur countries

Por/By Eduardo Mario Barreiro

El mercado mundial del gas ha sido dividido en tres zonas geopolíticas: 1 (Canadá/Estados Unidos/México), 2 (Norte de Africa/Europa/Repúblicas de la CEI) y 3 (Japón y los países de Norpacífico). Hasta hoy, América del Sur y especialmente los países del Mercosur han sido ignorados como nueva zona geopolítica porque sus mercados emergentes recién comienzan a ser delineados. En el trabajo "Gas geopolitics in the Mercosur countries" presentado en el 1^{er} Congreso Latinoamericano y del Caribe de Gas y Electricidad realizado recientemente en Bariloche, Argentina, el autor trata de presentar una fotografía de esta nueva zona geopolítica para el gas natural, para definirla e incorporarla por derecho propio a las otras zonas geopolíticas mundiales.

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The world gas market has been divided in three main geopolitical regions: 1st. (Canada/United States/Mexico), 2nd. (North Africa/Europe/CIS Republics) and 3rd. (Japan and North Pacific Countries). Up to now, South America and specially the Mercosur countries have been ignored as an emergent geopolitical new area, because its emerging gas market only recently started to be delineated.

In the paper "Gas geopolitics in the Mercosur countries" presented at the 1st Latin American/Caribbean Gas & Electricity Congress held recently in Bariloche, Argentina, the author shall try to present a photograph of this new geopolitical area for the natural gas, to define it, and to incorporate it by own rights into the other geopolitical areas of the world.

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En un mundo en el que la economía tiende a globalizarse, en el que los precios del crudo son iguales en todos los puntos del planeta, sólo dependiendo del porcentaje de azufre y de la densidad API, hablar de Geopolítica del Gas en el Mercosur parece redundante y fuera de moda.

En el concepto geopolítica hay implícita una connotación local particular y diferente del resto del mundo; o sea, opuesta al concepto de globalización.

Pero la globalización no es todavía válida para el gas natural.

El valor del gas natural no es el mismo en Estados Unidos, Europa o Japón. Ni los precios, ni sus oscilaciones ni los contratos son iguales: existen diferencias importantes en cada mercado.

Esto es debido a un motivo fundamental: el transporte. Transportar gas es más caro que transportar petróleo. Si el gas se transporta por ducto, el mismo diámetro de caño transfiere sólo 1/5 de la energía implícita en el transporte de crudo.

La inversión necesaria en la construcción de gasoductos es mayor; las plantas de pretratamiento son más complejas, los procedimientos de seguridad son estrictos y más caros, los sistemas de control también lo son.

El costo de transporte es todavía más alto si el gas se transporta como GNL (gas natural líquido); el transporte de GNL demanda un proceso de liquefacción previa, transporte en barcos especiales y dedicados, más caros que los tanqueros para crudo de igual tonelaje y la regasificación en el punto de llegada.

El mercado mundial del gas ha sido dividido en tres zonas geopolíticas:

1. Canadá/Estados Unidos/México
2. Norte de África/Europa/Repúblicas de la CEI (ex URSS)
3. Japón y los países de Norpacífico

Hasta hoy, América del Sur y especialmente los países del Mercosur han sido ignorados como nueva zona geopolítica porque sus mercados emergentes recién comienzan a ser delineados.

Pero a pesar de que el mercado es nuevo, sus posibilidades son enormes.

Con tráficós potenciales cuyas características predecibles se presentan en este trabajo, y existiendo países que pueden proveer las reservas de gas suficientes para esos mercados, el Mercosur aparece como una nueva zona geopolítica que debe ser considerada, y como una región para grandes inversiones en producción, transporte, distribución y uso del gas natural.

Sin embargo, su desarrollo no será lo explosivo que algunos autores han delineado; tomará su tiempo. El cuello de botella no consiste solamente en las enormes inversiones necesarias, sino que debe considerarse el tiempo que llevará desarrollar los trabajos de infraestructura.

En este trabajo se analiza el proceso histórico de conversión hacia el uso del gas que sucedió en Argentina, primer país gasificado de la región (y uno de los más gasificados del mundo), y se delinearán las analogías y diferencias con otros países de la región.

Se presentan asimismo, las reservas que existen en los países en varias cuencas, para suplir la demanda de otros miembros del Mercosur. La infraestructura de transporte necesaria para enviar gas a otros mercados se presentará asimismo, con los proyectos en estudio y en construcción a la fecha y su costo estimativo.

Con este trabajo se tratará de presentar una fotografía de esta nueva zona geopolítica para el gas natural, para definirla e incorporarla por derecho propio a las otras zonas geopolíticas mundiales.

In a world context in which the economy tends to globalize; in which the oil prices are the same in any point of the planet, only depending on the API gravity and sulfur content, to speak of "Gas Geopolitics in the Mercosur Countries" seems redundant and old fashioned.

In the concept of "geopolitics" a local connotation is implicit, particular and different of the rest of the world; therefore opposed to the globalization concept.

But the globalization is not yet valid for the natural gas.

Its value is not the same in United States, in Europe or Japan. Neither the prices, nor its oscillations, nor the contracts, are equal; there are market differences. This is due to a fundamental motive: transportation. To transport gas is more expensive than to transport oil.

If transported by pipeline, same pipe diameter transfers only 1/5 of the implicit energy

in the crude transportation.

The needed investment in the gas pipeline construction is higher (pretreatment plants are more complex, safety procedures are strict, control systems much more expensive).

The cost is much higher if the gas is carried by ship; LNG transports demand a previous liquefaction process, transportation in a special and dedicated ship, more expensive than an equivalent tonnage oil tanker, and the regasification at the arrival point.

The World Gas Market has been divided in three main geopolitical regions: 1.- Canada/United States/Mexico 2.- North Africa/Europe/ C.I.S Republics 3.- Japan and North Pacific Countries.

