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geopolitics of gas
working paper series

NATURAL GAS PIPELINES IN THE SOUTHERN CONE

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Natural Gas Pipelines in The Southern Cone

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Working Paper #29

May 2004

Prepared for the *Geopolitics of Natural Gas Study*, a joint project of the Program on Energy and Sustainable Development at Stanford University and the James A. Baker III Institute for Public Policy of Rice University.

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About the Geopolitics of Natural Gas Study

Natural gas is rapidly gaining in geopolitical importance. Gas has grown from a marginal fuel consumed in regionally disconnected markets to a fuel that is transported across great distances for consumption in many different economic sectors. Increasingly, natural gas is the fuel of choice for consumers seeking its relatively low environmental impact, especially for electric power generation. As a result, world gas consumption is projected to more than double over the next three decades, rising from 23% to 28% of world total primary energy demand by 2030 and surpassing coal as the world's number two energy source and potentially overtaking oil's share in many large industrialized economies.

The growing importance of natural gas imports to modern economies will force new thinking about energy security. The Energy Forum of the James A. Baker III Institute for Public Policy and the Program on Energy and Sustainable Development at the Stanford University Institute for International Studies are completing a major effort to investigate the geopolitical consequences of a major shift to natural gas in world energy markets. The study utilizes historical case studies as well as advanced economic modeling to examine the interplay between economic and political factors in the development of natural gas resources; our aim is to shed light on the political challenges that may accompany a shift to a gas-fed world.

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About the Author

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Natural Gas Pipelines in the Southern Cone

David R. Mares[1]

INTRODUCTION

Discussions of trade in natural gas in South America's Southern Cone (Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay) began as early as the 1950s. But it was not until 1972 that the first international gas pipeline in the region, linking Bolivia and Argentina, was built. It was twenty years later before significant gas pipeline projects integrating Chile and Argentina were proposed, followed by one large project connecting Bolivia and Brazil (see Table 1).

Table 1. Southern Cone Cross Border Gas Trade (bcm per year)

Country Pairs	1996	1997	1998	1999	2000	2001
Bolivia→Argentina	2.0	1.6	1.6	1.0	0.1	0.2
Bolivia→Brazil	-	-	-	0.8	2.1	2.6
Argentina→Chile	-	0.5	2.0	3.3	4.4	5.3
Argentina→Brazil	-	-	-	0.1	0.3	0.8
Argentina→Uruguay	-	-	-	-	-	0.1

Source: (IEA 2003)

This paper examines three historical cases to understand why there was a 25 year lag between the first international pipeline project and the others, and to uncover key factors that determine why particular pipeline projects were built while similar proposed pipelines languished. The 1970s pipeline, YABOG, linked Bolivia and Argentina and competed with an alternative project to send Bolivian gas to Brazil. Information on this pipeline project is limited, as the main financier of the project, the World Bank, has not yet released its records on the project. The case thus serves mainly as historical background for the contemporary projects. More detailed analysis examines the competition in two major gas trade projects in the 1990s. First, the paper will examine the GasAndes pipeline

[1] I want to thank Mark H. Hayes and David G. Victor for their comments, Monica Herz of IRI-PUC and Francisco Rojas of FLACSO-Chile for their assistance and Eduardo Dubin, Pablo Pinto, Kati Suominen, and Andrés Villar for research support. Meredith Williams created the map. Responsibility for all views presented here is mine.

and competing alternative, Transgas, transporting Argentine gas to Chile. Second, the paper will analyze the decision to supply Brazil with Bolivian gas (via the GASBOL pipeline) rather than Argentine gas (via the Paraná-Porto Alegre project).

Among the findings in this comparative study is that the *potential* market can be as attractive as an established market for private investors if government policies for that particular sector offer the possibility of making a profit. The increasing vulnerability of hydropower to unpredictable weather patterns and environmental pollution were the factors driving Southern Cone governments to pursue natural gas.

The general investment climate was favorable in all four countries at the time the contemporary projects were discussed, but was difficult during the period of the first pipeline project (YABOG). Pricing risks were fundamental to the Bolivia-Argentina and Chile-Argentina cases, but the role of prices in investment decisions was effectively mitigated by the Brazilian government and World Bank policies in the GASBOL case. The role of gas in the offtake energy market in absolute terms and as a fraction of total primary energy supply was fundamental in the earliest project (YABOG), but not in either of the two contemporary projects. International institutions for economic cooperation were important only when they provided financing, as in YABOG and GASBOL; regional institutions for economic cooperation were marginal to all the pipeline decisions.

International institutions for economic cooperation can play important roles in both underwriting the cost of such investments as well as increasing the credibility of national governments' commitments to develop that market. And finally, the geopolitical relationships in the Southern Cone were, and continue to be, fundamental factors in the evolving energy markets because governments see international gas pipelines influencing interstate relations.

The first section of this paper provides a brief history and analysis of the YABOG pipeline project and its competing project. The second and third sections analyze in greater detail the economic, legal and financial aspects of the two projects in the 1990s. The conclusion briefly reviews the evolution of the gas markets after the pipelines were built and elaborates on the lessons that can be drawn from these three case studies for understanding trade in natural gas.

Figure 1. Gas Pipelines in the Southern Cone

YABOG (BOLIVIA-ARGENTINIA) PIPELINE, 1972

The first discussions concerning a natural gas pipeline in southern South America revolved around two competing projects, one from Bolivia to Brazil and the other from Bolivia to Argentina. Argentina and Brazil had been competing for influence over their smaller neighbors Uruguay, Paraguay and Bolivia since the mid 19th century (Kelly and Child 1988). Bolivia began discussions with Brazil and Argentina in the 1930s to develop a regional energy market fueled by Bolivian petroleum. Bolivia, a poor country, hoped that its neighbors would finance exploration and development, with Bolivia using crude sales to repay its debts.

Bolivia experienced a revolution in 1952 in which mobilization by miners and peasants played a major role. Yet the country remained significantly stratified by race and income (Malloy 1970; Gamarra 1996). These economic and social tensions combined with the willingness of frustrated citizens to engage in massive and prolonged demonstrations to dramatically limit the ability of government to follow through on much of public policy. A pattern that continues to today was developed in the 1950s: Bolivian governments searching for exporters and buyers of its natural gas must walk a fine line, lest their policies provoke popular protests and counter-reaction by civilian and military sectors fearful of public protest.

Bolivia's revolutionary government, led by the Movement of the National Revolution (Movimiento de la Revolución Nacional, MNR), quickly broadened the search for capital to develop its energy resources. In 1956, legislation permitted private foreign investment in the petroleum sector. Gulf Oil invested in Bolivian oil fields and quickly asserted its rights to associated natural gas, provoking a nationalist uproar over such claims. The government of Brazil also expressed its interests in natural gas imports from Bolivia. In 1958, seeking to attract more private investment, Bolivia offered Brazil all the natural gas from Bolivian fields developed by private Brazilian investors (Vargas Salguiero 1996; Calvo Mirabal 1996).

Brazil had growing energy needs, but it also had options. In 1964, oil finally caught up with wood and charcoal as the main source of primary energy consumed. The rising price of petroleum even before the 1973 oil shock, however, led national policymakers to switch their focus away from oil and promote hydropower. By 1972, hydropower had more than doubled its contribution to primary energy consumption compared with 1964 (21%, up from 13%) (Santiago 1989). In this context, a hydropower complex at Itaipú was an attractive alternative for Brazil. The waters between Brazil and Paraguay had been a source of disagreement, but in 1966 the two countries decided to jointly develop the waterway and

share the benefits. The Itaipú Treaty, signed in 1973, authorized the construction of a massive dam and world's largest hydroelectric power plant at the time.[2]

Despite its success with the Itaipú agreement with Paraguay, Brazil continued to woo Bolivia both for geopolitical reasons and to keep Bolivian energy resources as a potential reserve for the future. These were the years during which the Brazilian "economic miracle" was in full bloom and future energy supplies were problematic in the wake of OPEC's damaging oil embargo of 1973. In 1974, Brazil and Bolivia signed a cooperation and industrial complementarity accord that committed Bolivia to sell 2.5 bcm per year of 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. Brazil also agreed to finance electric power plants and infrastructure in Bolivia to support the industrial complex. In 1978, the gas agreement was reaffirmed with a volume of 4.1 bcm per year. Domestic opposition to the sale of gas erupted in Bolivia (Vargas Salguiero 1996), as the poor majority of Bolivians began to feel betrayed by YABOG's inability to spur development and by Argentine efforts to reduce the price and quantity of imports from Bolivia. Once again, the agreement remained on paper only.

