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REGULATORY ISSUES IN BRAZILIAN EMERGING GAS INDUSTRY

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Abstract
This paper provides an analysis of current context for the development of the Brazilian emerging gas industry, in order to evaluate with type of regulation framework is better adapted to this industry. Two main questions are is raised: i) Is territorial monopoly the best approach for the industrial organization of the infant The Brazilian Gas Industry – BGI? ii) How should the regulatory framework of the gas industry be related to the competition oriented regulatory framework that is being used for the mature Brazilian electricity market? The paper shows that the type of regulation adopted in North America and in Europe some decades ago when their gas industries were infancy stage is not adapted for BGI. New driving forces are bounding the development of the gas industries. The BGI, requires an innovative regulatory framework that preserve market power equilibrium and regulatory coherence throughout the gas chain.

Introduction

BGI is at its infancy but the electricity market can be considered relatively mature, at least in Southeast area of the country were most of the industrial production is made. This peculiar situation raises two fundamental questions: i) Is territorial monopoly the best approach for the industrial organization of the infant BGI? ii) How should the regulatory framework of the gas industry be related to the competition oriented regulatory framework that is being used for the mature Brazilian electricity market?

This paper intends to offer a first attempt to answer these two questions. The next section summarizes the recent pattern of growth of BGI while the third section analyses the driving forces in the emerging gas industry. The fourth section reviews the current regulatory BGI point out its inconsistencies and it suggests few guidelines for future regulation orders.

2 – The Brazilian Gas Industry

Gas supply has traditionally occupied a small place in the Brazilian energy market (about 2,5% of total energy consumption). Reserves were low and very few infrastructure to transport it to consumers was available (Table 1)**.** The BGI is at its infancy and there is a very large potential market for gas to be developed. Brazilian per capita gas consumption is very low (30 m3/year) as compared to mature gas markets, such as Argentina, where per capita consumption is 580 m3/year. This situation is expected to change substantially in the near future. Large natural gas

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reserves were found both in Brazil and in neighboring countries while a market oriented reform of the electricity supply industry creates a favorable environment for the rapid development for BGI.

Until recently, there was no clear, specific regulation for the gas industry. Petrobras, the federal oil and gas company, that was then a monopolist for oil and gas production, imports and transportation to the city gates, was in practice the industry regulator. In 1997, an independent regulator (ANP) was created for both oil and gas. Since then, a regulatory framework for this infant industry is under construction but fundamental questions regarding the industrial organization have not been cleared off by the regulator so far.

Table 1

Main Features of BGI - 1999

Brazilian Gas Reserves		
Associated	160.9 billion m^3	
Non-associated	62 billion m^3	
Total	225.9 billion m^3	
Gas Supply		
Domestic production (Petrobras)	29 million m^3/day	
Imports (Bolivia)	8 million m^3/day	
Final Users Consumption	23 million m^3/day	
Trunk Pipelines	**Extension (km)**	
Petrobras	6,713	
Enron	266	
Distribution Pipelines	**Extension (km)**	
19 distribution utilities	5,571	
Distribution Utilities	**Sales (thousand m^3)**	**Number of consumers**
Comgas (part of São Paulo State)	3,790	310,000
CEG Rio (Part of Rio de Janeiro State)	1,258	14
CEG (Part of Rio de Janeiro State)	1,158	371,400
Bahiagas (State of Bahia)	2,026	30
Others 15 Utilities	3,960	253

New opportunities

For many years, Bolivia and Argentina have been unsuccessfully pressing Petrobras to import their gas to the Brazilian market (Dias Leite, 1997). In the 1990's, liberalization of the Brazilian energy markets[3] paved the way for a new policy regarding the development of the BGI. Substantial gas reserves have been discovered in Brazil and several gas-fired thermal power plants are planned to be built in the next few years. Government energy and environmental policies introduced incentives for natural gas consumers in order to increase its share in the energy balance to 10-12%. Roughly, the Brazilian consumption of natural gas should grow from the current level of 23 millions m^3/day to 120 million m^3/day in the year 2010. Private investors are expected to develop the network of pipelines and find reserves that is needed to achieve this objective.

[3] See Almeida and Pinto Jr. (1999 a and b).

Imports from Mercosur[4] should play a substantial role in the BGI. A 3000 km pipeline (Gasbol) that can transport 30 millions m^3/day gas from fields in Santa Cruz de la Sierra (Bolivia) to Porto Alegre passing by São Paulo and Curitiba is already in operation[5]. Another pipeline should come on stream shortly that will move another 12 million m^3/day from Argentina to Brazil[6]. There are plans to import gas to the Northeast of Brazil using LNG tankers to bring it from Nigeria and the Caribbean. However, most of the natural gas that will be used in Brazil should come from the Brazilian sedimentary basins both on-shore and off-shore. Petrobras reserves are substantial and there are very optimistic prospects mainly concerning off-shore.