Up to now, South America and specially the Mercosur countries have been ignored as an emergent geopolitical new area, because its emerging gas market only recently started to be delineated.

But in spite of the fact that is new, possibilities are big. With potential markets which foreseeable characteristics are presented in this work, and providing countries that can supply gas reserves for those markets, Mercosur is appearing as a new geopolitical area to consider, and in a region for large investments in production, transportation, distribution and natural gas utilization.

Nevertheless, the development will not be as explosive as has been outlined by some authors; it will be slow. The bottle neck is not only the huge amount of money needed for the necessary investments, but the time that will take the accomplishment of the needed infrastructure works. The historical conversion process to gas use in Argentina, first gasified country of the region, will be analyzed, and the analogies and differences with the other countries are going to be outlined.

Gas reserves, that exist in the country in several basins to cover the supply to other member countries, are going to be presented.

The necessary transportation infrastructure to send natural gas to other Mercosur markets will be summarized.

With this work I shall try to present a photograph of this new geopolitical area for the natural gas, to define it, and to incorporate it by own rights into the other geopolitical areas of the world.

1.- World markets and natural gas prices. Driving forces for natural gas consumption.

The globalization concept is not valid for the natural gas. The gas has distinctive markets and different prices in each world zone; it has not the same value in United States, Europe, or Japan.

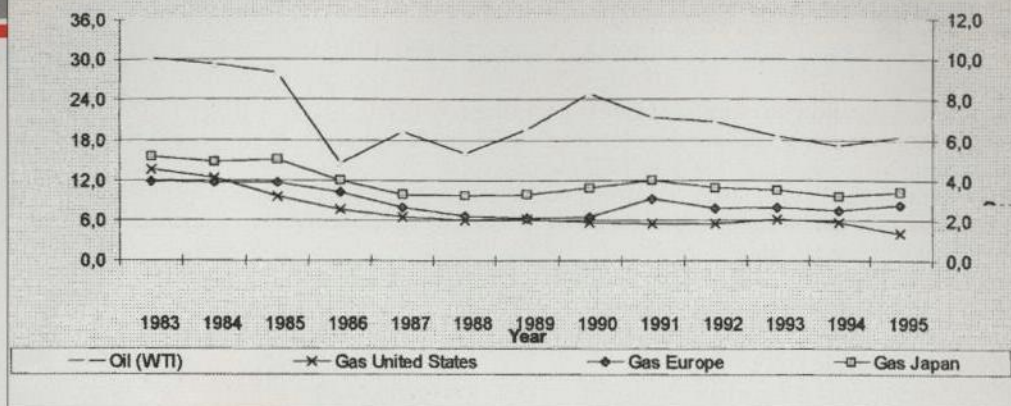
Table 1 represents international oil prices and gas prices in those countries as presented in (1).

Fig. 1

Oil and gas prices

Same data are represented in Figure 1.

I have presented also the average WTI cost; in the Figures 2, 3, and 4 it can be seen that *there is no correlation between oil and gas prices*, with the exception of the periods in which the oil price is higher than 26/27 \$/Bbl. In those periods, the gas tends to follow the oil prices.



WORLD OIL AND GAS PRICES

Table 1

Year	Oil, \$/bbl	Gas, \$/MMBtu		
	Oil (WTI)	Gas United States	Gas Europe	Gas Japan
1983	30.2	4.5	4.0	5.2
1984	29.2	4.1	3.9	4.9
1985	28.0	3.2	3.9	5.0
1986	14.5	2.5	3.4	4.0
1987	19.1	2.2	2.7	3.3
1988	16.0	2.0	2.2	3.2
1989	19.6	2.0	2.1	3.3
1990	24.8	1.9	2.2	3.6
1991	21.4	1.8	3.1	4.0
1992	20.7	1.8	2.6	3.6
1993	18.5	2.0	2.6	3.5
1994	17.1	1.9	2.5	3.2
1995	18.4	1.4	2.8	3.4

The figures are higher in Japan, because all the natural gas is imported as LNG.

When the oil prices increase over 26/27 \$/Bbl, the increase in gas value is higher in United States than in Europe. European state companies have a tendency to regulate the costs; nevertheless they cannot prevent to increase gas prices when oil rate goes up.

Probably the technological changes that have begun to appear in LNG production, transport, and storage, will decrease price differences; but today, the high costs of moving gas causes that the globalization of the markets has not arrived to the natural gas. The prices to the producer (and also the cost for the consumer), depend on the geographical location.

This are the reasons for which we can speak about **geopolitics of natural gas**, separating what happens in the Mercosur region from what happens in other zones of the planet.

And when I speak of the region, I extend the concept of Mercosur, in addition to their

original signatories, to Chile and Bolivia. Chile already is almost a full associate; and Bolivia will probably join in a short period. It will not be analyzed as a market, as it has not joined yet, but it has a big influence in the future of gas in the region.

There are important driving forces tending to produce a new gas market in the Mercosur countries.

The price: is the first and most important factor. Natural gas is cheaper than other fuels. To use natural gas, strong investments in transportation and distribution are needed.

If the market, and the value paid by the consumer—which must be lower than the substituted energy—can compensate those investments, the integra-

tion will take place.

Fuel oil for electrical generation or industrial consumption, fuelwood, LPG and kerosene for home use, are natural ceilings to the gas price, to penetrate markets and substitute a fuel that is already being used.

The ecological factor. This is an increasingly important factor, specially in Santiago de Chile and Sao Paulo. Thermal generation based in coal produce much more CO₂ per MWh than a combined cycle gas central; and the exhaust gases are cleaner with gas (less SO_x, particulates and NO_x). Capital costs are much lower also.