In contrast to Brazil, Argentina had a developed market for natural gas years before seeking Bolivian supplies. Domestic policies controlled the price of gas in Argentina, initially benefiting both middle class consumers and industrial users, but these policies starved the gas sector of capital. By the late 1960s, both civilian politicians and military dictators feared the political fallout of gas shortages for middle class homes and industry. The Comodoro Rivadia pipeline from the northern gas fields to Buenos Aires, in particular, was underutilized (Davison, Hurst and Mabro 1988), making Bolivian gas an attractive option for Argentina.

Gulf Oil, meanwhile, had begun to export petroleum in 1966 via the Sicasica-Arica pipeline through Chile, and naturally sought export markets for its natural gas. With its developed gas market and declining domestic reserves, Argentina was a more attractive market than Brazil. Gulf Oil created a company (Bolsur) to negotiate the terms of a contract, and in September 1967, signed a Letter of Intent with the Argentine parastatal Gas del Estado to supply it with Bolivian natural gas for 20 years.

Bolivia's national oil company (Yacimientos Petroliferos Fiscales de Bolivia, YPFB) produced gas from its own fields and also targeted the Argentine market. Within Bolivia, this competition between Gulf and YPFB over export markets sparked massive

[2] Construction commenced in 1975, the dam began filling in 1982, electricity started flowing in 1984, and the 18th and final generating unit came on line in 1991. 50% of Itaipú is owned by Eletrobrás, Brazil's national electric power company; essentially all of Itaipú is Electrobras/Brazil financed. The US$18-20 billion project generates 75 billion kilowatt hours of electricity per year. Brazil has first call on the output, using 95% of it and Paraguay uses the remaining 5%. (Itaipú Dam; Itaipú Dam and Environment)

protests against Gulf Oil. The Bolivian government responded by putting the Army on alert. The Argentine Foreign Minister insisted that the Bolivian government and Gulf Oil resolve their differences before Argentina would buy any gas from Bolivia (Calvo Mirabal, 1996).

The administration of General René Barrientos was doing a delicate balancing act: retaining the interest of private investors in Bolivia while increasing Government revenues from the exploitation of natural gas to pacify the nationalist opposition. Faced with increasing civil unrest in Bolivia and the possibility of losing the Argentine market, Gulf agreed to discuss an increase in royalty payments. The Barrientos government issued a decree permitting the sale of gas to Argentina through a new entity, YABOG, with equal ownership between YPFB and Gulf Oil. A contract among the three parties was signed in August 1968. The 20 year agreement stipulated that Bolivia would provide 1.5 bcm per year for the first 7 years, rising to 1.7 bcm per year in the subsequent 13 years. Williams Bros., a partner of Gulf Oil, was selected to build the pipeline (Calvo Mirabel 1996).

Discussions between Gulf Oil and the Bolivian government failed to produce an agreement regarding royalty payments. After a military coup by General Alfredo Ovando the issue was settled via the nationalization of Gulf's Bolivian holdings in October 1969. (Nationalization was a constant threat in the Southern Cone countries at the time. Bolivia had nationalized the tin companies in 1952, Peru nationalized the IPC oil company in 1968, and Chile progressively squeezed copper companies through a process known as "Chileanization," then nationalized them in 1971.)

Nationalization of Gulf Oil slowed construction but did not terminate the YABOG pipeline project. Financing for the project was provided by the World Bank and US private firms, construction began in 1970 and the pipeline began operating in 1972 (Calvo Mirabal 1996). The 441-km, 600 mm trunk line, with a capacity of 2.2 bcm per year, connects Río Grande, Bolivia to the Argentine pipeline network in Salta. The Argentine portion is operated by Transportadora Gas del Norte (TGN).

The Bolivian-Argentine agreement that produced the YABOG pipeline proved contentious because the market in Argentina evolved in a manner unforeseen by either government at the time the original agreement was signed. The new Argentine military government (1976-1984) began adopting neo-liberal policies to attract both domestic and foreign investment (Ramos 1986). Private investment rushed in and by 1978 large new gas reserves were being developed in Argentina. An expansion of the Argentine natural gas transport and distribution system followed, increasing not only the supply gas, but gas the price of which was lower than that negotiated with Bolivia (Bechelli 1989). The contracted volumes of Bolivian gas were no longer competitive.

The Bolivian economy collapsed in the early 1980s (inflation peaked at 11,700% in 1985), producing a foreign debt crisis and making the country ever more dependent upon

its exports. Disagreements developed over the price Argentina paid for Bolivian gas, the proportion of currency and in-kind payments, and Bolivia's failure to make its debt payments to Argentina, its largest bilateral creditor. The two nations negotiated a comprehensive agreement in 1987. Under the accord, Bolivia agreed to cut its gas price by 20 percent and periodically adjust it to prices calculated from imported fuel oil prices (c.i.f.) in Buenos Aires, with allowances of US$0.71 for transport from the wellhead to the Argentine border. To avoid abrupt price fluctuations for Bolivia, Argentina agreed to a final price that would be a combination of a new price (70%) and price in the past period (30%). Argentina resumed its gas payments to Bolivia with 80 percent of its payment in convertible currencies and 20 percent in goods, such as wheat (Library of Congress, 1999; Givogri, García and Bastos, 1990).

Table 2. Evolution of YABOG Gas Prices (nominal US$/mmbtu)[3]

Year	1978	1980	1982	1984	1986	1987	1988	1989	1990	1991	1992	Post - April 1992
Price ($/mmbtu)	1.13	2.42	3.82	4.28	3.51	2.98	2.49	2.44	2.63	2.74	1.57	1.15

Source: Muller & Associates, Estadísticas Socioeconómicas as cited in Vargas Salguiero: 277-79

The long-term contract with Argentina expired in 1992, but the two governments agreed to several consecutive extensions (although at a much lower price) to provide income to Bolivia until the start of exports to Brazil. The contract expired on July 31, 1999, resulting in only minor Bolivian exports to Argentina via two short cross-border pipelines owned by the Argentine company, Pluspetrol. Over the life of the relationship, Bolivia exported almost 50 bcm of natural gas to Argentina, worth about US$4.3 billion (in nominal dollars) for an average price of $2.21/mmbtu (Vargas Salgueiro 1996).

The Brazilian bid for Bolivian gas was driven largely by geopolitical interests in extending Brazilian influence in the region and was limited by the existence of energy alternatives that fit better into their energy matrix than did natural gas. Brazil opted to pursue greater influence over Paraguay and additional hydropower resources at Itaipú during the 1970s rather than to invest in a Bolivian gas pipeline. Argentina pursued its project (the YABOG pipeline) to completion. Not only did Argentina have geopolitical interests similar to those of its rival, Brazil, but its domestic market for natural gas was already developed and domestic supplies were expected to become insufficient. Gulf Oil's Bolivian company originated the project, but the pipeline was developed by the two governments, in conjunction with the World Bank, after Gulf was nationalized by Bolivia.

[3] Assuming heat content of Bolivia gas at 36,908 btu/bcm.

