

# **Natural Gas Regulation in Brazil: a framework to Stimulate Competition in the State of São Paulo from 2011**

by

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## **Abstract**

Regulation of the natural gas industry is recent in Brazil. The agencies regulating this industry, both in Federal and state levels, were set up only in the late 90's. Figure 1 shows the current natural gas industry organization in Brazil. This paper proposes a new regulatory framework to pave the way to competition in retail trade of natural gas in the state of Sao Paulo from 2011. At this year, a regulatory mark in the state will liberalize the retail trade for industry and electricity generation. Market planning of natural gas in Sao Paulo State is done through a market outlook. Demand is projected using simple logistic curve estimation. On the supply side, projection considers Petrobras Strategy Planning. Proposed regulatory framework considers international experience and Brazilian characteristics, both in upstream and downstream levels. Brazilian natural gas market is concentrated in the Southwest part of Brazil, and the interstate system is interconnected in the major markets. It means that a natural gas oversupply in Brazil would directly reflect in Sao Paulo State, that is located in the Sothwest. In the optimistic (aggressive) scenario considered for 2011, Brazil would have an oversupply of 0.4 bcf/day. This oversupply together with Bill 334/07 for the upstream, and the downstream framework proposed in this paper, would help competition development in the state of Sao Paulo; it would probably: 1) create a wholesale and a retail gas market; 2) stimulate risk management tools, i.e. derivative instruments; 3) promote a shift from long-term to short-term contracts between LDC's and shippers; 4) create a spot and future markets; 5) promote a move towards spot and futures gas price indexation in mid- and long-term supply contracts. Competition would probably bring end-user prices down, as it happened in USA and the

United Kingdom (IEA, 1998). However, government and regulators should work together on planning activities and the security of supply, to avoid possible shortage problems that happened in these countries.

## 1. Introduction

Regulation of the natural gas industry is recent in Brazil. The agencies regulating this industry, both in Federal and state levels, were set up only in the late 90's. "Agência Nacional do Petróleo" (ANP), a Federal regulatory agency, was created by Law 9,478, in 06/08/1997, during the government of President Fernando Henrique Cardoso, to regulate and monitor oil, natural gas and other fuels' markets. ANP regulates natural gas upstream activities (production, imports, and transportation) and storage. Before a constitutional amendment in 1995, a legal monopoly granted the oil and gas upstream activities to a Federal-government-owned company called Petrobras.

The current Constitution, holding since 1988, sets forth that the Brazilian states are responsible to explore downstream natural gas services (distribution and retail trading). That Constitution allowed initially just state-owned companies to carry out such services. A constitutional amendment, also approved by Congress in 1995, extended this right to investor-owned companies holding a concession contract granted by the state governments. So, today, the state governments, through local agencies, regulate the downstream activities of the gas industry in the country (ANP, 2001). Figure 1 shows the current natural gas industry organization in Brazil, while Figure 2 illustrates the regulatory regimes holding since Law 9,478 was passed in 1997.

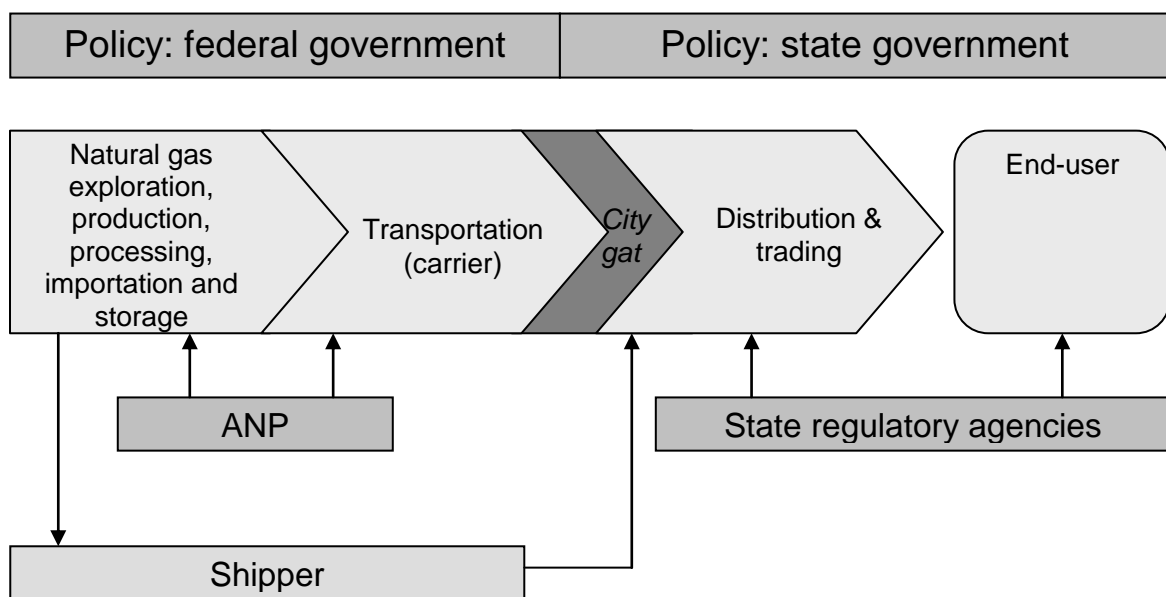
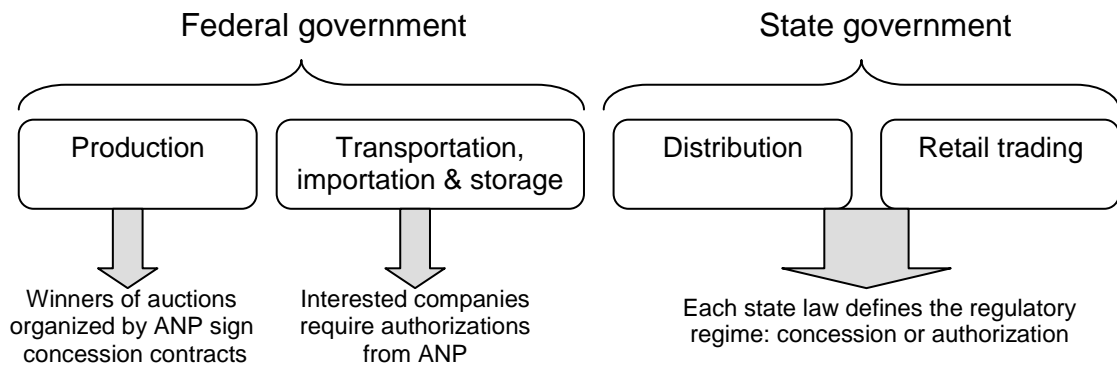


