THE GAS PIPELINE BOLIVIA-BRAZIL AND THE NATURAL GAS MARKET EXPANSION IN SAO PAULO STATE

LE GAZODUC BOLIVIE-BRÉSIL ET L'EXPANSION DU MARCHÉ DU GAZ NATUREL DANS L'ÉTAT DE SAO PAULO

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ABSTRACT

This paper will present the main interesting points of COMGAS Investments to increase the distribution and sales of the Natural Gas purchased from Bolivia. It will also present the technical and economic aspects of PETROBRAS – COMGAS Natural Gas Furnish Contract, the sale strategy adopted to achieve the objectives and the schedules coming from this contract.

RÉSUMÉ

Cet article présente les principales raisons des investissements faits par COMGAS pour accroître la distribution et la vente de gaz naturel en provenance de la Bolivie. Il aborde également les aspects techniques et économiques du Contrat d'approvisionnement en gaz naturel entre PETROBRAS et COMGAS, ainsi que la stratégie de vente adoptée pour atteindre les objectifs et respecter les échéances fixés par le contrat.

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INTRODUCTION

Bolivia – Brazil pipeline was one of the first actions that started the process to restructure the energy police in Brazil. Together this providence happened the privatisation of electric power sector, privatisation of pipelined gas distributor, deregulating of petroleum sector and *liberalisation of petroleum prospecting to abroad companies. All this providence's will increase* in a large proportion the opportunity of gas business and the availability of this energy as happened in neighbour country Argentina, who had this process already, and has his position changed from gas importer to gas exporter.

1. NATURAL GAS DISTRIBUTION:

1.1. TOTAL ENERGY CONSUMPTION IN BRAZIL AND IN THE WORLD

1.1.1. SITUATION PRIOR TO BOLIVIA - BRAZIL GAS PIPELINE OPERATION

Bolivia and Brazil has discussed the construction of pipeline for decades. In this period Argentine started to import natural gas from Bolivia. However Argentine become self sufficient in natural gas after increase of the gas reserve. Thus Brazil become the larger market for Bolivian gas reserve.

Brazilian Government approved the target of 12% of participation of natural gas in the energy matrix in 2010 year. From 2% of participation of natural gas in 1990.

COMGAS, the only one owner of piped gas distribution concession for all San Paulo state sow the transference of many industries of the capital to the interior of the state where Pipeline Bolivia-Brazil were designed.

The table 1 bellow presents the market position of Natural Gas in Sao Paulo state, prior to operation of Bolivia-Brazil gas pipeline.

Table 1 - Situation of the Sales Prior to Bolivia-Brazil gas pipeline operation

year	Sales Per Day Million m^3	Sales Per Month Million m^3	Sales Per Year Million m^3
1.990	1,10	33,50	402
1.991	1,16	35,42	425
1.992	1,35	41,00	492
1.993	1,57	47,83	574
1.994	2,07	62,92	755
1.995	2,62	79,75	957
1.996	3,04	92,42	1.109
1.997	3,38	102,75	1.233
1.998	3,30	100,25	1.203

1.1.2. PRESENT SITUATION (1.999)

COMGAS a state-owned company was privatised and his concession area was divided in three areas:

Eastern Area: The only one area the natural gas services are going on with 2.400 Km of pipeline installed , the biggest in population quantity and economical volume. This area includes San Paulo metropolitan region. Total Natural Gas sale in Eastern Area is 1.308 million in 1.999. Total number of consumer of 313.000 .

Northern Area: The biggest in superficies area, second in economy volume. It has only Bolivia – Brazil pipeline crossing it but it will be benefit in the future if the tendency of transference of companies to interior continues. The pipeline is already operational in this area.

Southern Area: The smallest in economy volume, is crossed by Bolivia – Brazil pipeline yet but it is not operational yet, and will be privatised after this condition.

1.1.3. FUTURE SITUATION (2.000 -2.006).

The Sale Goals for next 8 years are presented in the Table 2 bellow.