CONTEMPORARY PROJECTS

GASANDES PIPELINE (ARGENTINA-CHILE), 1997

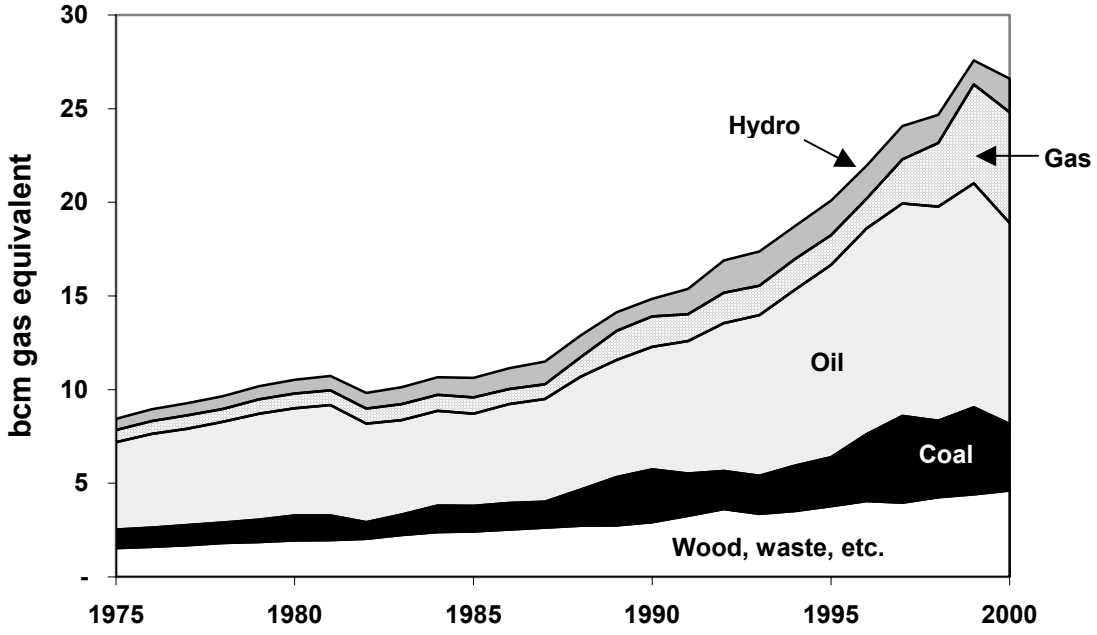
In the early 1990s, Chile had an interest in importing cheaper and cleaner natural gas and Argentina was seeking to promote its natural gas exports. Two pipeline projects competed fiercely to bring Argentine gas to Chile's major energy market. The GasAndes pipeline would run directly across the Andes into Santiago, tapping into an existing Argentine pipeline extending north of the Neuquén gas fields from which the gas would originate. The Transgas pipeline, in contrast, would begin at Neuquén and cross into south-central Chile, servicing a number of smaller urban and industrial centers before heading north to Santiago (see map, above).

Argentine reserves of natural gas continued to expand after the 1978 discoveries, turning the country from a gas importer into a potential gas exporter. By 1993 Argentine proven reserves had reached 517 bcm (Secretaría de Energía, as cited in IEA 2003). The Argentine gas market was liberalized in the 1990s, producing a robust domestic gas market with very competitive prices. The dominant question in the early 1990s was whether the availability of that supply for foreign trade should be subordinate to domestic demand.

Chile, a neighbor with a booming economy and an interest in diversifying its energy sources, was a potential client for Argentina. Chile's energy sector did not use much natural gas in 1994—less than 2 bcm (see figure 2). However, natural gas became an attractive energy source in Chile for multiple reasons. Concern over the potential for petroleum prices to rise again stimulated government efforts to diversify energy supplies. Also, severe air pollution in the nation's capital and industrial center provoked the new democratic government to promulgate more stringent environmental regulations[4] (Jadresic, 1999). Concerns were also voiced over the possibility of prolonged drought and its impact on hydroelectric supplies.

[4] With five million people, Santiago lies in a basin 1,700 feet above sea level.

Figure 2. Chile Primary Energy Mix, 1975-2000



Source: IEA 2003

But before Argentina and Chile could pursue closer economic relations, especially in a sector considered to be as strategically important as energy, they had to overcome a legacy of mistrust and rivalry. Resolution of the Beagle Channel dispute in 1984, after near war in 1978,[5] opened the way for improved relations between Argentina and Chile. The 1984 Treaty of Peace and Friendship reaffirmed the need to promote economic relations as the building blocks for a lasting peace.

Argentina returned to democracy in 1984 and Carlos Saúl Menem became president in 1990. Menem was able to use his control of the Justicialist (Peronist) Party to attain almost complete dominance over the Legislature and Supreme Court during his tenure (1990-1998), implementing the most far-reaching changes to the economy in Argentina's history. Under the guidance of Economy Secretary Domingo Cavallo, state-owned enterprises were virtually all privatized in a process heavily criticized for having little transparency. A Constitutional amendment pegged the peso to the dollar and made it

[5] Argentina and Chile sent their maritime boundary dispute to arbitration in 1971. In 1977 the British Monarch awarded three disputed islands in the Beagle Channel to Chile. Argentina rejected the decision and attempted to militarily coerce Chile into negotiating a division of the islands that would produce a maritime boundary consistent with Argentine claims.

freely transferable, thereby eliminating foreign exchange risks. The Heritage Foundation ranked Argentina's economy as among the "freest" in the world in 1999 (Corrales, 2002). For most of the 1990s the Argentine economy boomed, fueled by large infusions of foreign investment. The Menem administration had great support at home and abroad. The indirect tax imposed by the vast network of corruption was easily over-shadowed by the rapidly growing economy.

In contrast to the tumultuous history of Argentina, Chile had a long history of democratic rule that was interrupted by a military coup in 1973. The military government overhauled much of Chilean legislation to make the country attractive to foreign investment, thereby creating the first neo-liberal economy in Latin America in 1978, long before the Washington Consensus of 1990. When the country returned to democracy in 1989, the military government's constitution was revised to include "authoritarian enclaves" (a number of designated Senators, Senators for Life, a national security council in which the military occupied half the seats, etc.). The constitution and its reforms played a major role in convincing the Armed Forces and the political Right that the Left could not make major changes even if they won elections.

The new democratic government of Chile was significantly constrained in its policy by the Constitution. In addition, it needed to produce growth because it faced public comparison with the previous dictatorship that had overseen a booming economy. As recently as the 1988 plebiscite on military rule, the dictatorship garnered 43% of the vote.

The credibility of both the Argentine and Chilean governments vis-à-vis private investors was high during the 1990s, though for completely different reasons. In Argentina, Menem's free market ideology and political power convinced private investors that the investment climate would remain favorable. In Chile's case it was the restricted policy space within which the Center-Left governments could move that gave private investors confidence.

Once both countries had re-democratized in the 1990s, they embarked on a flurry of bilateral agreements, quickly settling 22 of the 24 remaining territorial disputes and signing agreements promoting trade and integration. On Aug 2, 1991 the countries signed the Acuerdo de Complementaridad Económica under the auspices of the ALADI (Asociación Latinoamericana de Integración) Montevideo Treaty of 1980, which provided a basis for permitting bilateral agreements exempt from Most Favored Nation clauses that would automatically extend similar benefits to third parties[6].

[6] MFN clauses in trade agreements speed the process of decreasing trade barriers by making the benefits provided by one country to another automatically applicable to all countries. But because it is automatic, countries lose the ability to negotiate adjustments with those third parties. ALADI has 12 members; any lowering of trade barriers between Chile and Argentina would have to have been extended to the other 10 members if the MFN clause had not been circumvented. ALADI adopted this treaty circumventing MFN

Political leaders in both Chile and Argentina saw economic integration not only as a means of promoting growth but also a way of consolidating democracy—on the logic that a diminished external threat environment would undercut the military's influence at home. Chilean President Patricio Alwyn proposed an energy agreement with another traditional rival, Bolivia, in 1992. The two pipeline projects were complementary in the eyes of the Alwyn administration: Bolivia would supply the north while Argentine gas could meet Chilean gas demand in the center of the country. There was also discussion about integrating electrical grids, but Chile's National Energy Commission decided to pursue integrating the natural gas markets first.[7] However, Alwyn's initiatives towards Bolivia could not overcome the stumbling block of Bolivia's demand that Chile provide it with a sovereign outlet to the Pacific Ocean to compensate for the littoral province seized by Chile in the War of the Pacific (1879-1883).[8]

The governments of Chile and Argentina prematurely called for international bids on the gas pipeline project linking the two countries. Investors initially stayed away primarily because neither the rules for deciding among competitive bids nor those guiding the project's operation after construction were clear. This uncertainty was rectified when the Gas Interconnection Protocol (1991) stipulated that gas exports from Argentina would be subject to a maximum level, and Chile could only import gas from the Neuquén Basin in Argentina (Gallardo 1995).

The 1991 Protocol reflected both Argentina's move under President Menem to adopt the neo-liberal economic policies that had produced sustained economic growth in Chile as well as Argentine fear that the domestic market might be undersupplied if exports competed with domestic demand. Under the legal stipulations of the Protocol, Chile would likely confront a monopolistic supplier, resulting in higher prices to the consumer, because only one pipeline consortium could come from Neuquén.

Chile's newly democratic government, tied to a constitution favoring private markets and politically in favor of lowering energy prices, wanted market forces to determine who would build which pipeline. The Alwyn administration realized the need to set the context both through a better treaty for supply from Argentina and the establishment of the regulatory regime under which transportation and distribution of gas

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because it believed that progress on lowering trade barriers could proceed faster among subsets of its membership than if all members had to be included.