Figure 1: Organization of the Brazilian natural gas industry



**Figure 2: Regulatory regimes in the natural gas industry in Brazil after Law 9,478/97**

In the exploration and production (E&P) stages of the natural gas production chain, auctions for E&P blocks are organized by ANP, and the winners sign concession contracts to explore and produce oil and gas fields during a specified period of time. Transportation, importation and storage need just authorizations provide by ANP to the interested companies.

A framework to stimulate competition in retail trading for the state of São Paulo is proposed in this paper. When Comgas, the only natural gas distribution utility existing in the State of São Paulo was privatized, in 1999, and two new, private, utilities were created in the state, their concession contracts, signed with the state government, defined that their monopoly in gas sales for power generation facilities and industrial plants will end from 2011 on. However, if market structure and regulation stay as they are now, competition will probably not develop to a meaningful scale.

In the following section, this paper provides a short description of the natural gas industry in the state of São Paulo and Brazil. In section 3, a likely surplus of natural gas in 2011, in Brazil, is discussed. Then, the current upstream gas regulation is reviewed, together with an analysis of two gas bills now being discussed in the Brazilian Congress. In the sequence, downstream gas regulatory in the State of São Paulo is briefly described. In section 5, a new regulatory framework to pave the way to competition in retail trade of natural gas in the state from 2011 is put forward. Finally, in the concluding section, the foreseeable impacts of the proposed framework are examined.

It is important to point out that the authors are not worried here about arguing for a more market oriented, or a heavier handed regulation, since both structures can produce distorted results, as demonstrated by several experiences all around the world, and the efficacy of corrective actions depends on how advanced are the antitrust legislation and performance based regulation available in each case.

## 2. The Natural Gas Industry in the State of São Paulo

The state of São Paulo is located in the Southeastern part of Brazil. In 2004, the state was responsible for 31% of the National Gross Domestic Product (GDP), corresponding to US\$ 186.81 billion<sup>1</sup> (IBGE, 2005). “Comissão de Serviços Públicos de Energia” (CSPE), which was created in October 1997, regulates natural gas downstream activities in the state of São Paulo.

The restructuring of natural gas distribution and retail trading in São Paulo started with the privatization of “Companhia de Gás da São Paulo” (Comgas) in April 1999. The concession contract was signed one month later by a joint venture formed by British Gas and Shell, which bought Comgas for US\$ 1.65 billion<sup>2</sup>. The company was created, through a concession granted by the Brazilian Empire, in October 1872, with British capital and the name of San Paulo Gas Company, to provide public lighting services to the city of São Paulo, capital of the state of São Paulo. In 1912, Canadian Light bought the company. Comgas was nationalized in 1959, situation that lasted until the privatization in 1999.

Two other, fresh concession areas were created by the state government and granted, after public auctions, to “Gas Brasileiro Distribuidora Ltda”, in December 1999, and to “Gás Natural São Paulo Sul S/A”, in May 2000.