What type of regulation for this nascent industry?

Franchised monopoly was the industrial organization traditionally used to develop the gas industries during its infancy in order to reduce transaction costs (Estrada et al., 1995). Long term take-or-pay contracts were used to link projects and strategies of few producers and most often one single transmission company. Moreover, gas utilities were not allowed to supply other public services (e.g. communication, electricity) because these industries were operated by other companies that received territorial monopolies as well. This vision dominated the regulatory framework of the gas industry until the 1970s, when many gas markets reached its mature phase.

Since the 1980's, the industrial organization of the gas industry started to change dramatically in mature markets. Open access to the network of pipelines was given, competition was introduced among suppliers and barriers that forbidden public service suppliers to move into other industries were removed. This new context has completely reshaped the regulatory regime that has been historically used to oversee gas supply. Particularly important is the growing convergence between electricity and gas industries, as result of the competitiveness of gas turbines in electricity generation.

Most countries with mature gas industries are moving to a new industrial organisation where competition and open access are central pieces and price regulation is limited to the use of the network of pipelines. Large consumers of natural gas, specially thermal power plants, are free to contract their gas but have to pay transportation fees to pipeline owners. Countries with non-mature gas industries are facing a very different environment for the development of their energy industries, as compared to the circumstances experienced by mature gas industries. As new driving forces are triggering the evolution of gas markets, gas industries in emerging markets require new and innovative regulation framework

3 – New Driving Forces

The context of gas markets was drastically changed in the last two decades. Two events were particularly relevant: i) competitiveness of gas-turbines technology, making possible the diffusion gas use for base load in the electricity supply industry; ii) liberalization of utilities (gas, electricity, telecom, water and sewage) markets. As result of these changes more and more utilities are moving to new markets producing a progressive convergence between gas and electricity business.

Gas and Electricity Convergence

[4] This is the name of the Common Market in the South Cone: Brazil, Argentina, Uruguay, Paraguay and two other associated Countries, Chile and Bolivia.

[5] Investment cost of this pipeline was US$ 1,9 billions. The volume of 30 million m^3/day should be reached progressively to the end of the 8th year of a 20 year take or pay contract.

[6] This new pipeline will link the pipelines in the north of Argentina (Rosario) to Porto Alegre.

Increasing availability of natural gas[7] and innovations in gas turbines technology[8] created a favorable context for the rapid expansion of natural gas in power generation. This is specially true were institutional and economic conditions are created to induce competition as it happens in Europe[9] and in North America[10]. This new context generated a movement of gas utilities towards the electricity industry and *vice-versa*. Three main elements are inducing utilities to this movement: i) to avoid high transaction costs[11]; ii) to explore opportunities of economies of scope both in the network (pipelines and wires) and in marketing energy services to the end-users[12]; iii) to take a position in the energy market that render possible the arbitrage between fuels for electricity generation and fuels for heat production, exploring price fluctuation in both markets to increase profitability. A striking evidence of this trend is the emergence of *merchant power plants*, which are designed to use gas for power when gas price is low or electricity prices are high, and direct their gas supply to final consumers when prices are in the reverse situation.

Although there is no consensus that the process of convergence between gas and electricity industries is a long term process[13], convergence seems to be a structural and durable trend up to this moment. Energy authorities in countries that have initiated first the liberalisation of their energy sector seems to share this view. The British, for instance, recently created a single regulatory agency for both gas and electricity suppliers.

Global players

Liberalization and competition have completely changed strategies of energy companies. Old monopolies see newcomers fighting for their former captive customers excited with the idea of new services and lower prices. Competition comes not only from companies that traditionally operated in the business but increasingly from firms belonging to other energy industries and public services providers as well. As result, companies that until quite recently were used to monopoly power and co-operation, are now competing fiercely for the same consumers. Rivalry among energy companies is a process accelerated by the low growth rate of mature energy markets that induces old, established utilities to move to emergent markets.

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[7] See Terzian (1998), Stern (1998) and Estrada et al. (1995) about the improvements of gas competitiveness in energy markets.

[8] See Islas Samperio (1995) about the innovation process in gas turbine technology.

[9] In Europe, the share of natural gas in power generation is already 15% of all power supply. However, in countries with large gas reserves, this figure is much more significant. There is an widespread perception that this share will grow significantly in a near future (Terzian, 1998 and Stern, 1998)

[10] In the US, about 25% of current generation capacity concerns gas-power plants. This figure does not reflects the real role of natural gas in the US, since about 60% of the added capacity in this decade was made by gas power plants. Furthermore, the American Department of Energy- DOE estimates that 75% of the planned capacity until 2006 will be gas-fired power plants.