[7] The Commission concluded that natural gas imports would not be profitable if electricity were imported. While lowering electricity prices was a goal of the Commission, they wanted to decrease energy prices for industry, domestic consumption and transport first (FLACSO-Chile 1996).

[8] In 2003 massive and violent protests forced the resignation of Bolivian President Sánchez de Lozada and the rejection of an LNG export project that would have traversed Chilean territory on its way to Mexico and the U.S. In 2004, when Argentina faced domestic shortages of natural gas, Bolivia signed an emergency agreement to export gas to Argentina but stipulated that "not one molecule" could be re-exported to Chile.

would operate. But the administration was not yet ready to revise the regulations governing the natural gas sector and thus investors confronted the risk that major investments had to be legally committed to the projects before the reforms were decided upon (Business Latin America 1995).

The decision to modify the Protocol and allow Chile equal access to Argentine gas was a major step towards permitting private investors to compete on a level playing field set by the bi-national market. Within this framework two consortia (Transgas and GasAndes) competed to build the major pipeline that would bring Argentine gas to Chile. Although the playing field was level, the two competing consortia structured themselves in fundamentally different ways, and this would make an enormous difference in their competitiveness in what came to be known in Chile as the "Pipeline Wars" (Figueroa B and Smith, 2002).

The "Pipeline Wars"

In 1992 the Argentine government began receiving requests for permits to export Argentine natural gas. Shell Argentina presented a rudimentary proposal, which was seen as only an expression of interest and it was told to flesh out the proposal. The petition of Gas Natural, S.A., a Chilean company, was rejected because its application for a permit did not specify where and how it was going to get the gas to export. The proposal of an Argentine consortium led by YPF (Yacimientos Petrolíferos Federales, owner of 70% of Argentine natural gas reserves) and including Astra, Bridas, Petrolera San Jorge, Pluspetrol, was accepted for the full 1.8 bcm per year that the Protocol authorized for export. But the deadline for the proposal had to be extended a number of times until the consortium could find suitable buyers for the gas in Chile (Secretaria de Hidrocarburos y Mineria 1992).

Chile's Enersis group (including the country's largest electricity distribution company, Chilectra) and Chile's national oil company, ENAP (Empresa Nacional de Petroleo) became the Chilean partners in the Transgas consortium. The pipeline project was to be financed by equity participants and had two components, the pipeline itself and a distribution network. Shareholding in the pipeline was to be Chilectra/Enersis 35%, U.S.-based Tenneco 25%, ENAP 10%, YPF 10%, and the remaining 20% to be allocated among Astra, Bridas, Pluspetrol and Petrolera San Jorge. Financing of the distribution network, "Gas de Chile", was to be divided among the operator British Gas (46%), Chilectra (27%) and Enersis (27%). Transgas participants did not formalize their partnership and had no separate management council; their coordination was affected by the lack of institutionalized collaboration throughout the negotiation process (Figueroa B and Smith 2002). On the Argentine side, TGN contracted to transport the gas but did not wish to become a shareholder (Cameo 2003).

The Transgas pipeline proposal began in the Neuquén Basin, Argentina and ran a total of 1,381 km, feeding the cities of Concepción, Santiago and Valparaíso, Chile. Because the consortium on the Chilean side was dominated by hydropower producers, Transgas chose a circuitous path (1,200 km) to the main industrial and population center, Santiago. One advantage of this indirect route for Chile was that it would supply a greater area of the country. But the longer pipeline would also make gas prices higher in Santiago, thus reducing gas-generated power's ability to compete with hydropower.

The Transgas pipeline was anticipated to cost US$490 million to reach Santiago, US$90 million for branches to regions along the way, another US$90 million for compression stations, and US$330 million for investments in the distribution network, requiring a total of nearly US$1 billion in direct investment. Another US$700 million would be needed for new combined-cycle gas turbines to burn the gas, and US$100 million for conversion of industrial and residential consumers to gas, thus requiring mobilization of nearly US$1.8 billion in capital to make the project viable (Figueroa B. and Smith 2002).

Transgas was especially vulnerable to the two governments' regulatory policies. Essentially, the consortium was gambling that the project's positive externalities for regional development would lead both countries to allow it a monopolistic position as sole importer of gas from Argentina in the central region and with closed access for the pipeline in Chile. This result, however, required that Argentina adopt policies that restricted the export market (one supply source and a limited volume), and that Chile regulate the domestic market in ways that protected Transgas' early market position (a de facto closed system for transportation). In short, Transgas wanted public policy to protect its gains under the original Protocol.

A second pipeline project emerged without many of these regulatory protections. NOVA Corporation of Canada, two Chilean firms (Gasco, a gas distributor and Gener, the country's second largest power generating company, but also its largest thermoelectric generator) and two Argentine companies (Compañía General de Combustibles and Techint Compañía Ténica Internacional) formed a competing project, GasAndes. This proposed pipeline tapped into an existing Argentine pipeline north of the Neuquén basin and went directly to Santiago. The shorter pipeline route (463 km) meant a significantly lower cost, initially estimated at just US$284 million for the pipeline itself.

Recognizing the risks posed by both an evolving government policy and the immature Chilean natural gas market, the GasAndes partners structured the terms of their relationship very clearly. NOVA Corp. committed to increasing the capacity of the Central-Oeste pipeline owned by TGN in Argentina to feed the proposed GasAndes pipeline. (The Canadian firm held 11% of TGN shares in 1994 and increased that to 19.1% by 1997.) NOVA held 70% of the shares in the GasAndes project, with the two Chilean partners splitting the remaining 30% as they saw fit. The option of adding institutional

investors to the deal later was kept open. Any sale of shares had to be offered first to partners and then to outsiders, subject to agreement by the rest of the group (Figueroa B. and Smith 2002).

Gener committed to modifying its thermoelectric power plant at Renca to accept natural gas and Gasco was to organize and operate a distribution company in Santiago (Metrogas). They set up a Management Committee and bound themselves to not participate in competing projects for a period of two years unless the Memorandum Of Understanding had been dissolved; this stipulation applied even if a company withdrew from the project. The agreement was governed by Chilean law and disputes among the partners were to be settled by the Rules of Conciliation and Arbitration of the International Chamber of Commerce, in a process to be held in Paris, France. Cooperation among the GasAndes partners was further promoted by cross-investments in these ventures. The project was solely equity financed, with the pipeline totaling US$325 million, the power plants US$235 million, and the distribution system estimated to be US$600 million over 8 years (Figueroa B. and Smith 2002). Thus the project would require mobilization of just over US$1 billion, 60% of the Transgas proposal.

Table 3. Shareholding Distribution of GasAndes Project		
Pipeline (Gasoducto GasAndes, S.A.)		
NOVA Gas International		56.5%
Gener		15.0%
Metrogas		15.0%
CGC, Argentina		13.5%
Nueva Renca Thermal Power Plant (Sociedad Elecrica Santiago, S.A.)		
Gener		51.0%
Duke Power		24.0%
NOVA Gas International		15.0%
Compania General de Electricidad		10.0%
(majority owner of Gasco)		
Santiago Distribution system (Metrogas, S.A.)		
Gasco		40.0%
Copec		22.5%
Gener		10.0%
NOVA Gas International		10.0%
Lone Star Gas		10.0%
Enagas		7.5%
Source: Figueroa B. and Smith: p. 153		

GasAndes' feasibility study showed that, with a competitive pricing structure, demand for natural gas in its potential area of service would double between 1997 and 2000 and increase by almost 900% in the twenty-year time frame relevant for a pipeline project. The study also anticipated that the composition of demand would undergo important changes: in 1997 the industrial sector led in total demand for gas, the study projected industry's relative share to fall dramatically (from 45% to just 12%) and use for electricity generation to increase sharply (from 34% of total to 70%) over the 20 year project lifetime (GasAndes 1994).

GasAndes was also vulnerable to political decisions. However, whereas Transgas bet that governments would allow them a monopolistic position, GasAndes' gamble was that the Chilean government would choose a regulatory scheme that would allow the market forces decide which project should proceed. GasAndes' studies had convinced it that if the government let the market decide which pipeline should be built, prices would be competitive enough for natural gas to compete effectively against other energy sources. To bet on the Chilean government choosing a regulatory scheme that would err on the side of letting the market work was an acceptable risk, given the record of economic growth under Chile's free market reforms and the constitutional/legislative limits on the Executive's ability to implement important economic changes (Aguila 2003).