Thus three utilities distribute natural gas in the state of Sao Paulo since the year 2000, each one of them with a concession contract that assures exclusiveness in the distribution business for 30 years in their concession areas. The contracts also grant exclusive rights for retail trading. These rights, however, were assigned for just 12 years in what concerns industrial consumers and power generators. So, competition for supplying natural gas for these consumers in the state should start in 2011.

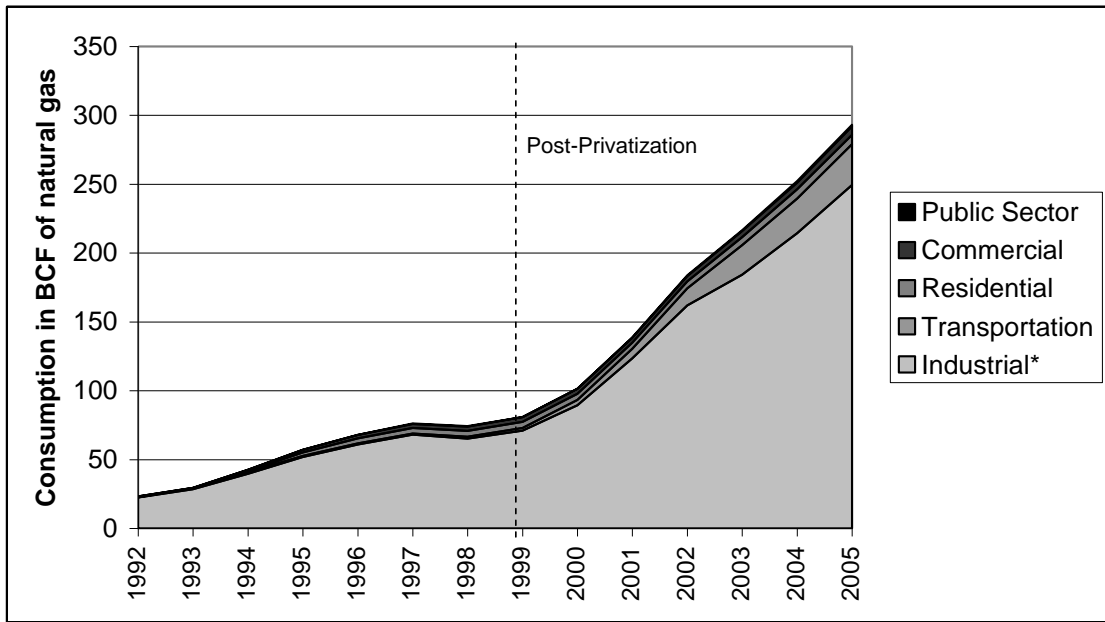
In 2005, Brazil produced 741 billions of cubic feet (bcf) of natural gas (excluding losses and re-injection) and imported 557 bcf, the majority from Bolivia. Total consumption in the country was 1,298 bcf (MME, 2006).

In the same year, the state of São Paulo consumed 293 bcf of natural gas, with industry responsible for 80,3% of the total, followed by the transport sector (10,1%), power generation (4,8%), households (2,3%), commerce (2,1%) and public services (0,4%) (see Figure 3). Figure 4 shows how the market shares of the main fuels and electricity changed in the state of São Paulo from 1992 to 2005; figure 5 shows the strong growth in natural gas consumption since the privatization process in 1999 (BESP, 2006).

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<sup>1</sup> 1USD = 2,926 reais (average 2004 dollar)

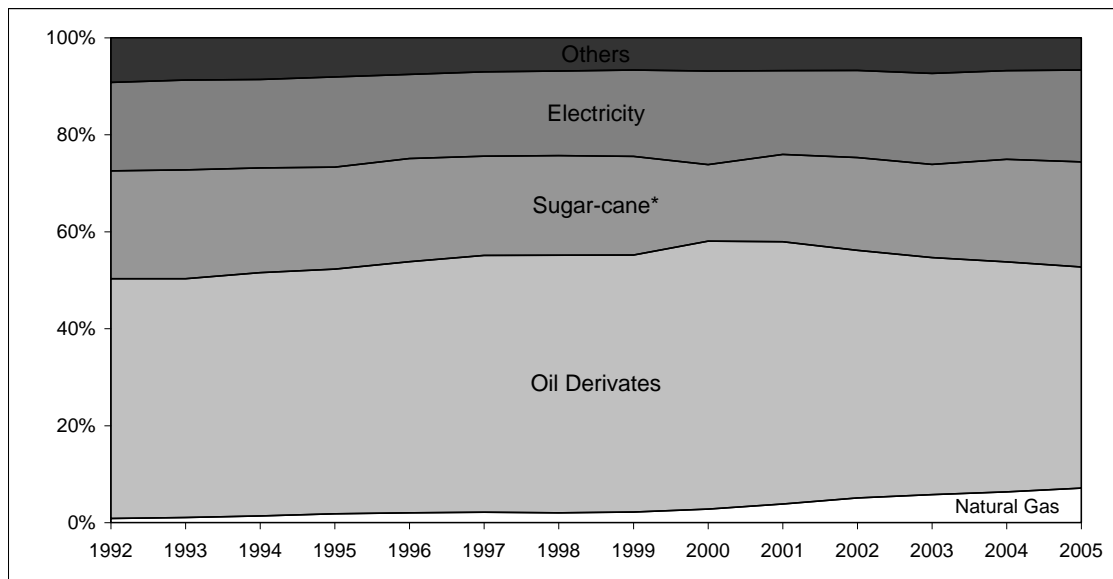
<sup>2</sup> 1USD = 0,996 reais in 14/04/1999