[11] Gas-fired plants do increase transaction costs for utilities positioned only in one of the industries due to the uncertainties regarding the future supply of gas. Vertical integration (i.e., co-ordination of investments in both gas and electricity industries) can avoid opportunist behaviour of agents positioned in other segments of supply chain (Carlton e Perloff, 1994).

[12] Main factors contributing to the scope economies are the use of the same firm's infrastructure to build and operate joint transport networks (pipelines and wires) reducing the operational and investments costs; use of one single system for metering and billing, reducing costs of commercialisation.

[13] Some analysts argue that this movement is just a sign of a larger market trend which is the convergence of all network industries (telecom, cable tv, water and sewerage) (Flowers, 1998 and Jamison, 1999).

The dominant competitive strategies observed in liberalized energy markets are: i) business diversification to reduce industry risks; ii) a certain degree of vertical integration to build market power and to explore scale and scope economies; iii) geographic diversification to explore opportunities in different markets and reduce market risks. Most often, energy companies strategic plan is a mix of these strategies due to larger obstacles for utilities to diversify or to verticalize in their original concession area[14]. Market concentration is the main outcome of these dominant competitive strategies, giving birth to large international energy companies able to compete globally.

Emerging countries offer many opportunities for these global players. Their consumption is growing fast and most of them are pursuing very aggressive privatization policies. These markets are particularly interesting because competition tend to be less intense since global players tend to co-operate, specially in the acquisition of state-owned utilities, in order to reduce financial risks. In the Brazilian case, for instance, almost all privatized utilities have been bought by different consortia of global players. However, this seems to be just an entry strategy that is changing after these companies have acquired some local experience. Indeed, companies like EDF and Southern that structured a consortia to acquire Light and Metropolitana[15] are breaking up their initial co-operation agreement and will be soon competing for the supply of large consumers in the Southeast of Brazil.

3 – Regulatory Issues In Brazilian Natural Gas and Electricity Markets

Constitutionally, gas regulation is divided between federal and state authorities. Oil and gas production and transportation to the city gates are regulated by the specific federal regulatory agency (ANP) while gas distribution is regulated at each state by local regulatory agencies that most often take on board the regulation of all public services (gas, electricity, telecommunication, water and sewage, public transportation).

Since its inception, ANP encouraged new players to come into the Brazilian oil and gas markets, aiming to introduce competitive pressures in these industries. Several blocks were offered for companies interested to explore oil and gas in a first bidding round and a second round is going to take place in June 2000. Gas imports specially from Argentina and Bolivia were stimulated and existing trunk pipelines were open to upstream producers, importers and distribution companies. New trunk pipelines will be franchised soon. Although Petrobras[16] still owns most of the domestic natural gas reserves and controls the existing trunk pipelines, it is expected that newcomers will rapidly reduce its market power.

Until recently, there was no clear price policy for domestic gas. Since last February, consumers will pay a maximum price at each city gate that will result from the sum up of a commodity price and a transportation cost. The commodity price is settled by the Energy Ministry and will move accordingly to a basket of fuel oil international prices. The transportation costs is regulated by ANP, accordingly to the travel distance of the commodity.

At distribution level, state regulatory agencies are building a new regulatory framework as well. Their main objective is to create an attractive investment context, reducing risks for investments needed to build up the distribution network. Franchised monopoly has been so far the main industrial organization chosen by state level regulatory agencies to achieve this goal. The two

[14] See Jamison (1999).
[15] Light is the distribution company tha has the concession for the area of Rio de Janeiro and Metropolitana for the area of São Paulo.
[16] A company owned by central government.

main distribution companies, COMGAS and CEG, have been both privatized and several other state owned gas distribution utilities have been sold off to international oil and gas companies in the last 5 years. So far, competition does not concern the gas end-users and thermal power plants are constrained to buy their gas supply from their local distribution utility.

ANP developed an institutional framework that offers gas utilities and gas producers open access to trunk pipelines. This framework intends to give a prominent role to competition in the upstream, although state level regulators organized distribution as a monopoly. This situation confines competition to bulk market only, consumers remaining prisoners of their local distribution company. Therefore, there is a fundamental market power asymmetry between players positioned in the upstream and players positioned in the downstream. This asymmetric market power is full of long term consequences.

Regulation in the Electricity Market

As in other parts of the world, the Brazilian electricity supply industry was recently reformed with the objective of introducing competition in both generation and supply of electricity services to end-users (de Oliveira, 1999). The new institutional arrangement includes: i) an independent system operator (ONS)[17] for managing the grid; ii) a new regulator (ANEEL) for supervising the electricity business both economically and technically; iii) a wholesale market[18] where generators have to find consumers for their power; iv) a *price-cap* regime for the wire business and captive consumers as well. Moreover, government decided to privatize state-owned electricity companies and that the new regulatory framework must be attractive to private investors. Several companies, most distribution utilities[19], have been privatized providing approximately US$ 20 billions[20] to the Treasury.