In the transport sector, CNG (Compressed Natural Gas) will have an important paper also, as happens in Argentina.

The "comfort" factor.

This is a very difficult ele-

ment to quantify, but the influence is undeniable in the case of the natural gas. It is a continuous energy supply, burns without smell, without smoke, without ashes; these characteristics cause the quick domestic and industrial expansion—only limited by the transportation system—in the very moment of the arrival to a town or a city.

Energy balance in the Mercosur countries. Natural gas sector.

1.1 Argentina

1.2 Uruguay

1.3 Paraguay

1.4 Chile

1.5 Brasil

There are two countries that are neat producers of natural gas: Argentina and Bolivia; the other four will be markets for that gas. Some data corresponding to those countries is present-

MERCOSUR COUNTRIES

	Surface Km ²	1996* Population	Long term market
Argentina	2786000	34000000(2)	export
Brasil	8511905	161000000(1)	88000000(3)
Paraguay	406750	5300000(2)	2000000(4)
Uruguay	176220	3220000(2)	2000000(5)
Chile**	750950	14400000(2)	8000000(6)
Bolivia**	1084300	8020000(2)	export

(1) Based in extrapolation of 1994 data.

(2) Based in extrapolation of 1992 data.

(3) Population of the states: Minas Gerais, Rio de Janeiro, Sao Paulo, Matto Grosso do Sul, Paraná, Santa Catarina and Rio Grande do Sul.

(4) Population corresponding to the cities: Asunción, Encarnación and Ciudad del Este.

(5) Colonia / Montevideo area.

(6) Population between Los Angeles and Concepción in the south to Santiago and Valparaíso in the north

(**) They are not yet full members. But they will certainly join in the future.

Table 2

Oil vs. gas prices

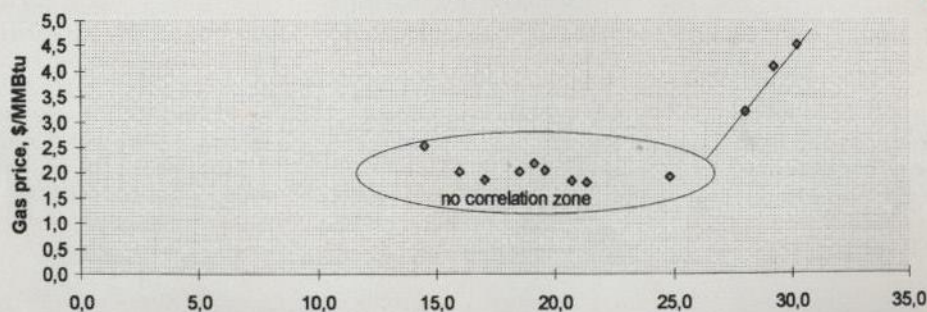
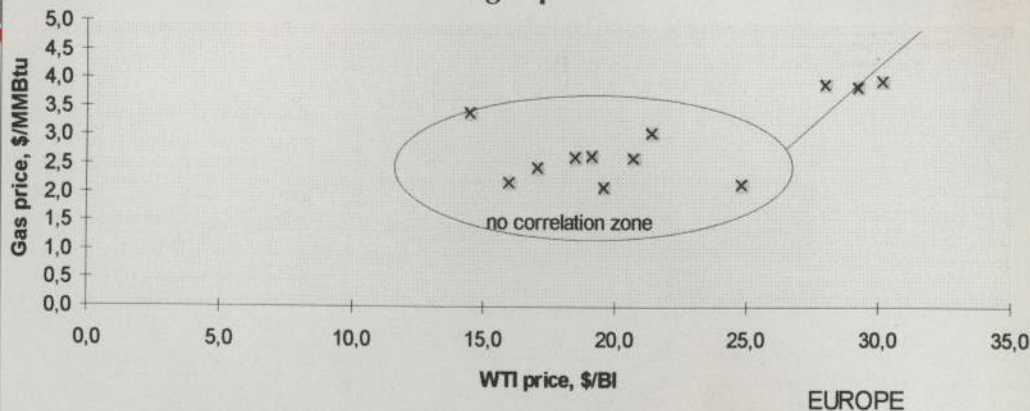


Fig. 2

Oil vs. gas prices



ed in Table 2. (Ref 2,3,4,5)

The table demonstrates huge possibilities for natural gas. Only Argentina has a well developed natural gas market with a consumption per capita of 0.64 TEP/year. Chile has 0.129; Brasil 0.024; Bolivia, 0.117; Uruguay and Paraguay, no consumption of natural gas, with the exception of a small use of refinery gas provided by La Teja Refinery in Montevideo, Uruguay.

Its tempting, but too primary (though it has been made), to establish a simple proportion to see which could be the gas consumption of "N" million inhabitants of Brasil or Chile based on the consumption by inhabitant in Argentina. Each particular case must be studied to predict how the natural gas might influence over the energy matrix of the country.

1.1 Argentina

Population	Energy Cons.(MTep)
34.000.000	55.891
Idem per cápita	
1,64 Tep/ Inhabitant y.	

Argentina is the second country in gas consumption per capita in Latin America (the first one is Venezuela). Over the primary energy consumption, natural gas has become the most important energy in the last years. In Table 3, 1995 figures for primary energy consumption are given (Ref. 4,6,7).

The conversion of 0.29 Tep / MWh is the one used in Brazil, and was the real conversion factor for their power system in 1994. I have taken the same

equivalence for all the Mercosur countries, though this is not the official OLADE conversion factor. Chile uses the OLADE recommendation (thermodynamic equivalence); Argentina uses a figure that changes every year, and represents the real equivalence, which arises from the real generating plants.

The effect of taking real efficiencies -instead of theoretical ones- is that the digit in TEP representing hydroelectric or nuclear energy is higher, thus reducing the incidence of the hydrocarbons and other sources in the primary energy matrix.