(\*) Including electricity generation

Source: BESP (2006)

**Figure 3: Consumption of natural gas in the state of São Paulo, by sectors of the economy, in bcf, from 1992 to 2005**



\* includes ethanol and bagasse to energy generation

Source: BESP (2006)

**Figure 3: Market shares of the main fuels and electricity in the state of São Paulo during then period 1992-2005**

### 3. Natural gas outlook for 2011 in Brazil

The Brazilian natural gas market is concentrated in the Southern and Southeastern regions of the country, which are interconnected through a transportation pipeline.

Excess of commodity (gas) and capacity are two important conditions to start the development of a competitive market (IEA, 1998). If there is space and gas available in the pipeline, it's possible to stimulate lower prices through pipeline optimization, creating a spot market, interruptible contracts, and allowing open access for third parties. These issues are discussed in this paper in the following sections.

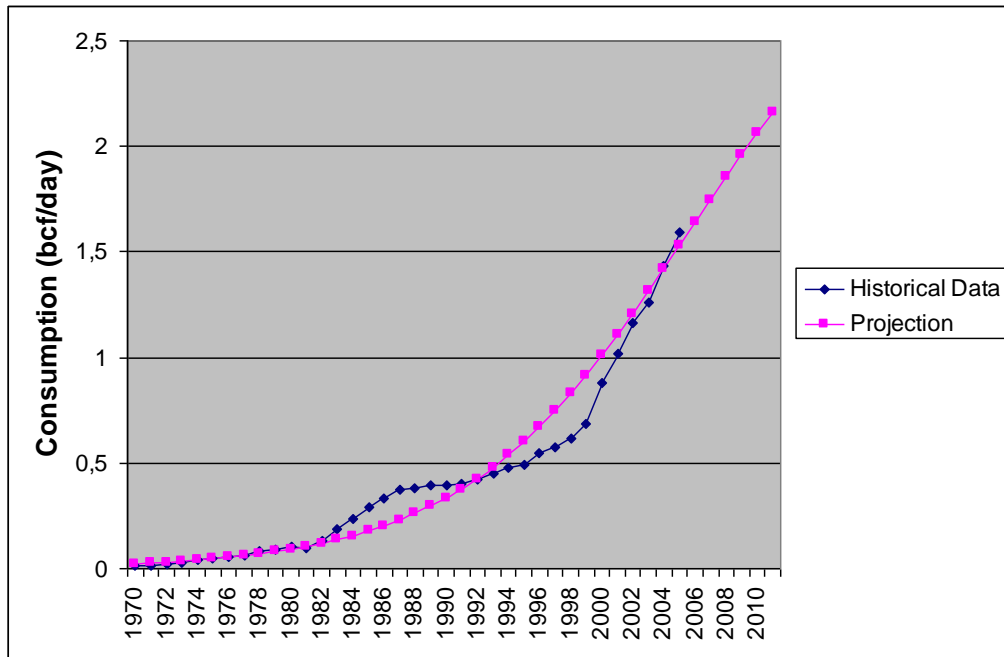
Logistic curves are often used to simulate the growth, along time, of the market shares of new products or technologies. They can also be used to forecast natural gas demand, excluding the consumption for power generation. Equation (1) illustrates a simple logistic curve.

$$Q(t) = \frac{K}{1 + \exp(-\alpha(t - \beta))} \quad (1)$$

where  $K$  represents the maximum value the demand is expected to reach asymptotically during the time period considered,  $\alpha$  is the time that the demand takes to increase from 10% to 90% of the value of  $K$ , and  $\beta$  is the time when the curve reaches 50% of  $K$ . The curve represented by equation (1) is symmetric around the average time  $\beta$ .

Finding a coherent “ $k$ ” point is the key of this logistic modeling. Preliminary data for Local Distribution Companies (LDC's) sales in the end of 2006 and in the first four months of 2007 (GasNet, 2007), show that natural gas consumption is reaching its stabilization in Brazil. Another important issue is that Brazil is facing today some supply problems due to rapid demand increase over the past 7 years and the political problems in Bolivia, that affected new expansion projects by Petrobras in the country. Bolivia is the responsible for supplying approximately 1.00 bcf/day to Brazil. This situation, allied with the saturation of the largest Brazilian markets (São Paulo and Rio de Janeiro States), shows that natural gas consumption in Brazil will increase smoothly from now. This excludes a possible growth in the commercial/residential sector and other small growth in the industry and transport sectors. This analysis excludes natural gas for electricity generation.

