Perspectives and Challenges for Gas Market Development in South America’s Southern Cone.

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ABSTRACT

The aim of this paper is to analyze South America’s Southern Cone current trends in natural gas supply, demand and trading, with a particular focus on Argentina, Bolivia, Brazil, Chile and Peru. From the 1970’s onwards, the paper describes how this region has evolved to become one of the world’s most dynamic region for natural gas industry in the world. Particular attention is given to the influence of the earliest gas discoveries in Brazil as well as the relevant forces pushing for and against regional integration. Finally, the paper discusses the perspectives and challenges in order for the region to monetize its gas resources or by enjoying its own regional market growth or by investing in LNG facilities.
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1. INTRODUCTION

The first idea of stabilizing a cross-border gas trade between South America’s Southern Cone countries dates back as early as the mid 20th century and it floated with the discussions around two competing projects: one from Bolivia to Brazil and other from Bolivia to Argentina. Apart from feasibility of those plans, the discussions also brought about a geopolitical component of Argentina and Brazil competing for influence over their smaller neighbors: Uruguay, Paraguay and Bolivia (Kelly and Child apud Mares, 2004).

Nevertheless, the focus of Brazilian energy policy, at that time, was mainly based on developing projects to exploit the countries’ hydroelectricity potential (including transnational projects) rather than to enlarge natural gas market. This, naturally, resulted in a closer relationship between Brazil and Paraguay than Brazil and Bolivia. In 1974, Brazil and Bolivia had already signed a cooperation and industrial agreement, but this plan faced huge Bolivian opposition and the sale of gas to Brazil did not materialize. According to Mares (2004), this consisted in a purchasing contract to sell 6.8 million m³/day of Bolivian gas over the next 20 years in return for Brazil’s opening of its markets for steel, petrochemicals, fertilizer, and cement from a new Bolivian industrial complex to be built on the border.

Differently of Brazil, Argentine government had been promoted the use of natural gas since 1956. So, Argentine gas industry was much more developed than the Brazilian one during the 1970s. At that time, Argentine government was also facing an increasing internal concern about the domestic upstream ability to meet the country growing energy needs. This, in fact, created an opportunity to trade gas with Bolivia, which resulted in a construction of the 441km, 24-inch Yabog (Yacimientos-Bolivian Gulf) pipeline.

Bolivia started exporting gas to Argentina in 1972 under a 20-year contract, with annual volumes varying from 4.2 million m³/day to 6 million m³/day. This represented nearly 20% of Argentine gas demand in 1972, but was gradually reduced to almost 5% in 1998 (Mares, 2004). According to Mares (2004), this long-term Bolivian-Argentine agreement proved contentious because the market in Argentina evolved in a manner unforeseen by either government at the time the original contract was signed.

The economic reforms of the 1990s made Argentina one of the most liberalized countries amongst emerging markets. After declining in the 1980s and early 1990s, the repositioning level of Argentina’s proven gas reserves between 1980 to 2000 was of 121.4%, which means that for every consumed unit it was certified 1.21 resource. In the mid of 1990s, Bolivian exports had slowed dramatically, exposing Bolivia to the threat of not renewing its long-term export agreement with Argentina.

For Brazil, this represented an opportunity to strengthen its geopolitical influence over the region. Besides these political purposes, Gasbol construction also meant a strategy to develop the Brazilian natural gas market as an alternative to reduce the country’s overwhelming reliance on oil and hydropower generation. At that time, the share of natural gas in the Brazilian energy matrix represented little more than 3% (BEN, 2005). In fact, the predominance of associated offshore gas fields in Brazilian supply had limited the reliability and quality of the supply, which inhibited consumers’ decisions toward the use of natural gas. To establish a firm supply consisted a strategy of breaking the prevailing vicious circle in which, on the one hand, there had not been a gas market due to the lack of reliability in supply; on the other hand, there had not been enough investment to improve the quality of supply due to the inexistence of a minimum gas demand to pay for it.