The preponderance of the hydrocarbon sector, and gas in particular, can be seen in the matrix.. Hydroelectricity is less important than in other countries, but it will increase when Yaciretá operates in the design capacity.

The incidence of natural gas in the primary energy matrix is one of the highest in the world, comparable with some European countries, or United States. This can be seen in Table 4.

Main reasons for this fact are:

- In the last three decades, and during the regulated period, in which the gas was produced by YPF and distributed and sold

ARGENTINA: 1995 Table 3
ENERGY BALANCE (in MTEP/Y)

Oil byproducts (1)	20631
Natural gas (2)	22164
Hydroelectricity(3)	8229
Wood	2148
Mineral Coal	1136
Nuclear Energy	2320
TOTAL	56629

(1) Refinery consumption added.

(2) 9300 Kcal/m³.

(3) 0,29 Tep/MWh.

GAS SHARE IN ENERGY BALANCES

COUNTRY	% SHARED	
	1994	1995
C.I.S (ex URRS)	48	50
Holland	47,6	47,4
Argentina*	42	44
Canada	28,7	29,4
United Kingdom	27,9	29,2
Italy	26,8	28,2
United States	24,9	25,5
Ireland	21,9	22,2
Germany	19,1	19,7
Bélgium	19,2	20,3
Luxemburg	13,1	17
Denmark	14,8	16,4
Spain	6,7	6,8
France	13,6	13,5
Japan	11,3	11,2

Table 4

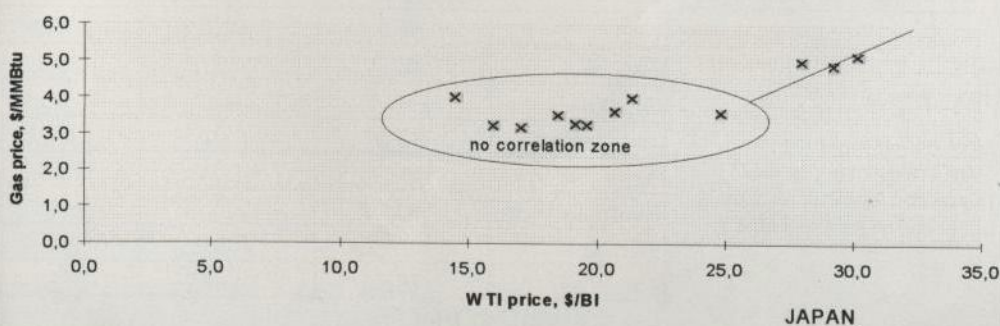
To make the comparison, in this case the thermodynamic equivalence

has been used: 1 therm = 1000 Kcal = 1,162 KWH

1 TEP = 10.000 therms (9)

Fig. 4

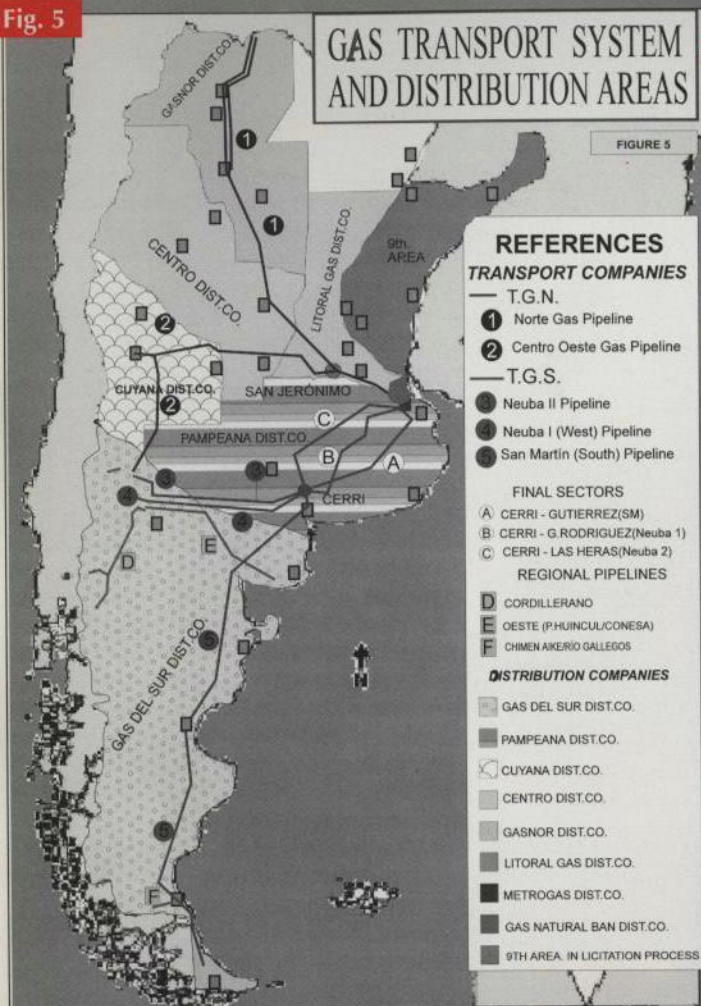
Oil vs. gas prices



by Gas del Estado, there was a national policy tending to use the resource. A big distribution system was built, covering a large portion of the country. (Figure 5)

• In 1991/93 the oil and gas industry were privatized. The gas distribution system was divided into two transportation companies and 8 distribution companies (Figure 5). The system has worked well, and gas

Fig. 5



AVERAGE ANUAL PRICES, \$/MN

Table 5

YEAR	BASIN		
	NORTH WEST	NEUQUÉN	AUSTRAL
1993	0,97	0,97	0,97
1994	1,07	1,15	0,96
1995	1,16	1,25	0,96
1996	1,22	1,32	0,97

DISTCO.: RATES ON FINAL CONSUMERS W/O TAXES

Client	Gas Natural Ban	Metrogas	Notes
	\$/m3 w/o taxes	\$/m3 w/o taxes	
Residencial	0,157348	0,152538	Home use
Serv. General P	0,148755	0,143945	Commercial w/o contract
Serv. General G	0,097194	0,092384	Commercial w. contract
Gdes.Usuarios ID-FI	0,090748	0,085938	Industrial. Interruptible
Gdes.Usuarios IT-FI	0,083229	0,078419	Industrial. Firm
Subdistribuid.	0,101490	0,096680	Sub dist. Co.
GNC	0,104713	0,099903	Compressed Nat. Gas.