The average consumption in 2005 was 1.60 bcf/day. Considering above situation, a  $k$  value of 3.2 bcf/day can be considered an optimistic try. Figure 5 shows that, in the optimistic demand scenario, the average consumption of natural gas in Brazil (excluding electricity generation) will be approximately 2.16 bcf/day.



**Figure 5: evolution and projection of Brazilian natural gas demand, excluding natural gas for electricity generation**

For electricity generation, it's considered that 100% of generation capacity of natural gas plants will be used in 2011. This means a consumption projection of 1,71 bcf/day in 2011 (Petrobras, 2006).

On the supply side, Petrobras is running an aggressive national gas supply plan. This plan will increase the supply of natural gas from 1,60 bcf/day in 2005 to 4,27 bcf/day in 2011 (Petrobras, 2006).

**Table 1: natural gas market outlook for 2011**

	Demand		Supply
	2005	2011 (projection)	2011
Electricity Generation	0,25	1,71	4,27
Other consumption	1,53	2,16	
<b>TOTAL</b>	<b>1,78</b>	<b>3,87</b>	

Table 1 summarizes natural gas outlook for Brazil in 2011. This shows that, in the optimistic scenario for the demand projection in 2011, Brazil will have an oversupply of 0.4 bcf/day.

## **4. Regulation**

### **4.1 Upstream regulation and the “Gas Law”**

As it was said in the introduction of this paper, Law 9,478/97 broke the legal monopoly execution of Petrobras in oil and natural gas upstream activities. The purpose of this Law was to introduce competition in upstream activities.

According to ANP regulation, exploration and production of natural gas must undergo a transparent and public bidding process with ANP oversight. The winner signs a concession contract, whose exploration phase may last three (3) to eight (8) years and the development/production phase may last twenty seven (27) years (it may be extended if requested by the concessionaire and accepted by ANP) (ANP, 2001).

Regarding transportation activities, ANP allows the construction of interstate pipeline gas through authorization. Open access is allowed and negotiated between the parties (carrier and shipper). At the beginning, the tariff for national gas was negotiated between shipper and carrier, having a price ceiling at the city gate point. Imported gas tariffs were regulated by ANP through a postal tariff methodology during almost five years (ANP, 2001). However, Law 9,478/97 limited price regulation until 31/12/2001. It was expected that competition would be developed during the years 1997 - 2001. The situation today is that price is fully negotiated and competition was not established in upstream activities.

Production and transportation of natural gas is dominated by Petrobras. In 2006, Petrobras was the only company to produce natural gas in Brazil, although some other companies are in exploration process (most of them in joint ventures with Petrobras). Regarding the processing of natural gas, Petrobras has 27 out of 28 Natural Gas Processing Plants (NGPP); moreover, it has 20% of capital of the remaining one.

In the transportation activities, Petrobras system, through its cross-participation, has a dominant position, detaching Transpetro (a Petrobrás subsidiary), which detains 45.9% of all transport structure. TBG, in which Gaspetro (another Petrobras Subsidiary) has 51% of total capital, detains 47.6% of total capacity.

The rapid development of national gas industry, the lack of competition and the regulatory problems illustrate the necessity of a specific legislation for natural gas in instead of Law 9,478/97, that consider natural gas as oil derivate. Considering this situation, two Bills were addressed to national congress in 2006 and 2007. Bill number 334/07 is from the legislative and the Bill 6,673/06 is from the executive. Table 1 summarizes some issues of the existing Law and the



proposition of the two Bills. It's possible to notice that Bill N. 6.673/06 is more centralizing, and Bill N. 334/07 is more liberalizing.

**Table 2: comparison between Law 9.478/97 and the Bills N. 6.673/06 and 334/07**

	<b>Law 9.478/97</b>	<b>Bill N. 6.673/06</b>	<b>Bill N. 334/07</b>
<b>Transportation and Storage regime for pipelines</b>	Authorization	Authorization or Concession (Defined by the Ministry of Mines and Energy)	Concession
<b>Expansion Planning</b>	Company	Determinative (Defined by the Ministry of Mines and Energy)	Participative
<b>Exclusiveness Period and open access</b>	No exclusiveness period. Access is open but must be negotiated	10 years of exclusiveness before open access	None for new gas pipelines (capacity auctions). 8 to 15 years for the existing ones
<b>Tariffs</b>	Negotiated after 31/12/2001	Regulated	Regulated
<b>Cross-participation</b>	Accounting separation	Accounting separation	Accounting and partial legal separation for Carriers to participate in activities of production, storage and trading
<b>National Operator System</b>	Agência Nacional do Petróleo (ANP)	Agência Nacional do Petróleo (ANP)	Creation of a National Transport Operational System (ONGAS), subordinated by the electrical system operator (ONS)

## 4.2 Downstream regulation in the State of Sao Paulo

The concession contract signed by the natural gas utilities in Sao Paulo State describes the methodology for price regulation in the first two tariff revision. The period between two tariff revisions are five (5) years. The tariff readjust is annual, in which CSPE consider changes of gas prices at city gates, dollar variation and an inflation index.