Then, the first gas supply agreement between Petrobras and the Yacimientos Petrolíferos Fiscales Bolivianos (YPFB) was signed in 1993. This made possible the construction of the 30 million m³/day Gasbol pipeline, which became operational in 1999. However, as the South America’s poorest country, Bolivia was highly dependent upon exporting its natural resources to its neighboring countries. Therefore, the Andean country could not renounce the income generated by its natural gas exports to Argentina. Hence, after the previously long term gas contract expired in 1992, several
extensions were negotiated with Argentina until 1999, when finally Bolivia began exporting natural gas to Brazil. Those negotiations resulted also discount over the previous already low price (IEA, 2003).

2. THE DIFFICULTIES SURROUNDING THE DEVELOPMENT OF BRAZILIAN NATURAL GAS INDUSTRY

The lack of investment in power generation and transmission systems changed the initial plan to anchor the Bolivian natural gas demand basically on the conventional market segments, such as industry, transport, commerce and household. In 1999, the Brazilian Energy Ministry launched the Priority Thermoelectric Plan (PTP), which aimed to promote private investment in 51 plants (22GW) natural gas power plants to those power plant developers able to start generating before the end of 2003. At this time, Petrobras was called to exercise its option to anticipate the ramp up of natural gas, as foreseen in the contract signed with the YPFB. This enlarged the volume previously contracted to 24 million m³/day in 2003 and to 30 million m³/day in 2004.

Nevertheless, neither guarantees in widely favorable conditions nor access to financial programs supported by the Brazilian Development Bank (BNDES) were enough to attract the level of desired private investment capable of preventing the problems in the power energy supply in Brazil at the beginning of the 21st century (Sauer, 2002). Of the 22GW forecast initially, only 6GW were effectively incorporated into the Brazilian power system between 2000 and 2004. Most of them were undertaken only because of Petrobras' sharing in it.

This governmental failure to stimulate private agents to invest in the expansion of the generation capacity through natural gas power plants was followed, in 2001, by a rationing program which required all users to reduce energy consumption by an average of 20% on pain of being disconnected from the power supply. As a consequence, every electricity user had to adopt energy-saving practices, which made total power consumption in Brazil drop back to 1999 levels. This decrease in consumption, associated with an economic recession and the favorable hydrological regime in subsequent years have led to a surplus of cheaper hydropower generation capacity, which practically eliminated the demand for thermoelectric generation.

Another consequence of the mistaken policy to induce the development of the Brazilian gas market based mainly on power generation demand was the lack of planning in terms of the infrastructure and reserves available throughout the country. On the one hand, Petrobras found itself in the undesirable position of importing expensive gas from Bolivia, much of which it did not need and could not sell. On the other hand, the natural gas production and transport capacity of the existing Northeastern network had shown to be insufficient to supply the demand created by the natural gas power plants installed in the past few years, as can be seen in the Figure below.
3. LNG AS AN ALTERNATIVE TO THE GAS SHORTAGE IN NORTHEAST BRAZILIAN REGION

The discovery of an estimated 419 billion m³ (14,8Tcf) non-associated gas in Brazil in 2003 changed the initial Petrobras plan to build with Shell a 1.5x10⁶ tpy (or million tons of LNG/year) LNG regasification terminal on the eastern coast of Brazil.

Two options have been suggested as alternatives to reduce the unbalance in Northeast Brazilian gas market for the next decade or so. The first one, presented by Petrobras on its Strategic Plan, was to build a 1.200km 20 million m³/day pipeline linking Northeast and Southeast Gas networks, known as Gasene. As an alternative, its was proposed to install a 3,3Mta liquefaction plant in the South to not only supplying the Northeastern gas market, but also accelerating the development of gas reserves recently found in the South by exporting part of it to European and North American markets. Once that nearly 65% of the Northeastern natural gas shortage falls into a highly seasonal power generation demand, this proposal, in fact, represents a strategy to explore LNG operational flexibility to minimize the infrastructure expected spare capacity throughout the year.

However, Rechelo and Sauer (2005) have shown that a LNG export from Brazil would not be competitive in the main international gas markets. As a consequence of that, the Brazilian project would be highly vulnerable to the uncertainties associated to the gas prices volatility observed on the North-American gas market. Although it revealed to be also exposed to uncertainties concerning either the level of domestic transport tariff or the installed generation capacity from gas-fired power plants not previously contracted in long-term contracts (both could be locally mitigated), the pipeline’s proposal has shown to be more appropriated than the LNG’s one (Rechelo, 2005).