The Menem administration in Argentina was split over the Protocol. YPF's director argued for limiting and regulating access to Argentine gas; the Secretaries of Energy and Economy favored creating open markets. Once Menem decided to favor Economy Secretary Domingo Cavallo's dramatic liberalization of the economy, YPF's opposition ceased (Bastos 2003). In 1995 the natural gas treaty was renegotiated, allowing exports from any Argentine gas field and providing for open access to any pipeline built. A small 356 mm, 83-km pipeline, *Methanex PA*, was immediately built to supply a methanol producing plant in the far south of Chile. The pipeline began operations in 1996 with an initial capacity of 0.73 bcm per year (IEA 2003).

Once the Argentine and Chilean governments agreed to let the market decide which pipeline would be built, GasAndes' advantages gave it a tremendous benefit in securing downstream clients. Both groups sought commitments from buyers for their supply. GasAndes' lower pricing attracted sufficient buyers to justify their pipeline, while Transgas failed to sign up enough clients; even a subsidiary of one of the Transgas' partners wound up signing with GasAndes (Qué Pasa 1995).

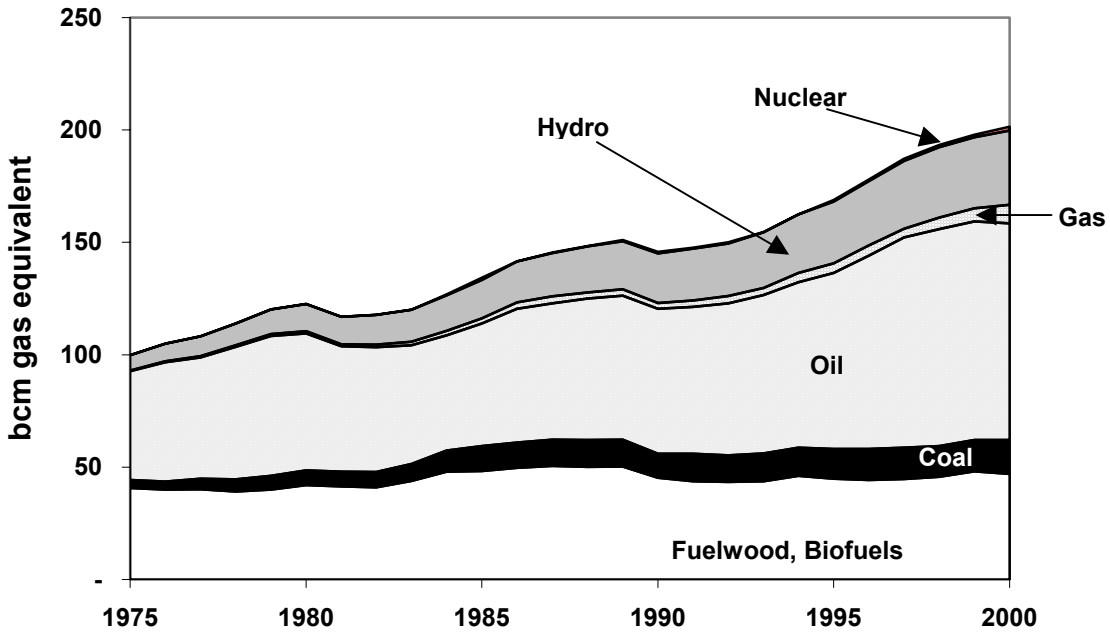
The GasAndes pipeline, with a capacity of 3.3 bcm per year in 610-mm pipe, runs 463 km from La Mora, Mendoza to San Bernardo on the outskirts of the Chilean capital, Santiago. Operations began in August, 1997. Total investment in the GasAndes project, including the pipelines, distribution grids and thermal power plants was US$1.46 billion (Jadresic 1999).

GASBOL PIPELINE (BOLIVIA-BRAZIL), 1997-1999

The third gas pipeline in our study connects Bolivia and Brazil. In a repeat of the earlier Bolivian search for an outlet for its energy resources, Argentina was a player in the discussions of the 1990s. This time, however, Argentina had its own surplus gas to sell and the question was whether Brazil would be supplied by a pipeline from Bolivia (GASBOL) or Argentina (Paraná-Porto Alegre). The GASBOL project would ultimately beat out its Argentine competitors because of price and the Brazilian government/World Bank interest in promoting the political and economic development of Bolivia.

Macroeconomic and environmental concerns raised the profile of natural gas in Brazilian policymakers' eyes. In the early 1990s, hydropower, petroleum and wood/sugar cane derivatives each accounted for about one-third of Brazil's primary energy supply, with natural gas contributing only 2% (see figure 3).

Figure 3. Brazil Primary Energy Supply, 1975-2000



Source: IEA 2003

Not only was increasing the supply of these traditional sources expensive, but fuelwood contributed to deforestation and fuel oil's high sulfur content worsened the industrial city of São Paulo's notorious pollution problems (de Franco 2001). Brazil's macroeconomic problems, particularly its fiscal deficit and inflation, were heavily influenced by the country's efforts to increase the domestic supply of petroleum, hydroelectricity and alcohol (as a fuel produced from sugarcane).

The reforms of the 1988 Brazilian constitution did not disrupt Petrobrás' monopoly. In addition, petroleum prices remained in the hands of the government. Policymakers used petroleum prices to combat inflation, often subsidizing LPG and fuel oil, to the detriment of natural gas (de Franco, 2001). Brazilian industrialists as well as private investors worried that Petrobrás was biased against natural gas.

The 1990 "Reexamination of the National Energy Matrix" report advocated increasing the use of natural gas to 6% of all primary energy in Brazil by 2010; in 1993 President Fernando Henrique Cardoso approved the Gas Commission's recommendation doubling that goal to 12% by 2010 (Salles Abreu Passos 1998). The state governments of São Paulo and other industrialized states were pressuring the federal government in the early 1990s for greater supply of natural gas, whether through domestic production or imports **(**Deffarges and Maurer 1993). At the beginning of pipeline discussions, the goal was primarily to supply the industrial sector in Brazil (ESMAP).

Table 4. Brazil's Gas Market 1973

Sector	% Total Consumption	Growth Prospects within Sector	Determinants of Prospects
Industrial Sector	69	Good	Price/Environmental Policy
Fertilizers/Feedstocks	23	Good	Price/Environmental Policy
Residential	8	Good	Inherent Limits on Growth
Transportation (CNG)	0	Good	Inherent Limits on Growth
Electric Power Sector	0	Good	Structural Constraints; Requires Policy Stimuli

Source: Author's analysis based on Deffarges and Maurer (1993) and (IEA 2003)

Brazil and Argentina had signed an accord in 1987 committing the two countries to trade in natural gas. But the two countries were far apart on price, with Brazil insisting that it would not pay more than US$1.70 per mmbtu and Argentina insisting on US$3.40

per mmbtu. Talks among representatives of both governments would continue without agreement for years.

Industrialists in Rio Grande do Sul were attentive to the looming energy shortage. They were also aware that the Argentine government and industrialists were concerned that the trade liberalization proposed under the Mercosur regional integration project (to be inaugurated in 1994) would produce a trade surplus for Brazil. Brazilian industrialists worried that their products might get locked out of the Argentine market to compensate for the trade imbalance. Importing natural gas from Argentina thus met both their energy and trade concerns.

In 1989, the industrialists' association FIESP (Federacão das Indústrias do Estado de São Paulo) mobilized their state government to promote a pipeline project directly with the provincial government of Entre Rios, Argentina. A technical feasibility study was presented to the state governments by a bi-national consortium led by the Brazilian firm Mendes Junior. The proposed pipeline would run from Paraná to Entre Rios on the Argentine side, to Porto Alegre and then on to Rio Grande do Sul, on the Brazilian side. Along its 1,140 km path it would also provide gas to the Brazilian cities of Alegrete, Santa Maria, Santa Cruz do Sul and Montenegro. The 460 mm pipeline would have a capacity of up to 3 bcm per year at a cost of US$600 million (Bem David 1989; Wells 1989; Zero Hora 1989).