Price regulation in the first revision (1999-2004 at Comgas and Gas natural SPS, and 2000-2005 in Gas Brasileiro) has followed, in general, the methodology of rate of return, including commitments of investments in expansion and replacements of the old and deteriorated distribution pipelines. In an incipient market with no practical experience in regulation, this was a coherent solution to incentive investments in expansion for natural gas industry.

With the experience achieved in the first tariff revision for the utilities' cost evolution, the methodology of the second tariff revision could incorporate some mechanisms of incentive, through a hybrid modeling.

The object of regulation is the maximum margin of distribution activities (MM). The initial MM,  $P_0$ , defined in each tariff revision by CSPE, is determined by equation (2) .

“..

$$P_0 = \frac{BRRLi - \frac{BRRLf}{(1+r_{wacc})^5} + \sum_{t=1}^{t=5} \frac{OPEX(t) + CAPEX(t) + ODESP(t)}{(1+r_{wacc})^t}}{\sum_{t=1}^{t=5} \frac{V(t)}{(1+r_{wacc})^t}} \quad (2)$$

Where,:

*OPEX(t)*: operational expenses approved by CSPE in tariff revision;

*CAPEX(t)*: capital assessment expenses approved by CSPE in tariff revision;

*ODESP(t)*: other expenses (including taxes);

*BRRLi* and *BRRLf* are the net asset regulatory basis at the beginning and end of the tariff revision;

*V(t)*: volume of gas distributed,

*r<sub>wacc</sub>* : asset rate of return; “ (CSPE, 2004)

Fixation of *BRRLi* and *BRRLf* are based in the economic equilibrium of the concession. *BRRL* defines the value of all assets calculated from the privatization. In the case of São Paulo State, Comgas was the only company with assets at the signature of the concession contract.

The fourth sub clause of thirteenth clause of the concession contract defines the methodology for the calculation of *MM* for year “*t*” (*MM<sub>t</sub>*), which is expressed in Reais R\$ for cubic meter (m<sup>3</sup>), as it follows:

“...

$$MM_t = P_t + K_t, e \quad (3)$$

$$P_t = P_{t-1} [1 + (VP - X)] \quad (4)$$

where:

*VP*: Brazilian *IGPM* inflation index in year *t* (percent)

*X*: efficiency factor (percent);

*P<sub>t</sub>*: Maximum Margin (*MM*) without year *t* adjust term, expressed in reais for m<sup>3</sup>; and

*K<sub>t</sub>*: adjust term to guarantee the *MM* applied in the year *t*, in reais for m<sup>3</sup>.”

According to the third sub clause of thirteenth clause of the concession contract, “... it will be applied, at the beginning of the forth year at the second tariff revision, a reduction or elevation in the Maximum Margin (*MM*), based in the margins obtained at the first three years of this second revision. In this case, the differences, from the first until the third year, will have its values actualized, in the terms of the Eighteenth sub clause, proceeding the necessary adaptations...” The

Eighteenth sub clause says that “*The adjust term ( $K_t$ ) for period  $t$ , will be expressed in reais for  $m^3$  and will be calculated as:*

$$K_t = [(MM_{t-1} - MO_{t-1}) (1 + r_{t-1}) V_{t-1}] / V_t \quad (5)$$

where:

$MM_{t-1}$ : Maximum Margin (MM), in the year  $t - 1$ , expressed in reais for  $m^3$ ;

$MO_{t-1}$ : Obtained Margin (MO), in the year  $t - 1$ , expressed in reais for  $m^3$ ;

$r_{t-1}$ : annual average interest rate, in the year  $t - 1$ ;

$V_t$ : annual volume forecasted for the year  $t$ , expressed in  $m^3$ ; and

$V_{t-1}$ : annual volume distributed for the year  $t$ , expressed in  $m^3$ .” (CSPE, 2004)

Exceptionally, in the second tariff revision, it's allowed a  $K_t$  positive. This means that, even if the average margin doesn't reach the average maximum margin established for CSPE, the value is corrected according to the Eighteenth sub clause mentioned above.