Source: (12)

A fix charge of \$8.27 was established for residential consumers and of \$11.816 for the rest.

Table 6

consumption has increased continuously without changing the slope.

Natural gas prices paid to the

producer are lower than in United States, but profitable. Depend on the basin; average prices can be seen in Table 5.

(Ref 10, 11) Transportation prices depend mainly on the distance, and in firm or non firm contracts; they are lucrative also. So do the distribution values.

Prices for the different consumers are listed in Table 6 (Without taxes) (Ref 12).

1.2 Uruguay

Population	Energy Cons.(MTEp)
3.200.000	3.392
Idem per cápita	
1,06 Tep/ Inhabitant y.	

Uruguay lacks of hydrocarbon resources in its territory; 100% of the oil that uses is imported; an important proportion of the oil derivatives are refined at La Teja Refinery, in Montevideo.

The main hydroelectric generation plant is located at Salto Grande, in the Uruguay river. In 1992 generated 7800 Gwh, 40% exported to Argentina. There is another small hydroelectric plant located in the dam Gabriel Terra (128 Mw); and the total installed thermal generation is 624 Mw, 313 turbo-steam and 281 turbo-gas. There are no combined cycle units.

The main energy resources are hydroelectricity and biomass (firewood).

Both are renewable resources; and promotional financing plans, tax exemptions, etc., have been developed to plant trees and to renew the reserve.

In Table 7, 1990-1995 figures for primary energetic consumption are given. As we are going to see, there are several projects to export gas to Uruguay.

1.3 Paraguay

Population	Energy Cons.(MTEp)
5.250.000	3.704
Idem per cápita	
0,705 Tep/ Inhabitant y.	

Paraguay does not produce oil, neither natural gas; there are some gas manifestations in the northwest zone of the country; several private companies are exploring some areas, with no results until now. All the light oil processed is imported from Africa and Argentina. There is a small refinery that belongs to Petropar, Refinería Villa Elisa, near Asunción; consists of a topping unit and stabilizing towers. Its capacity only covers about 30% of the Diesel, Kerosine and Jet fuel market; the rest is imported, from Argentina (by ship) or from Brasil (by truck).

In Table 8, figures for primary energetic consumption are given.

The energy consumption is strongly dependent on biomass. The per capita energetic consumption is the lowest of the Mercosur, though it is increasing very strongly (Ref 13).

The main electrical unit is Corpus, shared with Brazil; has 12800 Mw of installed power, 50% belonging to Paraguay. In 1992, Corpus generated for Paraguay 27519 GWh; 24615 Gwh were exported to Brazil and the rest was consumed locally.

The second important dam is Yaciretá (50% belongs to Argentina), having 900 Mw of installed power with the actual level of 76 meters; when increased to 83m the power will be 1400 MW for Paraguay But

URUGUAY: ENERGY BALANCE, MTEP

Table 7

	1.990	1.992	1995*
LPG	62,2	68,5	70,9
Fuel oil	233,1	235,8	301,3
Gasoline	218,1	247,7	265,6
Jet Fuel + Kerosine	58,9	61,7	64,4
Diesel oil	424,6	490,2	517,9
Hydroelectricity	1103,7	1227,9	1411,7
Biomass	667,3	708,2	760,7
Total	2768,0	3039,9	3392,4

Extrapolated Data (Ref 13)

PARAGUAY: ENERGY BALANCE, MTEP **Table 8**

	1.995
LPG	72,0
Fuel oil	62,0
Gasoline	137,0
Jet Fuel + Kerosine	61,0
Diesel oil	525,0
Hydroelectricity	841,0
Biomass	2006,0
Total	3704,0

Extrapolated Data (Ref 13)

this not going to happen until the year 2003 at least.

The energy matrix is strongly dependent on fuelwood and biomass; but this dependency has decreased from about 70% at the beginning of the to the current 53%. This will continue because of the incidence of the investments being made in electrification. The projections indicate a cumulative growth of 10% of the hydroelectricity until the year 2005 (Ref 14).

1.4 Chile

Population	Energy Cons.(MTEP)
14.200.000	21.931
Idem per cápita	
1,54 Tep/ Inhabitant y.	

(1995 estimated data)

Chile will be a very important market for natural gas. Though there are gas reserves in the country (108×10^9 m³ (Ref 15)), they are positioned in the south, with no gas pipelines to the central region, where over 8.000.000 people live, and about 70 % of the energy consumption

is located.

Petroleum production is low and does not cover the consumption of two refineries at Con-Con and Concepción. In 1993, 14201 b/d were produced; in 1994, 12300 b/d. This only covered about 8 % of oil needs. In 1994 (Ref 15 and 2). A pipeline has been built between Argentina and Chile, and the crude transport started in March 1994. The capacity of the pipeline is 15.000 m³/day and the oil exports from Argentina are covering a very important percentage of the Chile needs.

Table 9 presents the energy use in Chile in 1994 (Ref 2). The CNE measures the consumption in Teracalories and takes the thermodynamic equivalence to convert the electric energy. Those numbers have been converted under the assumption made for the rest of the countries, and presented in Table 10 1995 gas and coal have been estimated.