The Argentine national government favored the resumption of talks and indicated flexibility on price. Petrobrás claimed to support the project in principle as early as 1990, but insisted that it would not finance the project and that the prices offered by Argentina were not acceptable. (Despite a fall in Argentina's asking price to US$2.70 per mmbtu they still remained far apart because Brazil in turn lowered its preferred price to US$1.10 per mmbtu.) Brazilian industrialists, however, believed that the price issue could be resolved and accused Petrobrás of opposing the pipeline (Teixeira 1990; Thompson 1992).

Bolivia, because of its problems with exports to Argentina via its existing export pipelines, looked once again to Brazil as a potential buyer. In 1988, Presidents José Sarney of Brazil and Victor Paz Estenssoro of Bolivia signed an agreement under which Brazil would purchase power from a 525 MW thermal plant fed by a 500-mm pipeline from the Bolivian gas fields to Puerto Suarez on the border with Brazil. Brazil also committed to purchase 10 bcm per year of natural gas, 100 million tons of nitrogen fertilizer per year and 500 million tons of high, medium and low density polyethylene annually (Petrobrás 1999). This agreement continued the earlier characteristic of negotiations between the two countries, in which gas sales were part of a larger economic integration project under which Brazil would also invest in and purchase from Bolivian industrial development projects.

However, there were some initial concerns about how much gas Bolivia might have because its reserves at the beginning of the project projected that only 80% of the capacity of the pipeline would be filled (Law and de Franco 1998).[9]

A series of agreements hammered out by the state-owned enterprises YPFB and Petrobrás in 1992, 1993 and 1994 were signed by the respective Presidents. The 1992 Paz Zamora-Collor de Mello and 1993 Paz Zamora-Itamar Franco agreements stipulated:

1. A 710 mm pipeline from Rio Grande, Bolivia to Curitiba, Brazil;
2. A 20 year contract;
3. Petrobrás received first option to build and own the Bolivian side of the pipeline;
4. Petrobrás received exploration rights in Boomerang, San Alberto and other undeveloped Bolivian fields;
5. A volume of 2.9 bcm per year, increased to 8 bcm per year within 7 years and maintained for the remainder of the contract period;
6. A commodity price of US$0.90 per mmbtu at the start of the pipeline in Rio Grande.

Seeking to continue the neo-liberal reforms he had promoted as Bolivian Planning Minister in 1985, President Gonzalo Sánchez de Lozada (whose first term ran from1973 to1977) undertook major political and economic reforms to decentralize government, attract private investment and increase earnings from non-coca exports. The Popular Participation Law of April 1994 required that a significant portion of national revenues be transferred to municipalities to fund projects selected locally. The Administrative Decentralization Law of 1995 gave Bolivia's nine departments greater autonomy from the central government.[10]

Reforms were implemented to attract foreign direct investment (FDI). President Sánchez de Lozada removed exchange controls, restrictions on the repatriation of capital, dividends, interests, or any other remittances abroad. Most public enterprises were privatized and the five major state-owned companies in the energy, transport and telecommunication sectors were "capitalized."[11]

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[9] Major finds would begin in 1995 after policies were adopted to attract foreign investors. Barbara Pando, TED Case Study: Bolivia http://www.american.edu/projects/mandala/TED/bolpipe.htm

[10] The irony of these reforms is that they empowered people at the local level (which Sanchez de Lozada wanted), but they also made central government policy more vulnerable to opposition. (Sánchez de Lozada would be overthrown by popular protests against his natural gas policies during his second term in 2003).

[11] In this uniquely Bolivian program the government sets up "mixed capital corporations" to which a private partner contributes a 50% capital investment; the remaining 50% of the shares are transferred to a Bolivian pension fund. The foreign investment is used to expand the production apparatus or the capital stock of the companies, rather than to solve budget deficit problems. The program was hailed as a model for privatization worldwide and attracted unprecedented levels of foreign investment to Bolivia (IEA 2003).

To promote foreign investment specifically in the energy sector, the Bolivian government introduced legislation removing restrictions on foreign ownership of property within 50 km of the borders and created tax-exempt areas for energy-export projects. YPFB was reorganized into several independent business units: two upstream units, a transport unit, two refining companies and a marketing company.

Capitalization of YPFB was limited to 50% of shares, but Sánchez de Lozada offered Enron 55% of YPFB's shares. Massive protests erupted when this offer was made public, and on March 22, 1996, the Army occupied refineries and natural gas facilities to prevent workers from sabotaging them. Tensions were relieved when Enron invited Shell to purchase some of the disputed shares (Pató 2000; Ladouceur 2000). Capitalization of the upstream and transportation units took place in 1996 and 1997. Prior to these reforms, about 25% of the country's natural gas production originated from fields operated by private companies.[12]

Sánchez de Lozada also wanted to increase export earnings. He threatened to withdraw his country from the gas project unless three conditions were met: (1) increased gas sales; (2) higher prices; and (3) a bigger share of the Brazilian side of the project (*Oil Daily* 1994). The first addendum to the GASBOL agreement was negotiated in 1994. YPFB and its partners negotiated an 85% share of the pipeline in Bolivia and 20% in Brazil, while Petrobrás and its partners would own the corresponding 15% and 80% shares. The diameter of the pipeline was increased to 810 mm with a capacity up to 11 bcm per year. The new agreement was also extended until financing could be arranged.

Financing the pipeline project was complicated by the uncertainty introduced by the reforms of the state and energy sector regulations in both countries, and the immature gas market in the offtake country. Petrobrás' initial foray into the commercial financial markets in 1994 came up dry.

These financing difficulties produced a second addendum in 1995, establishing that Petrobrás would pay YPFB to supply the compressor stations and raising prices for the gas at Rio Grande, the start of the pipeline. These prices were calculated using a base price that had been raised from US$0.90 to $0.95 per mmbtu for the first 5.8 bcm per year, with volumes above that at US$1.20 per mmbtu. The base price was used in a formula that included a basket of three internationally priced fuel oils and was adjusted each trimester.

The transport fee is the responsibility of TBG and GTB, and is the same along the entire length of the pipeline. It is adjusted annually based on the US Consumer Price Index (CPI). The transport fee is set in US Dollars and is the sum of two other fees, the Capacity Fee and the Conveyance Fee. The Capacity Fee is adjusted annually at the rate of 40% of

[12] Today, all natural gas production is in the hands of private companies, which have shared-risk contracts with YFPB. But there are efforts to nationalize the industry once again.

the US CPI through 207 and 15% afterward. The Conveyance Fee is revised yearly at 100% of the US CPI. The final city-gate price is subject to value added and other taxes (Gama Coutinho, 2000).[13] The parties also agreed to review prices every five years. Petrobrás also purchased a Transport Capacity Option (TCO) for an additional 2.2 bcm per year above the base contract volume of 5.8 bcm per year for US$383 million. US$81 million of this would finance the Bolivian side of the pipeline with the remainder dedicated to the Brazilian portion.

The TCO negotiation also involved Eletrobrás and the Brazilian National Development Bank, BNDES. These additional volumes were earmarked for thermoelectric plants that were to be installed in Mato Grosso do Sul and São Paulo. According to an agreement between Petrobrás, Eletrobrás and BNDES, Mato Grosso do Sul plants were expected to consume about 0.73 bcm per year and the plants in Corumbá and Campo Grande and São Paulo 1.5 bcm per year. BNDES financing of the TCO value spurred a significant increase of gas demand by the electrical sector. Bolivia also received preferential access to Brazil's gas market for the first 11 bcm per year imported.

1996 brought more formal agreements and contracts. A bilateral agreement on August 5 exempted the pipeline construction from taxes. The Definitive Contract for the sale and purchase of natural gas and a contract for pre-payment were signed on August 16. The key new features were three-fold: (1) YPFB would supply gas volumes under the Transport Contract Quantity (TCQ), starting at 3.3 bcm in year one, ramping up to 6.6 bcm by year eight, and remaining at this level for twelve years thereafter; (2) Petrobrás would take on a 0% take-or-pay commitment in year one, 60% in year two, and 80% in year three and thereafter; and (3) Petrobrás would receive preferential access to the first 11 bcm per year of available Bolivian production, as well as the option to supply gas to the pipeline from those Bolivian fields where Petrobrás (or its subsidiaries) would have a participating interest. Petrobrás also committed to finance the Bolivian portion of the pipeline to the tune of US$280 million over 15 years (Petrobrás 1999; Pató 2000; de Franco 2001; Andersen and Faris 2002).