Electricity consumption remains growing at rates over 3% a year. In order to stimulate new investiments in generation capacity avoid rationing of power, government recently decided to launch a plan for the construction of 40 gas-fired power plants MW that should add 20 MW of installed capacity by the year 2003. Substantial incentives were offered for private investors interested in this package of power plants: i) output produced that cannot find its way to the market place will be bought by Eletrobras, a state-owned company; ii) soft loans are offered by BNDES[21]; iii) gas price was fixed at US$ 2,26/ million Btu for the next 20 years and indexed to a basket of fuel oil prices in the international market; iv) electricity generated by these power plants have their prices fixed at convenient level and any increase in gas price will be passed over to captive consumers.

Monopoly downstream but competition upstream: what consequences?

First, it represents a premature selection of dominant market players because monopolists can take advantage of its contracting power both in upstream and downstream to decide the rhythm and pattern of new investments. Downstream, these players can, for instance, chose to direct their gas supply to thermal power instead of other consumers like residential and commercial users of

[17] Named "*Operador Nacional do Sistema*" - ONS.
[18] ANEEL has decided to implement progressively the wholesale market until 2006. After 2001, the share of the wholesale market in the in total electricity transactions will increase of 25% annually. Therefore, by the year 2006 all electricity exchange will be done through the wholesale market.
[19] Lower economic risks and higher potential to improve productivity increased the economic attractiveness of these companies.
[20] This price have been in average 50% higher than the minimum price established by the government.
[21] The National Bank for Economic Development.

gas. Upstream, they can select which players will receive their contracts to provide gas to the market and to transport this gas to the city gates. Therefore, they will be the gatekeepers that entrants in the BGI will have to deal with.

Second, gas distributors can use that asymmetry for rent seeking strategies in inter-fuel competition. Since there is no restriction for gas utilities to enter the electricity or the oil markets, they can operate their monopoly power at the gas end to use cross subsides in order to avoid inter-fuel competition. This will be made easier if gas utilities take positions in many segments of the energy market. It is important to note that most of the near future gas demand will come from new gas power plants. Competition between gas and electricity at end-users is severely bounded by the fact that gas-fired power plants will be able to pass over any increase in gas price to consumers.

The use of gas distribution companies asymmetric market power is already in place. For instance, in the case of the trunk pipeline that transports gas from Bolivia, distribution companies are refusing to sign supply contracts with Gaspetro, the current holder of the gas import contract. By this way , they are creating available capacity in the pipeline that according to ANP ruling has to be offered on a open bid to other players. Distribution companies can use this mechanism to discriminate between gas suppliers, eventually buying gas from associated companies. This trend can explain the verticalization strategy of Agip and its aggressive biding for exploration concession areas and acquisition of a distribution area in São Paulo state.

Given the consequences mentioned above, it seems important to change current regulatory framework in order to re-establish market power equilibrium and regulatory coherence throughout the gas chain. Considering the new driving forces of emerging gas markets, a fundamental trait of the regulatory framework should be the creation non-discriminatory opportunities for new players to participate in this rapid growing market. A market oriented regulatory framework is essential to foster investments and for that a first step is to offer power generators and large consumers the right to choose their gas supplier.

4 - Conclusions

Natural gas is expected to assume an important place in the Brazilian energy balance. The share of natural gas in primary energy demand is expected to increase from 2,8% to about 12% in 2010, fuelled by private investments. A new regulatory framework for the infant BGI intends to create an attractive context for private investors.

Territorial monopoly has been given to distribution utilities, in order to allow these firms to face the high risks faced by an infant industry. This type of regulation was chosen in North America and in Europe some decades ago when their gas industries were infant as well. However, the BGI is facing a different economic and technological context.

New driving forces are bounding the development of the gas industries: i) the diffusion gas-fired turbines use for base load in the electricity supply industry; ii) liberalization of utilities markets and a new industrial dynamics resulting in a progressive convergence between gas and electricity business. Traditional regulation framework for infant gas industries will not produce the same results in this new context.

Territorial monopoly in gas distribution while competition is introduced in other segments of the gas industry and the electricity industry as well is a source of asymmetric market power between

players. Gas distribution companies can use their monopoly power to discriminate among consumers and to develop verticalization strategies as well.

The BGI, requires an innovative regulatory framework that preserve market power equilibrium and regulatory coherence throughout the gas chain. This can be obtained offering power generators and large consumers the right to choose their gas supplier. The development of the distribution network to supply low volume consumers (residential and commercial users) is a much riskier business. Therefore, the regulator has to find forms of incentives other then cross subsidies from higher consumers (power generators and large consumers). A careful evaluation of economic and financial risks for projects intending to supply low volume consumers markets can generate appropriate mechanisms to protect investors from excessive risks that eventually have to be taken on board by society as a whole.

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