The oil sector has the major part of the matrix. Hydroelectricity is very important in Chile. About 68% of the 4800 Mw of the installed electric power is hydroelectric. The rest is thermal, based in coal and

CHILE: ENERGY BALANCE, MTEP **Table 10**

	1994	1995*
Oil Derivatives	7986	8379
LPG*	912	948
Gases*	2071	2178
Coal and Others	2646	2372
Hydroelectricity	4912	4590
Biomass	3208	3464

1994: Ref (2)

1995: *estimated figures

liquid fuels. That will be an important initial market for gas exports.

The electricity demand has been increasing the past ten years at a big rate, about 7% per year; and CNE has predicted that this tendency will continue and increase (Ref 17). The first gas central is programmed in 1997; in 1998/99 another should be built; and between 2000 and 2005, one central per year (of about 300/400 Mw) have been scheduled. This will cause the decrease in the generation cost, from the current 34/38 mills/KWH to about 26/28 mills (30% less), according to Alejandro Jadresic, minister president of the CNE.

Only 10% of the total energy consumption is produced from gas; natural gas accounts for

around 75% of the total gas.

The penetration of the gas in the matrix will begin to change in 1997; during June 1997, the second gas pipeline between Argentina and Chile should be concluded and inaugurated by the presidents. (See Figure 6)

1.5 Brasil

Population	Energy Cons.(MTEP)
161.800.000	201.674
Idem per cápita	
1,246 Tep/ Inhabitant y.	

Brazil is the biggest Mercosur member. With a surface of more than 8.500.000 Km², is the most populated country in South America. Sao Paulo, with about 25.000.000

GAS EXPORT PROJECT FROM ARGENTINA

Fig. 6**CHILE: 1994 ENERGY BALANCE** **Table 9**

Fuel	MTEp			MTEp
Diesel	3.177	↕	Oil Derivatives	7.986
Fuel	1.996			
Gasoline	2.124			
Kerosene+ Jp	690			
LPG	912	↕	LPG	912
Refinery Gas	176			
City Gas	180			
Natural Gas	1.576			
Biogas	26	↕	Gases	2.071
Furnace Gas	113			
Mineral Coal	2.202			
Coke	417			
Methanol	27	↕	Coal and Others	2.646
Hydroelectricity	4.912			
Biomass	3.208			
Total	21.735			
			Hydroelectricity	4.912
			Biomass	3.208
				21.735

inhabitants (and destiny of the Bolivia/Brasil gas line as presented in the next pages), is the most important future market for natural gas.

In Table 11 the energetic balance can be seen. 1995 figures demonstrate a 7.4% increase in the oil consumption. About 50% of the total oil needs have been produced in 1995 by Petrobras; the percentage is increasing; premature 1996 figures account for around 55% of the consumption.

Hydroelectricity is very important in Brasil. Near 75% of the total electricity consumption is hydroelectric.

The energy matrix shows 37.7% of the total energy demand provided by that way. 36% are oil by-products. Natural gas represents only 2.3% of the consumption.

Natural gas has not been developed in Brasil because the majority of the discovered reserves are associated gas; with

the exception of Rio Urucú, the most important gas field in Brasil, discovered in the Amazonas.

There are several interesting items in the balance:

More than 50% of the energy consumption comes from renewable energy sectors (ethanol, firewood, hydroelectricity), unlike to other Mercosur countries.

Natural gas has a very low incidence; even lower than LPG. The natural gas transportation and distribution systems are of a relative minor importance in Brasil (See Figure 7).

The proven reserves of natural gas were 154.000 MMm3 to 1/1/96; they have surely increased by now, because of new discoveries at Rio Urucú, which reserves are increasing steadily, and will have a big importance in the future. Actually (to September 1996) total gas reserves are 77000 MMm3 (Ref 20)

BRASIL: ENERGY BALANCE, MTE Table 11

	1995
Oil Derivatives	72700
LPG*	5790
Gases*	4684
Coal and Others	13000
Hidroelectricity	76000
Biomass	29500

1: Reference 18

e: Estimated, based in Ref 19

More than half of the exploitable proven reserves are found in maritime fields. 1/3 of the reserves are associated gas located in the Bahía de Campos oilfield.

In Figure 7, it can be seen:

1.- The main Brasil gasfields.
2.- The gas pipelines and distribution systems. These companies are being privatized; originally they were corporations depending on the governments of the different states.

3.- The projects of new gas pipelines, internal and external.
Brasil will be the biggest market for natural gas, but not the only one.

2. Reserves and Production.

In Table 12, the reserves of natural gas in the Mercosur countries are presented. In Table 13, the figures corresponding to the production are given.

As it can be seen, Argentina reserves are the highest in the region, duplicating the added reserves of the other members; in production, the same thing happens.

This the actual situation. Without any doubt the Argentina

reserves will increase; but new gasfields are certainly going to be discovered in Brasil and Bolivia, causing an increase in production and in use of natural gas.

2.1 Argentina and the analysis of the historical evolution of the gas market.

It is convenient to see how was the increase of the Argentina gas market to analyze, with some valid precedent, what could happen with the associated countries.

The consumer prices for natural gas had been subsidized in Argentina until the privatization.

During many years, the gas transfer price from YPF to Gas del Estado, both being state companies, was 35 cents per million BTU. It was a logic political decision to develop natural gas use (because it was discovered and produced associated with the oil), and the development of the transport and distribution systems was to be paid by the oil industry, who only covered the production cost with those numbers.