However, both the growth of Brazilian gas demand and the capital expenditure increase due to the surge of steel price in the international market has changed the aforementioned results of the Gasene pipeline, as can be seen in the Figure 2. This, in fact, has brought back the discussions surrounding the alternative to import LNG as a way to supply the highly seasonal Northeastern gas market. Such a
LNG importing terminal represents, in fact, a good opportunity to global players such as Shell to monetize its reserves in Brazil. However, the main problem that arises from this alternative remain being the unbalance between the price that would be paid by Petrobras in international LNG market vis-à-vis its selling price established in the controversial Priority Thermoelectric Plan’s contracts.

![Graph](image1.png)

**Figure 2 – Probability distribution of Gasene pipeline**

[source: authors’ estimates]

4. ARGENTINA: FROM ECONOMICAL CRISIS TO A CONFLICT WITH CHILE

From 1970s onwards, new gas reserves were discovered and developed in Argentina, which was followed by a development of the Argentine natural gas industry as a whole. After the mid of 1990s, several cross-border pipelines were built linking Argentine gas reserves to its neighboring countries: Chile, Uruguay and Brazil.

Export trade to Chile started in 1996 in response to this country growing energy needs. The first cross-border pipeline connecting Argentina to Chile was the 83km, 14-inch Tierra del Fuego pipeline, which was built to supply a methanol plant in the extreme south of Chile (IEA, 2003). From 1996 onwards, six new pipelines were built between the two countries, as can be seen in the table 1.
Table 1 – Existing Chile-Argentina cross-border gas pipelines
[source: Energy Information Administration, 2003]

<table>
<thead>
<tr>
<th>pipeline</th>
<th>year</th>
<th>length - capacity</th>
<th>target market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tierra del Fuego</td>
<td>1996</td>
<td>83km, 2×10⁶ m³/day</td>
<td>Austral Basin to Punta Arenas</td>
</tr>
<tr>
<td>Posesión</td>
<td>1999</td>
<td>9km – 2×10⁶ m³/day</td>
<td>Austral Basin to Punta Arenas</td>
</tr>
<tr>
<td>Patagónico</td>
<td>1999</td>
<td>33km - 2.8×10⁶ m³/day</td>
<td>Austral Basin to Punta Arenas</td>
</tr>
<tr>
<td>GasAndes</td>
<td>1997</td>
<td>463km – 9×10⁶ m³/day</td>
<td>Neuquén Basin to Chile’s central and southern regions</td>
</tr>
<tr>
<td>Pacífico</td>
<td>1999</td>
<td>638km - 9.7×10⁶ m³/day</td>
<td>Neuquén Basin to Chile’s central and southern regions</td>
</tr>
<tr>
<td>GasAtacama</td>
<td>1999</td>
<td>941km - 8.5×10⁶ m³/day</td>
<td>north of Chile</td>
</tr>
<tr>
<td>NorAndino</td>
<td>1999</td>
<td>1.066km - 7.1×10⁶ m³/day</td>
<td>north of Chile</td>
</tr>
</tbody>
</table>

In late 1998, the 26km 0.7 million m³/day Gasoducto del Litoral, linking Entre Ríos in Argentina to Paysandú in Uruguay came on stream (IEA, 2003). The construction of another 205km, 2.5 million m³/day Cruz del Sur pipeline linking Punta Lara (Argentina) to Montevideo became operational in 2002.

Finally, gas export trade to Brazil comes through a 440km 24-inch pipeline that supplies mainly a 600 MW thermoelectric power plant installed in Uruguaiana (IEA, 2003).

However, a prolonged recession began at the end of 1998, which led the Argentine government to default on part of its US$145 billion debt at end of 2001. After some months, the government devaluated the local currency (peso), switched the privatized utilities’ tariffs to pesos and froze them. Prior to January 2002, all gas supply contracts between gas producers and utilities, power stations and large industrial consumers were denominated in US dollars (Honoré, 2004).