The implications of this regulation are discussed now. First, the maximum margin average limits the profit of the three LDC's, freezing its profit margin. With the margin frozen, the main focus of the LDC's are to increase its revenue, and this is done through the increase of gas sales. This  $K_t$  factor is a vital boundary condition in the strategies of CSPE and gas utilities. While  $K_t$  can be positive, LDC's will have its focus in the increase of sales (to any cost), since, in the case that the maximum margin average is below the established by CSPE, this value is corrected and incorporated in the annual tariff adjustments due to the effect of this factor. This means that there is an incentive for price reduction, with the purpose of increasing gas sales. In this condition, the LDC's could even practice trusting measures, selling natural gas below the corresponding marginal costs. However, the thirtieth sub clause of the concession contract says that “*The tariffs practiced lower than the price cap, in any one of the tariff revisions, will be limited by the cost of service of the contracted supply...*”.

Another consequence of a positive  $K_t$  is that possible efforts of energy efficiency actions by the LDC's would not be stimulated; this is because the higher the sales by consumer, smaller would be the tariff by  $m^3$  consumed, what is desirable, as discussed before, for sales increasing.

After the second tariff revision,  $K_t$  cannot be positive anymore. It means that CSPE understands that the distribution system will be mature in Sao Paulo State in the occasion of the third tariff cycle. As described previously, the formula of  $P_0$  includes expenses of OPEX, CAPEX, ODESP and BRRL. The definition of  $P_0$  is normally a stressful moment between the regulator and the LDC's. The case of Sao Paulo State LDC's and CSPE is not different. This tension can be noticed, for example, in the CSPE Technical Note N°3, of 2004. In this document, Comgás (the

largest gas distribution company in São Paulo State) seeks to forecast gas sales below reality, moreover, exaggerated OPEX and CAPEX investments; these projections and forecasts are obviously adjusted by the CSPE.

On incentive regulation, under regulatory rules with a delayed adjustment of revenue to the company's own actual level of total cost, incentives are stronger to cut operating (OPEX) rather than capital expenditure (CAPEX). This is because OPEX savings enable the companies to enjoy the benefit of lower cost through profits in the short term, while the benefits of CAPEX savings are to a large extent enjoyed in the medium to long term, by which time the firm will have had to adjust its revenues to the lower cost level (Gordon et al, 2003). Another common practice of LDC's, in the years that precedes the tariff revision, is trying to spend some money for CAPEX with smaller rates of return than usual; this occurs because BRRL includes the total of the liquid investments up to date of the revision.

For the definition of X Factor (cost efficiency tendency) of the LDC's in the second tariff cycle, CSPE used the historical tendency of cost efficiency of the LDC's during the first cycle; furthermore international standards of efficiency in the gas LDC's (in particular in the Argentinean one).

Despite all efforts in the second tariff cycle in the direction of cost allocation efficiency improvements, the regulation elaborated by the CSPE had clearly a main objective: the development of a market still incipient of natural gas, what was laudable up to that time.

However, if regulation stays as it is, competition in 2011 will hardly be seen, because the LDC's will probably try to protect its market, and third parties would not have bargaining power to purchase natural gas. Next section proposes a new regulatory framework to pave the way to competition in retail trade of natural gas in the state from 2011 is put forward.

## **5. Framework to stimulate competition in Sao Paulo State from 2011**

Monopoly is commonly regarded as appropriate during the early stages of a gas industry, because of high marginal costs, the technical and financial risks and the low returns intrinsic to business due to competing fuels. The pressure for a more competitive gas market comes when markets become matured (IEA, 1998). Brazil has a heterogeneous development in gas market. Some regions of the country don't have access to natural gas, and others, like the States of Sao Paulo and Rio de Janeiro, are closer to maturation. As described in this paper, CSPE (the Sao Paulo State Regulator) has put clauses in the concession contracts finishing the retail trading exclusiveness after 12 years from the signature for industrial and electricity sectors (beginning from 2011).

Before proposing some downstream measures, it is necessary to develop an upstream regulatory scenario. Bill 334/07 was already approved in the Senate, and it is a more liberalizing model, because:

- This bill defends concession regime for upstream pipelines. This would be done through public auctions for capacity and commodity allocation, including daily information about contracts, capacity and commodity allocation.
- It defends a participative planning for pipeline extensions, allowing the market to participate in the planning procedure for future demand markets.

This paper considers that the “Gas Law” will be more likely the Bill 334/07, although the transition to a competitive market will be probably slow, because the existing pipelines would have an exclusiveness period from 8 to 15 year from the Law promulgation, and the pipelines that supply the State of Sao Paulo would be in this protection period. However, it’s necessary to introduce some changes in downstream regulation in the state of Sao Paulo from 2011 to create a competitive structure for the retail sale.

According to DTI (2005), the main characteristics of a truly competitive market are:

- 1) Market size and diversity: lots of producers enrolled in the exploration, development, production and sales of natural gas
- 2) Development of a wholesale natural gas market
- 3) Retail market: a competitive wholesale market is a pre-condition for the development of a retail market, where end-user, shippers and LDC’s need to obtain gas (commodity) and capacity to carry this gas at market prices to their costumers.