Of course, this is not the actual situation. Natural gas industry has been privatized in Argentina, and is in the same process in Brasil. The well mouth prices for gas have been increasing from 0,97 \$/MMBtu in the Neuquén Basin in 1993 to 1,35 /1,38 \$/MMBtu during 1996 winter. Northwest basin prices are lower, about 1,22 \$/MMBtu (because of the trans-

Gas projects in Brasil



Fig. 7

Comercialized gas in Argentina

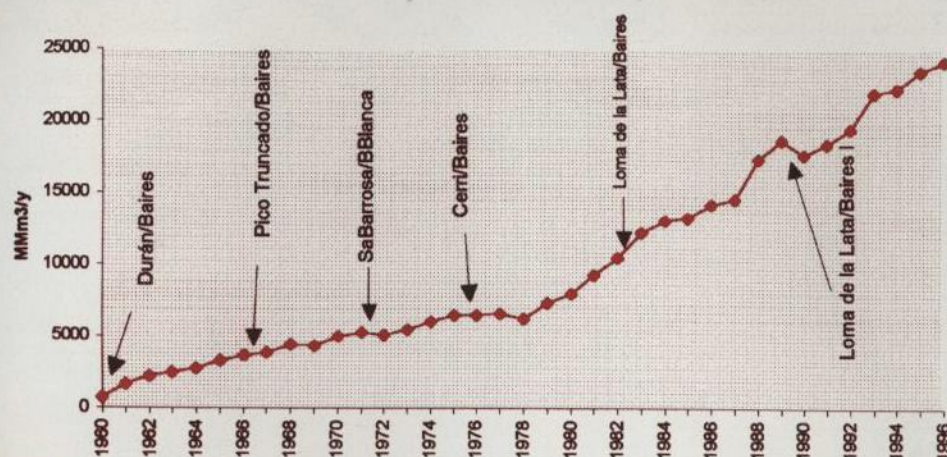


Fig. 8

Table 12

IN MMm3

NATURAL GAS RESERVES IN THE MERCOSUR COUNTRIES				
COUNTRY	1-1-94	1-1-95	1-1-96	
Northwest Basin	123897	113244	122144	1,2
Cuyo Basin	112	861	854	1,2
Neuquén Basin	3313781	294708	343802	1,2
San Jorge Basin	13844	10867	16148	1,2
Austral Basin	64019	115848	136347	1,2
Total	516662	535528	619295	1,2
BOLIVIA	118000	108000	110000	3,4
BRASIL	137000	146000	154000	3,4,5
CHILE	109000	108000	104000	3,4
PARAGUAY	-	-	-	
URUGUAY	-	-	-	

1.- Ref 21; 2.- Ref 22; 3.- Ref 23; 4.- Ref 1; 5.- Ref 18

port cost to Buenos Aires), but has also increased.

So this situation need that future markets will pay a profitable price to gas producers, Transcos, and Distcos.

That can be achieved only with competitive prices with the actual liquid fuel or LPG values.

In Argentina, the historic curve of transported gas can be seen in Figure 8.

Besides, I have marked the moment of arrival of the main gas pipelines to Buenos Aires. As it can be seen, the increase in consumption does not happen immediately; there is a delay to build the distribution complex associated with the appearance of more gas in the market.

It is interesting to notice that in the last 35 years the increase in consumption follows a straight line in a semilogarithmic plotting, with a correlation coefficient $r^2 = 0,98$. The slope has not changed during the last years, with the privatization process; the increase in consumption continued without transition, even though the prices have increased to residen-

tial consumers (and decreased to the electric sector) (Figure 9).

The investments made by the private firms in distribution and transport have increased the consumption by 27 % in the period 1992/95.

In the 60's the use of gas was about 120 m³/inh/year; now is over 700 m³/inh/year. Nevertheless, it has taken 35 years to reach those numbers.

Gas consumption is going to increase in Chile, Uruguay and Brasil; but we should expect -at most- the same slopes of increase we have had in Argentina. It is not real to think that Brasil, for example, will develop a 50 million m³/day market at Sao Paulo for the Bolivia/Brasil gas line in 10 years as some authors have published.

3. Gas pipelines. Regional projects.

Natural gas has been commercialized between Bolivia and Argentina for more than fifteen years. The gas coming from Bolivia is processed at Refinor

Refinery in Campo Durán, joined with Argentine gas; in winter, up to 6.000.000 m³/day have been imported. This will end when the Bolivia/Brasil project is built. So, the international gas commerce is not new in the region.

There are many plans in different stages of development to transport and sale gas in other countries. Argentina and Bolivia are the origin of all the ducts; in the future, Perú will participate with the impressive Camisea reserves (near 350.000 MMm³), but to build a gas pipeline, a big market is needed, and the Bolivia and North-West Argentine basin reserves will cover all the needs for the Sao Paulo market.

There are five gas export projects to Brasil; one has been finished and is working now (the Methanex pipeline); the second should start to pump gas in June 1997. The others are in the financing studies (Trasandino); the Atacama is being studied, but it will presumably be delayed due to the new power central and electric line to the north of Chile, departing from Aguarague gas field.

The Gasur project is a competitive plan with Trasandino, and it will probably be discarded, at least in its initial capacity.

Table 15 resumes all the export projects between Mercosur countries.

Some projects here might have a very low IRR and will not be profitable. For example, is doubtful the feasibility of the Atacama gas duct if the Chilgener electric plant and line to Antofagasta/Iquique area is built.

A project to Asuncion and Ciudad del Este might be possible, but is difficult; Paraguay has a lot of hydroelectricity, and no gas for a combined cycle unit is needed. That means no anchored consumption for gas.

3.1.- Possibilities of other gas projects in the region.

I will mention three long term possibilities of other gas ducts.

3.1.1 Use of Río Urucú gas.

In that area Petrobras is investing a lot of money to increase the discoveries, with good results. It is very probable to find huge gas reservoirs; actual reserves have duplicated in the last two years. If they are doubled again in the next years, there is a good plausibility for a Brasil internal project, to cover the demand that will appear in the Sao Paulo/Rio de Janeiro region, which has more inhabitants than Argentina.