By the end of 2002, the Argentine peso had lost 70% of its value, which made the value of gas to fall overnight and, consequently, to discontinue all gas exploration and development projects onwards. In fact, there have been almost no incentive to explore gas since then at the current wellhead gas prices, although only one-third of the total acreage of known sedimentary basins has been explored in Argentina so far (Honoré, 2004). However, Argentina’s economy is recovering thanks mainly to the growing demand for its main commodities at external markets. In the last three years, the domestic economy expanded rapidly as well as the demand for gas, which, in its turn, has been being stimulated by the artificially low prices (Honoré, 2004).

Such an increasing risk of domestic gas shortages in Argentina has led the country to cut exports to its neighboring importers. Brazil, in fact, was not really affected by this decision thanks to its electrical energy surplus at that time. The most severely hit country was Chile, which imported nearly 90% of the 22 million m³/day of gas it consumes from Argentina. Those cuts in gas exports to Chile created diplomatic issues between the two countries; which not only damaged Argentina’s reputation as a reliable supplier, but also incentive Chile to search for alternative gas sources to reduce its dependence from Argentina.

Faced recently with declining gas reserves and increasing local consumption, Argentina has sign an emergency supply agreement to import 7.7 million m³/day of Bolivian gas until the end of 2006. In the long term, the two countries would like to expand that amount to almost 20 million m³/day, which would be shipped through yet another pipeline, the US$1 billion Northeastern Pipeline.
5. CIVIL UNREST AND POLITICAL TURMOIL IN BOLIVIA

Geographically placed between Brazil, Argentina and Chile, the nearly 1500 billion m³ (53Tcf) Bolivian gas reserves remain ideally located to supply a rapidly increasing regional demand foresaw to the next decade.

However, this expected trend to South America’s Southern Cone gas markets suffered a several setbacks due the increasing civil unrest and political turmoil in Bolivia in the past few years. In 2003, more than 30 people were killed during protests against the government plans to export natural gas through Chile, a country that has had numerous border disputes with Bolivia since the War of the Pacific (1879–1884). Many groups in Bolivia have called for the re-nationalization of Bolivia’s natural gas resources. Additional protests in 2005 forced the resignation of President Mesa, after his opposition implemented the referendum on which Bolivians narrowly approved gas exports but remain hostile to the idea of sending gas through Chile, the route preferred by Bolivia’s private Pacific LNG export consortium. This unfriendly environment between two neighboring countries explains why Bolivia explicitly refused to allow emergency supplies sent to Argentina to be forwarded to Chile.

In 2005, Bolivia approved a new hydrocarbons law that incorporated other 32% nondeductible tax on upstream production on top of existing 18% royalties. As a consequence of that, foreign gas investment plummeted in Bolivia in the past few years. Several local players, such as Brazil’s state-controlled Petrobras and Spanish Repsol YPF, have announced a reevaluation of their investment in Bolivia (WGI, 2005d).

6. SOUTH AMERICAN ENERGY RING

Since the first Argentine cuts, Chile started seeking alternative suppliers to wean itself off its 90% dependence on Argentine gas. To supply the north part of the country, Chile approached Peru with the proposal of buying nearly 5 million m³/day of Camisea gas via a 1,100 km pipeline linking Pisco (in southern Peru) to Tocopilla (in northern Chile). However, the amount of gas demanded by Chile would not make such a lengthy pipeline feasible. So, Chile proposed an estimated US$2.5 billion scheme connecting Peru’s Camisea reserves to Chile and then Argentina, Brazil and Uruguay (WGI, 2005b). Camisea gas would, then, have to cross the Andes to the Peruvian port of Pisco, from where the new pipeline would take it to Tocopilla, in Chile. There, the new line would link up with two of the existing pipelines that connect Chile to Argentina, the Norandino and Gas Atacama. Of the 23 million m³/day of gas expected to flow into the pipeline, at least 5 million m³/day would stay in Chile. The remainder would be exported to Argentina, Brazil and Uruguay by reversing the existing 17 million m³/day aforementioned pipelines. From Buenos Aires, two new pipelines would transport Camisea gas to Montevideo (in Uruguay) and Porto Alegre (in Brazil).