Table 2 – Sale Goals

Year	Sale (Bottom) Million m3 Per Year	Sale (Top) Million m3 Per Year
2.000	2.248	2.920
2.001	2.759	3.139
2.002	3.030	3.343
2.003	3.212	3.559
2.004	3.504	3.770
2.005	3.687	3.979
2.006	3.906	4.198

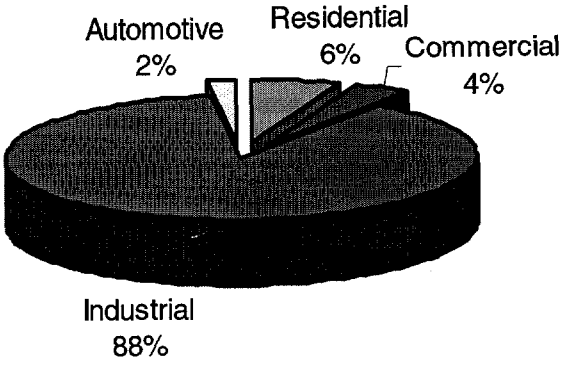
1.2. SAN PAULO STATE NATURAL GAS MARKET:

1.2.1. MARKET SEGMENTS:

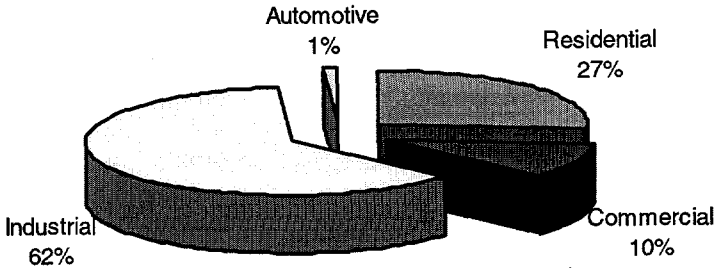
Sao Paulo market can be divided to sectors. The volumes and sale values are viewed in the table 3.

Segments:	Gas Volume (%)	Sale Revenue (%)
- Residential sector	6	27
- Commercial Sector	4	10
- Industrial Sector	88	62
- Automotive Sector	2	1
- Total	100	100

GAS SALE VOLUME BY SEGMENT



GAS REVENUE BY SEGMENT



1.2.2. ENTERPRISE TYPES

- Food Industries
- Textile Industries
- Electric and Electronic Industries
- Chemical and Petroleum Enterprises
- Metallurgical and Steel and Iron
- Rubber
- Plastic
- Glass and Crystal industries
- Ceramic
- Automobile industries

1.2.2. EQUIPMENT AND UTILITIES

- Boilers
- Ovens
- Heaters
- Dryers
- Thermoelectric Plants
- Internal Combustion Motors
- Etc.

1.3. COMPETITION WITH OTHER FUELS

For objective of study of natural gas penetration it was considered the technical, environmental, safety and supply reliability aspects.

1.3.1. TECHNICAL ASPECTS

For technical aspects study it was considered separately the LPG and combustible oil as fuel to be displaced.

Comparatively to LPG

Natural gas presents more constant quality like chemical composition, burning quality than LPG distributed in this state. Natural gas not has condensing problem or obstruction of gas flow like LPG. It didn't require frequent maintenance of shutoff valve, pressure control valve and gas reservoir like LPG.

Comparatively to combustible oil

Natural gas not requires fuel pump nor fuel heating what can be a fail point in the system and increases the operation cost. The combustion is more complete and uses less excess air than combustible oil. Let combustible flow variation with less loss of efficiency than combustible oil. It is a clean fuel not maculate internal surface of equipment's what reduces his efficiency. There is not particulate, the SOx or NOx emission are smaller than combustible oil. When this fuel is used in the food or glass factory it can burned directly in the food or glass oven or furnace without product contamination.

1.3.2. ENVIRONMENTAL ASPECTS

Brazilian regulation not permit the high emission level of particle and SOx deriving from boilers, furnaces, ovens, motors burned by combustible oil. In some cities is not permitted construction of buildings without gas piping as to avoid gas reservoir transportation inside the elevator nor apartment.

1.3.3. SAFETY ASPECTS

Comparatively to LPG

Natural gas density is lower than LPG density, so the gas accidentally escaped go up, not accumulate in the bottom of the house, increasing the possibility of explosion. Piped natural gas not has dangerous gas transference from trucks to reservoirs. Also not use internal combustible reservoir that is a risk area.

Comparatively to combustible oil

Piped natural gas not need combustible reservoir inside the factory what can reduce the insurance fee nor requires entrances of trucks inside the factory what can results in accidents or other transport problem.

1.3.4. GAS FURNISH RELIABILITY

Before operation of this pipiline, COMGAS were supplied only by two sources of natural gas, interconnected each other : Campos basin and Santos basin, both localised in Atlantic Ocean at east of San Paulo State.

After gas on in the Bolivia- Brazil pipiline, in the first quarter of 1999, San Paulo has been served by three natural gas sources interconnected, what increased significantly the reliability of gas supply, in case of failure of one of the sources.