This future demand cannot be covered by the Bolivia Brasil gas pipeline, due to the diameter selected by Petrobras: 32". So in about 12/15 years from now they will be needing to duplicate the existent line, or build a new line from Urucú gas fields.

3.1.2 Camisea reserves

The gorgeous reserves in the Camisea area have two opportunities to be employed.

a.- Used in Peru, probably generating electricity at the oil-field, and transporting it to Lima and to the southern part of the country.

b.- Besides, gas exports to Bolivia, in order to supply gas to the Bolivia/Brasil duct.

Table 13

NATURAL GAS PRODUCTION IN THE MERCOSUR COUNTRIES				
COUNTRY	1993	1994	1995	
ARGENTINA	26663	27697	30441	1,2,5
BOLIVIA	5590	5920	5350	3,4
BRASIL	7360	7760	8090	3,4
CHILE	4200	4240	3780	3,4
PARAGUAY	-	-	-	
URUGUAY	-	-	-	

1.- Ref 24; 2.- Ref 25; 3.- Ref 23; 4.- Ref 1; 5.- Ref 6

In MMm³/year

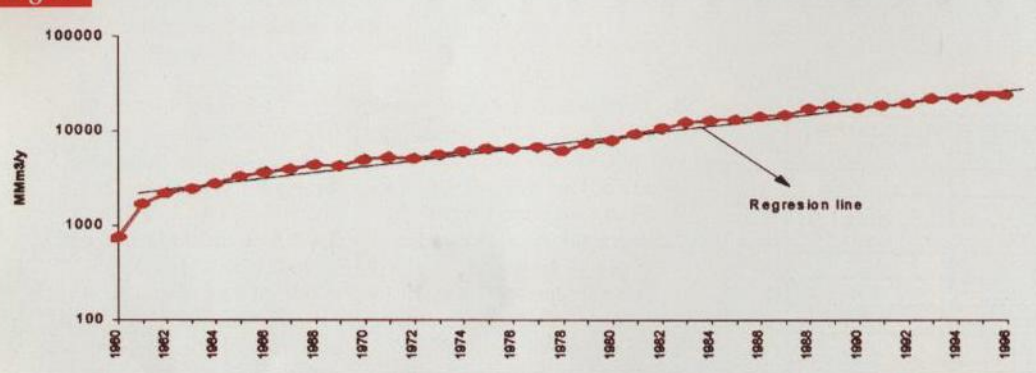
TRANSPORTED GAS, MMm3/y

Table 14

Year	Transported Gas	Year	Transported Gas	Year	Transported Gas	Year	Transported Gas
1960	754	1971	5312	1981	9252	1991	18360
1961	1691	1972	5089	1982	10456	1992	19345
1962	2213	1973	5504	1983	12217	1993	21826
1963	2462	1974	6044	1984	13067	1994	22159
1964	2757	1975	6478	1985	13237	1995	23317
1965	3316	1976	6524	1986	14154	1996	24000
1966	3678	1977	6557	1987	14506		
1967	3934	1978	6202	1988	17275		
1968	4449	1979	7329	1989	18571		
1969	4316	1980	8002	1990	17572		
1970	4960						

Ref 26/27/28/29, 1996 est.

Fig. 9



GAS EXPORT PROJECTS IN MERCOSUR COUNTRIES

Table 15

Project Name	Start	Export Country	Import Country	Capacity MMm3/d	Cost, MMUS\$	Departure/Arrival	Length	Reference
Atacama	1999	Argentina	Chile	5	500	Salta/Antofagasta	800	(33) (32)
GasAndes	1997	Argentina	Chile	12	285	La Mora/Santiago	460	(35)
Gas Sur(*)		Argentina	Chile	1.0	150	Sierra Chata/8th Region	450	(32)
Trasandino	2001	Argentina	Chile	15	500/600	Lomala/Lata/Santiago	800	(30)
Methanex	1996	Argentina	Chile	2	25	San Sebastián/Cabo Negro	48	(32)
Bolivia/Brasil	2000	Bolivia	Brasil	30	1800	Sta Cruz/Sao Paulo	3100	(32), (36)
Gaúcho	1999	Argentina	Brasil	5	120	Paraná/Uruguayana	440	(34) (32)
Mesopotámico	2002	Argentina	Uruguay	3/6	220	Paraná/Paysandú/Fray Bentos/Salto	570	(32)
Montevideo	2003	Argentina	Uruguay	3	150	B.Aires/Colonia/Montevideo	240	(32)(37)
Bolivia/Paraguay	?	Bolivia	Paraguay	3	?	Sta Cruz/Asunción/Ciudad del Este	800	(31)(32)

That will happen only if the Bolivia reserves are not enough, and Argentina does not find more gas in the North-West basin.

3.1.3 Venezuela gas pipeline to Brasil.

The gas reserves in Venezuela are vast, more than 4000 MMm3. Some studies have been done to transport gas to Brasil, specially to the northern zone of the country. But the distances are big, with no intermediate markets. Probably it will not be a feasible project for many years.

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CONCLUSIONS

In the near future, many important things are going to happen with natural gas and Mercosur.

A.- more than 80,000,000 m3/day of gas are going to be involved in gas exports between Mercosur countries.

B.- About 4 billion dollars are going to be invested in financing the export projects.

C.- A population of more than 150,000,000 inhabitants of the different states, members of Mercosur, will be the market for gas production, transport, and distribution companies.

Those are meaningful reasons to remark the initial sentences: **Mercosur countries must not be ignored as an emergent geopolitical new area of the world.**

Mercosur countries must be considered as a new region, with the capacity of receiving colossal investments in the natural gas industry