In addition, Peru LNG, which has recently signed a purchase agreement to receive 17.5 million m³/day of gas from the country’s Camisea upstream project, has been negotiating its LNG with Mexico, US and, more lately, Chile. Aware of the need to diversify away from Argentine gas reserves, Chile is also considering the construction of US$0.5 billion - 2.5Mta LNG regasification terminal to supply its central part of the country.

However, these multiple opportunities for marketing Peruvian gas would appear hugely promising except for the fact that not all that much gas has been found in Peru. The feasibility of the this Energy Ring linking Peru, Argentina, Brazil and Uruguay project remains doubtful, given the amount of Peruvian proved gas reserves. Of the 246 billion m³ (8.7Tcf) of Camisea’s proved reserves, some 113 billion m³ (4Tcf) is committed for Peru’s domestic market, while other 113 billion m³ (4Tcf) is to Mexico and US gas markets through Peru LNG project, which is foresaw to come on stream in 2009 (Vasquez, 2005).

Nevertheless, huge uncertainties have been surrounding the development of South American’s greenfield LNG export projects. Firstly, as Rechelo and Sauer’s study shows, special care should be
taken by exporting countries proponent to manage the impact of the increasing risks of international trade over the domestic gas market. Furthermore, the importance of the US market in the future LNG has been threaten by the effect of high prices on North-American gas demand as well as the its ability to manage the local opposition against the construction of LNG import terminal in the US territory.

Finally and probably the most unpredictable one is the magnitude of the structural changes in course in Pacific market; on which security of supply always prevails as a key factor for the importing countries. However, this seems to be changing due either the existence of some idle capacity (see Figure 3) originated to the Asian economical slowdown in 1990s and early 2000s or the new liberalized energy markets context. The Australia LNG, for instance, won its long-term purchasing contract to supply $3 \times 10^6$tpy to Chinese Guangdong terminal after agreed with a reported price 20% lower than the one paid by Japanese utilities (EIA, 2003). This, in fact, already influenced the latest renegotiation of the $7.4 \times 10^6$tpy 20-year contract with Malaysian LNG, on which Japanese utilities obtained a 5% price reduction over the last price as well as some shipping flexibility (EIA, 2003).

In this context, the main questions that arise are how close the Pacific market will get from European and North-American gas markets framework (pricing formulas, destination clauses, arbitrages) and how this changing process might influence the trade for South American exporting countries, mainly Peru and Bolivia.

![Figure 3 - Supply and demand for Pacific GNL market](source: authors’ estimates with Energy Information Administration, 2004)

7. CONCLUSION

Apart from technical-economical feasibility details surrounding this project, it is noteworthy that Peru might not be able to sustain alone the growth of the South America’s Southern Cone countries gas demand in addition to its own market. This means that Peruvian and Bolivian gas reserves should not be viewed as competing sources of supply, but rather complementary ones. In fact, both tend to be benefited by the development of strong regional gas markets and, therefore, should look forward to ways to create a cooperative environment instead of a competitive one.
This cooperative environment would be important for not only to enlarge the regional trade (what tends to reduce costs due to the economies of scales), but also to allow that the economic wealth generated by the development of South American natural gas industry can be translated into prosperity for the local countries, in particular, the poorest ones.

And Southern Cone countries actually faced a highly favorable atmosphere to lead to this kind of win-win situation. High and very volatile energy prices in international markets, abundant local reserves, favorable potential prospect to increase both production and consumption; all these facts could be viewed as an opportunity to strengthen region’s cohesion toward mutually beneficial projects.

Finally, it is worth mentioning the influence of the increasing share of LNG market and consequent emerging global arbitrages over the South America’s gas markets, once that it creates an opportunity cost that tends to affect exporters and importers differently. On the one hand, although exporting countries might be tempted to promote export projects to enjoy the highly favorable short-term trade with North American and European gas markets, the reducing gap between international gas markets tends to boost the exporting countries bargain power.

On the other hand, this increasing uncertainty created by rapidly shifting market structures as well as the high natural gas prices in the European and North-American gas markets creates incentives to import countries to pursue integration projects aiming to monetize South American resources on a regional basis. This, however, requires a better cohesion between South American importing and exporting countries in finding new ways toward regional energy independence.

…caminante, no hay camino, se hace camino al andar.

Antonio Machado (1875-1939).

8. REFERENCES


Honoré, 2004