1.3.5. COST COMPARISON WITH OTHER FUELS

The competitiveness of natural gas is a bit different from residential consumption to industrial consumption in San Paulo state. The prices variation with volume increasing is bigger for natural gas than oil or LPG.

LPG tariff is bigger than natural gas tariff for industrial consumption and a bit smaller than natural gas for residential consumption.

Combustible oil tariff is smaller than natural gas tariff. Computing other costs for environmental protection, oil pump and hating system and difference of maintenance cost needed for oil burning, the natural gas tariff became very interesting for the consumer

2. BOLIVIA – BRASIL PIPILINE PROJECT AND INVESTMENTS REALISED

2.1 THE START OF THE PROJECT

The first official event was the signature of the Letter of Intent of Energy Integration Process by Brazil and Bolivia in November, 1991.

In February of 1993 was signed the Sales and Purchase Contract of natural gas by Bolivian and Brazilian companies under the effectiveness depending of financing what could permit the economical viability of the project

In July of 1997 was signed the contract for Bolivia-Brazil gas pipeline construction.

The Sale and Purchase Contract foresee for sale and purchase of the volume of 8 million cubic meter a day in the 1 St year and 16 million cubic meter a day in the 8 Th year, in basis of Take or Pay. From 8 Th to 20 Th year, the same volume will be kept. The name of this transportation modality was named TCQ – Transportation Capacity Quantity.

Besides TCQ, other types of transportation contract were defined as bellow:

TCO – Transportation Capacity Option was created to transport up to 6 million cubic meter a day over the contract volume named TCQ, paying only variable cost of transport and investment in additional gas compressors.

TCX – Transportation Capacity Extra is a transportation volume over TCO up to volume of 30 million cubic meter a day.

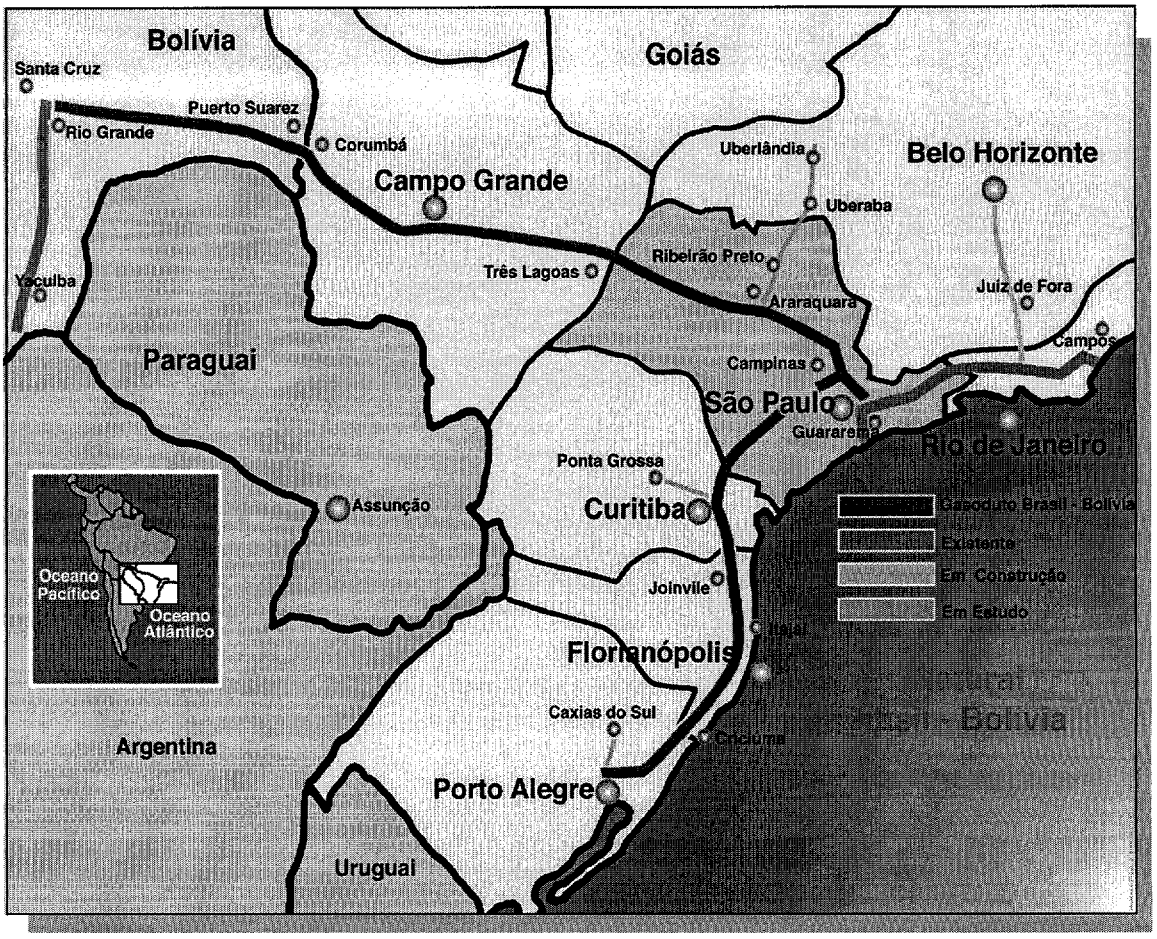
TCY – This is the name for additional capacity of transportation what overcomes 30 million cubic meter of transportation. This volume needs more investments in the pipeline and requires complementary negotiations.