Petrobrás played a major role in securing financing for the overall project, despite its doubts about its viability. Brazilian President Cardoso had reined in Petrobrás with elimination of its oil and gas monopoly in 1994 and a 1995 law that required all public concessions for services, including gas distribution, to be awarded via competitive bids. Cardoso and the Foreign Ministry wanted this project to proceed because they believed in the future of natural gas, they wanted to help Bolivia in a time of need (exports to Argentina had slowed dramatically), and they wanted to strengthen Brazil's geopolitical influence in the region. Petrobrás was pressured by the Brazilian government to rescue the project. Not only did it agree to oversee pipeline construction in Bolivia, it "basically

[13] IEA, 2003 reports that gas sales contracts are not in the public domain and reports a city-gate price for GASBOL customers of "around US3.20 Mbtu" at that time.

passed through financing terms which it obtained for an equivalent amount of borrowing in the market, based on its own balance sheet" (de Franco 2001; Sauer 2003; Law and de Franco 1998).

The World Bank had been working with Brazil to develop projects for its emerging natural gas market and had already approved a São Paulo natural gas distribution project in 1989. Talks between Brazil and the World Bank about a pipeline from Bolivia to Brazil had been initiated as early as 1992 (Mauro Arbex 1992). The Paraná-Porto Alegre pipeline was also included in the Brazilian negotiations with the World Bank for financial backing of a gas pipeline.

When the completed proposal was submitted to the World Bank for consideration in December 1996, the Bank had chosen to back GASBOL. Argentina's gas prices were indeed higher than Bolivia's. However, this was not the only and perhaps not even the largest factor in the Bank's consideration. The World Bank, and its partner, the Inter-American Development Bank (IADB), examine multiple factors in considering projects. The World Bank had an interest in helping create an export alternative for Bolivian gas in the wake of its loss of the Argentine market. Increasing the participation of private investment and promoting the creation of efficient regulatory agencies in both countries were also important objectives. In addition, the project had social and environmental implications that allowed the World Bank to play a larger role in Bolivia's human development and in the Amazon. Given the length of the GASBOL pipeline within Brazil, there were possibilities of interconnections to help boost the development of local and regional economies in Brazil. The international financial institutions also considered GASBOL to be a key factor in creating a Southern Cone gas transportation infrastructure (de Franco 2001; Salles Abreu Passos 1998; Sauer 2003; ESMAP 2003). Argentina's attraction to the banks on all these other points lagged significantly behind Bolivia's.

The Brazilian federal government preferred GASBOL as well. Prices were obviously a factor, but Brazilian industrialists believed the government had not been motivated to lower Argentina's prices. Brazil's agenda to bolster Mercosur and its own role as regional heavyweight also favored GASBOL, albeit indirectly. Argentina was already a firm member of the regional trade zone and the promise of GASBOL gave Brazil a carrot with which to further entice Bolivia to enter into the pact. For Brazil, however, the decision was sealed once the multilateral lending agencies (MLAs) opted to finance the Bolivian project (Sauer 2003).

The pipeline was built and operated by two consortia: Gas Transboliviano S.A. (GTB) and Transportadora Brasileira Gasoduto Bolivia-Brazil S.A. (TBG). Each is the owner of its respective side of the pipeline, and each has Petrobrás as partner through its subsidiary Petrobrás Gás, S.A. (Gaspetro). The heavy private sector component was in part due to the demand of the main funders of the project, the IADB and the World Bank, for

the majority share of the project to be owned by the private sector. The shares of different companies of TBG and GTB are presented in Table 5.

Table 5. GASBOL Ownership Structure

TBG (Brazilian section)		**GTB (Bolivian section)**	
PARTNERS	**%**	**PARTNERS**	**%**
GASPETRO – Petrobrás GAS SA	51	GASPETRO – Petrobrás GAS SA	9
BBPP HOLDINGS LTDA	29	BBPP HOLDINGS LTDA	6
ENRON	4	ENRON	17
SHELL	4	SHELL	17
TRANSREDES	12	TRANSREDES	51
of which: Bolivian Pension Funds Enron Shell	6 3 3	of which: Bolivian Pension Funds Enron Shell	25.5 12.75 12.75

Source: TBG website.

These public companies, private enterprises and pension fund administrators had differing goals and stakes. To deal with this diversity of interests they created an ownership structure for the entire project that comprised a certain degree of cross-ownership by each sponsor group. To administer the project they created special committees with representation from all sponsors. Legal responsibilities for most of the actions, however, rested with PETROBRÁS until TBG was solidly established (de Franco 2001).

The MLAs played a fundamental role because of the nature of Brazil's energy market and the magnitude of the project itself. Costs of the pipeline were expected to exceed $2 billion. The short maturities and terms characteristic of commercial loans on this amount would have resulted in a price level for gas that would have severely limited its ability to penetrate the market (de Franco 2001).

Accessing the resources of the multilateral lending agencies was complicated. The Bolivian government's privatization push and restructuring of YPFB's role in the energy sector had produced a transportation company, GTB, in which private capital overwhelmingly predominated. Consequently, the government could not offer the sovereign guarantees required by the MLAs.

The total cost of GASBOL was US$2.15 billion, of which $1.72 billion was spent on the Brazilian segment and $435 million on the Bolivian TBG was the debt-holder for the project, financed with 64% debt and the remainder in equity. Since financing draw-downs from multilaterals occurred only one year after construction was launched, private shareholders had to absorb the initial construction costs; they also had to accept restrictive and uncertain terms for reimbursement (Gama Coutinho 2000). Table 6 summarizes the sources of finance for the full project:

Table 6. GASBOL: Sources of Funding

Sources	**Millions $USD**	**% Total**
Inter-American Development Bank (IADB)	240	11.1%
World Bank (World Bank)	310	14.4%
International Finance Corporation (IFC)	126	5.8%
Andean Development Corporation (CAF)	80	3.7%
European Investment Bank (EIB)	60	2.8%
Finame (Brazilian National Development Bank agency)	285	13.3%
Export Credit Agencies	286	13.3%
External Financing (Loans)	**1,387**	**64.4%**
Petrobrás (BNDES-TCO)	383	17.8%
Petrobrás	165	7.7%
TBG and GTB Shareholders	219	10.1%
Internal Financing (Equity)	**767**	**35.6%**
TOTAL	**2,154**	**100.0%**

Source: Infrastructure Report (April 2000).

Investing in the mega-project that GASBOL represented was inherently risky for all parties involved. Investors had to gauge the degree of risk and seek mechanisms to hedge those risks. Despite the potential of the Brazilian natural gas market, investors faced an important disincentive in the country's pricing policies. The GASBOL contract priced gas in US Dollars and linked the price to a basket of international fuel prices. When

international oil prices rise and the Brazilian currency falls, gas becomes too expensive for end users, but suppliers are caught in long-term contracts.[14]

The MLAs were confident because they could take the long view and Brazil will clearly continue to experience a growth in energy demand over the long run. Private investors and Bolivian pension funds hedged their risks of investing in the pipeline itself by getting direct Brazilian government support for the project. First, they required take-or-pay contracts with Petrobrás. Still, this was not enough security and they dragged their feet on the project until multilateral financing was secured and Petrobrás assumed the financial risks of the project (Law and de Franco 1998). With regard to investing in thermal power plants, private investors largely stayed out until the Brazilian government assumed the foreign exchange risk and Petrobrás became a co-investor. Even then, new investment in power generation was slow in coming (de Oliviera 2004).