It was constituted two companies to construct and to operate Bolivia-Brazil pipeline:

BOLIVIAN SITE PIPILINE PARTNERS	%	BRAZILIAN SITE PIPILINE PARTNERS	%
Gaspetro – Petrobras Gas S.A	51	Gaspetro – Petrobras Gas S.A	9
BBPP holdings Ltda	29	BBPP holdings Ltda	6
Enron	7	Enron	30
Shell	7	Shell	30
Fundos de Pensão Bolivianos	6	Fundos de Pensão Bolivianos	25

2.1. PIPELINE

Bolivia-Brazil pipeline has 3.150 km of length, 557 km is Bolivian pipiline and 2.593 km is Brazilian pipeline. The pipiline has following diameters : 1815 km of 32 inch diameter, 624 km of 24 inch, 281 km of 20 inch, 178 km of 18 inch and 252 km of 16 inch.



2.2. FINANCING

The total investment of this project was about US$ 2 billion. The amount of US$ 1,6 billion for Brazilian site pipeline and about US$ 400 million for Bolivian pipeline. The project had financing of BIRD (US$ 310 million), BID(US$ 240 million), Corporación Andina de Fomento (US$ 80 million), Banco Europeu de Investimento (US$ 60 million) and fundig of BNDES/FINAME, Eximbank of Japan, Sezione Speciale Per lAssicurazione del Credito all'Esportzione (US$ 404 million)

3. PETROBRAS-COMGAS CONTRACT

PETROBRAS and COMGAS contract for Bolivian Natural Gas furnish foresee quantity of:

- 4,0 million cubic meter a day in the 1 St year of furnish.
- 8,1 million cubic meter a day in the 8 Th year of furnish.

With availability of Bolivian gas, the opportunity of gas business increased in San Paulo. Only in COMGAS area this volume represents about 8 million cubic meters a day and investment around 300 million dollars.

The gas price readjustment is according the local oil price variation, during 5 first years. After this period the price will be composed by two components: price of gas in the source and transportation tariff. The first component will be readjusted by three international oil prices variation and the second component readjusted by US Dollar variation.

4. SALE STRATEGY

To face the sudden increasing of gas offer of about 4 million cubic meter a day, wen the gas are on in the Bolivia – Brazil pipeline, PETROBRAS anticipated the gas furnish, increasing CAMPOS basin gas furnish by September 1998, with a additional volume of 1,500 thousand cubic meter a day, as to develop gas market and raise the gas consumption before Bolivia gas starting date.

The total volume of Bolivian gas will be destined to industrial equipment's and thermoelectric plants and for commercial and residential consumers. More volume should be delivered to thermoelectric plants, once there are many thermoelectric plant being analysed and the consumption of each one is very high .

The decision of one Thermoelectric or Large Cogeneration plant take long time from first gas purchase inquiry to the plant implementation, his implementation takes about two years. Many variables must be studied and consolidated during this period: the environmental aspects, gas prices and volumes, electric power penetration, prices and purchase guarantees, localisation of the plant, etc. So, there are many studies of thermoelectric plants developed, but little in implementation in San Paulo state.

5. CONCLUSION

The increase of consumption in the industry can come from availability of financing for industry equipment adaptation, incentive for non pollution fuels and a energetic police well defined and foreseen for long term supported development.

The thermoelectric study at this moment developed points to gas volumes consumption of 20 million cubic meters a day to 40 million what can overcame the pipiline capacity in the optimistic case.

6. CONSULTED BIBLIOGRAPHY

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