Petrobrás attempted to shift these risks by locking downstream parties into long-term gas purchase agreements. In addition, in 1998, when the pipeline was half built, Petrobrás negotiated an agreement with TBG that allowed for periodic revisions of the capacity amounts reserved under the Brazil TCX Transportation Agreement if required by Petrobrás. The capacity of the TBG Pipeline to be utilized by Petrobrás in 2000, 2001 and 2002 was reduced, while the capacity usage by Petrobrás for 2004, 2005 and 2006 was increased. These adjustments left TBG exposed in the early years, but did not eliminate Petrobrás' exposure to volume risk (de Franco 2001).[15]

Construction of the giant GASBOL pipeline began in 1997 and was completed in 1999. The Petrobrás-guaranteed market for Bolivian natural gas (along with the privatization of the sector) encouraged massive investments in exploration and pipeline construction in Bolivia, which in turn produced certified (proven and probable) natural gas reserves that increased from a level around 170 bcm before 1997 to 1,481 bcm by January 2001 (IEA 2003). Since natural gas and petroleum are often found together, petroleum reserves also increased dramatically from 200 million barrels in 1997 to 892 million barrels by January 2001. During the construction of the GASBOL project, new reserves were discovered by a number of companies, such as Chaco, a subsidiary of BP Amoco (UK), Perez Companc (recently purchased by Petrobrás), Pluspetrol and Andina (both Argentina), Maxus, a subsidiary of YPF (now controlled by Repsol of Spain), Petrobrás, Total (France), Mobil Oil and Tesoro (both US). Bolivia now has the second gas largest reserves in Latin America after Venezuela and the most non-associated gas (ESMAP 2003; Andersen and Faris 2002; IEA 2003). Bolivia's proven reserves now make it possible to

[14] In 2003 city-gate gas prices along the GASBOL pipeline were well above prices for Brazilian gas and prices for fuel oil or coal at around US$3.20 per mmbtu

[15] Petrobrás losses on the GASBOL project totaled some US$1 billion in 2002 (Sauer, 2003).

exceed the volumes that can be shipped via the GASBOL pipeline. Total and Petrobrás are studying the feasibility of constructing a second gas pipeline to Brazil or doubling the capacity of the GASBOL pipeline (IEA 2003)—a proposal that seems rather fanciful given the current financial woes of GASBOL.

CONCLUSION

In the 1970s case (YABOG), the developed nature of Argentina's gas market drove Bolivian gas to Argentina instead of Brazil. At the time, Brazil's government would not invest to develop Bolivia's natural gas exports because it perceived other options as preferable (including investment in hydropower at Itaipú and alternative energy sources such as biomass, gasohol and domestic exploration for petroleum, which were all firmly in national hands).

Moving to the 1990s and the shift to markets in the Southern Cone—the GasAndes project beat the Transgas project because it was designed to compete. When the "market" decides, individual buyers make decisions based on price. GasAndes sought to deliver gas to a small group of customers as cheaply as possible. The Transgas project sought government protection to serve an expanded grid of customers, serving a range of objectives other than price. When the Chilean government decided to allow the "market" to decide—or to not provide the concessions sought by Transgas—the GasAndes project was the clear winner. Geopolitical good will and confidence between Chile and Argentina was an important factor in both governments' willingness to let the market determine how much gas would move across their borders, at what price and under the control of which companies.

Governments and MLAs played a larger role in the GASBOL project. The Brazilian government and the World Bank sought to intervene to push forward a project that would not have advanced otherwise. Government and multilateral lending agency intervention subsidized the project via preferential financing and contract guarantees. MLAs funded the GASBOL project because it was seen as an important lever to induce Bolivia and Brazil to undertake the economic and political reforms and spur development of the entire Southern Cone region. Because Argentina already had a mature gas market and the government's role in the economy had already been scaled back dramatically, the MLAs perceived a greater payoff in the long run for GASBOL than for its Argentine rival. The decision by the World Bank not only added support to Brazil's geopolitical interests in Bolivia, but also attracted private investors to GASBOL—and away from Paraná-Porto Alegre. Brazil pushed Petrobrás to support the project as part of its broader regional objectives and at the behest of domestic industrialists. Critically, however, the Brazilian government did not provide a domestic energy regulatory regime to support an economically viable GASBOL project.

EPILOGUE

The Southern Cone gas markets are currently in a state of great uncertainty. Just two years ago the future looked bright—the failed Transgas project was reincarnated and completed as "the Gasoducto del Pacífico", and the Paraná-Porto Alegre project began to progress in piecemeal fashion. A project was also proposed to reverse the flow of the YABOG (as well as build a parallel pipeline), in order to send Argentine gas to Rio Grande, where it could then intercept the GASBOL pipeline and supply Brazil (IEA 2003).

The collapse of the Argentine economy in 2002 produced concerns in Chile that the free market orientation of future governments in Argentina would be diminished. Chileans wanted to ensure transparency in the energy sector and equal treatment for Chilean consumers, e.g. that Argentine supplies to Chile would not be cut-off (XXXVII Reunión 2002). An additional protocol to the gas agreements between the two countries was signed in 2002, creating a national information system to induce transparency in both countries.[16]

However, Chile's worst fears came to fruition in 2004, when Argentina restricted exports to Bolivia to address its own domestic gas shortage. (The shortage resulted from domestic price controls in Argentina—which in turn reduced the incentive to maintain supply.) Not only did the price of natural gas rise in Chile—along with the specter of blackouts—but a political debate has developed concerning the appropriateness of depending on energy imports from Argentina.

Meanwhile, Bolivia staggered through domestic turmoil in 2003-2004 as a project to export LNG to the US and Mexico via Chile rekindled geopolitical animosity. First, President Sánchez de Lozada was run out of the country for attempting to implement the export plan. Then, Bolivia insisted that no Bolivian gas would pass through Chilean territory until Chile provided Bolivia with some type of sovereign access to the sea as compensation for the territory lost in the War of the Pacific. Faced with Chilean refusal to discuss the issue and Argentine shortages of natural gas, Bolivia signed a contract with Argentine to supply it so long as "not one btu" of Bolivian gas is diverted to Chile.

The Southern Cone gas markets seem to have come full circle. If the gas markets are to recover their path towards regional integration, governments in the Southern Cone will have to pay more attention to the social and economic consequences of their energy

[16] Government entities (the Secretary of Energy and ENERGAS in Argentina, Comisión Nacional de Energia in Chile) will be responsible for maintaining updated information and providing it in a timely fashion to those who request it. The topics covered include all regulations, participants, prices and tariffs, future plans and all new contracts, except for confidential provisions (PROTOCOLO ADICIONAL).

promotion policies for their citizens. If private investors wish to tap into this bounty they will need strategies to facilitate a broader distribution of the benefits of natural gas exports.

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APPENDIX: TERMS OF MULTILATERAL LOANS FOR GASBOL

World Bank

In December, 1998, the World Bank and Petrobrás signed a loan of US$130 million. The loan is for a 15-year period and amortized in 24 biannual portions after a three-year grace period. In December, 2000, the World Bank approved PCG notes worth US$180 million. TBG issued these notes in the US capital market. The privately placed notes are fixed rate instruments with an 18-year maturity. The principal would amortize over a three-year period (years 16 to 18) in three equal installments. The guarantee covers 100% of the amortizing principal repayment at scheduled maturities on a non-accelerable basis. In addition, the World Bank would also guarantee two annual coupons on a rolling basis, which cannot be accelerated. The negotiated price has been 435 basis points (4.35%) above 30-year US Treasury Notes, which is extremely advantageous to the project finances and indicates the high value-added by the Bank instrument. This is the first Bank guarantee operation for Brazil.

IDB

Under Resolution Nº DE/152-97 of 17 December 1997, the IADB Board of Directors authorized a loan of US$240 million from the Bank's Ordinary Capital to TBG.[17] The loan was signed December 15, 1998 and had a disbursement period of three years, ending December 15, 2001. The loan is for 20 years, with amortization in 33 biannual installments with a three-and-a-half-year grace period. The IADB was scheduled to partially finance the construction and installation of the Corumbá-Campinas Segment of 1,256 km, and the purchase and installation of the monitoring and control system, SCADA, for the entire Brazilian portion of the pipeline.

EIB

Petrobrás' loan with the European Investment Bank, agreed to in November 1998, is over 20 years, with a 5-year grace period and repayment in 30 biannual installments. The loan is provided in the context of the European Community's cooperation policy with third countries that have concluded co-operation agreements.[18]

[17] de Franco, 2001.

[18] Gazeta Mercantil 1998; Financial Times Energy Newsletters, 1998

CAF

In November 1998, the Corporación Andina de Fomento and Petrobrás agreed on a US$80m loan to finance construction of the Bolivia-Brazil natural gas pipeline. The financing would be paid back in fifteen years with 18 payments to be made after a six-year grace period and fixed interest rates of approximately 8%, based on the US Treasury rate plus an annual spread of 3%. The loan covers a 15-year period, with payments made by the Brazilian state energy company every six months after a six-year grace period. Petrobrás had earlier in August, 1998 reached a similar US$85m financing accord with CAF in order to secure rights to transport natural gas through the Bolivian section of the pipeline (Gazeta Mercantil; Financial Times).

OPIC

In June 1999, the US Overseas Private Investment Corporation (OPIC) approved US$200 million in concessional financing to Enron for the pipeline project (Library of Congress, 1999).