Other measures that help competition development are: an effective gas release program, availability of access in the capacity of transport and distribution systems, unbundling the gas chain, development of market centers with information regarding capacity and gas availability, and standardization and harmonization of proceedings and rules (IEA, 1998).

Table 3 shows some positive and negative facts that have influence for competition development in São Paulo State from 2011. After this, it’s possible to propose some regulatory measures to develop competition in the State.

**Table 3: influence factors for competition development in Sao Paulo State from 2011.**

POSITIVE INFLUENCE	NEGATIVE INFLUENCE
According to Petrobras Business Plan (2007-2011) and the demand projection in section 3, in 2011, there will probably be an oversupply of natural gas in Brazil.	Petrobras and its subsidiaries dominate production, processing and transportation of natural gas. This situation will probably not change until 2011.

Petrobras doesn't have any participation in the gas distribution companies in Sao Paulo State.	The three Distribution companies in Sao Paulo State have long term contracts with shippers with take or pay commitments.
Industrial sector is the for more than 80% do of Sao Paulo State market, and this sector will be with most part of its market saturated in 2011.	Actual regulation in Sao Paulo State stimulates mainly the increasing of sales.

As described before in this paper, natural gas oversupply is considered an important point for competition development. Another positive factor is that Petrobras doesn't have any participation in the gas distribution companies in Sao Paulo State; this is important to avoid cross-subsidies and information asymmetries (ANP, 2002), (Viscusi et al, 2005). As competition in the retail trading activities begins from 2011 in the state of Sao Paulo State for industry and electricity generation sectors, a mature and developed market is favorable (DTI, 2005).

The negative factors illustrate the difficulty of implementing competition from 2011 in the State of Sao Paulo. Petrobras and its subsidiaries dominate production, processing and transportation of natural gas. As discussed in this section, even with a promulgation of any of the two Bills as the "Gas Law", in the short time Petrobras would still have a dominant position in 2011. Another point is that the three LDC's in Sao Paulo State have long term contracts with shippers with take-or-pay commitments; this rigidity of price may cause demand pressures, with periods of shortages or oversupply, depending of the competing fuel prices (IEA, 1998). As discussed in the section 4, actual regulation in Sao Paulo State stimulates mainly the increasing of sales. It can be harmful to competition development.

The third tariff revision at Sao Paulo State will initiate in 2009 for the companies Comgas and Gas Natural SPS, and then in Gas Brasileiro company in 2010. For this third revision, this paper proposes the following measures to stimulate competition, security of supply, transparency and avoiding cross-subsidies:

- 1) Changing the Maximum Margin  $MM_t$  that considers all sectors for a Maximum Margin for each sector.
- 2) Allowing  $K_t$  factor to be positive in the residential, commercial and cogeneration sectors.
- 3) Accounting unbundling of distribution and trading in downstream activities in 2009, and then a legal separation from 2011.
- 4) For the distribution system, considering firm allocated capacity as fixed costs and physical gas movement as variable costs.
- 5) Open access to distribution pipeline through a capacity and/or gas transportation payment.
- 6) Renegotiation incentives for demising take or pay and the switching of long-term to short-term contracts between shippers and LDC's.

- 7) Stimulate the Creation of a market center.
- 8) Standardization and harmonization of proceedings and rules.
- 9) Prohibition that any upstream party participate in end-user gas trading.
- 10) Monitoring contracts of supply and demand, working together with federal agency for supply and demand flexibilization, focusing in the security of supply.

The first suggestion is to change the Maximum Margin  $MM_t$  that considers all sectors for a Maximum Margin for each one. Total  $MM_t$  could be a pondered average of the  $MM_t$  for the industrial, commercial, residential, cogeneration, transport, electricity and interruptible gas. This would allow the regulator to be more flexible for implementing segmented politics. It would also increase transparency, avoiding cross-subsidies in the tariff formulation, as each sector would be considered separately.

It's predicted that in the third tariff revision, the  $K_t$  factor will not be positive. This paper proposes that  $K_t$  may be positive for the residential, commercial and cogeneration sector, due to its incipency in the state. The division of  $MM_t$  for each sector allows the implementation of that. The restriction of a positive  $K_t$  for industrial and electricity generation sectors would probably help to stimulate competition, because LDC's would not charge prices that would injure  $MM_t$ . This restriction may also help energy efficiency in industry, because of for every costumer, tariff decreases with the volume increasing (due to gains of scale considered in the tariff structure). So, energy efficiency measures could help the increasing of  $MM_t$  for each costumer, through consumption decreases per costumer, which would consequently increase LDC's profit by costumer.

Accounting separation of distribution and trading activities at the beginning of the third cycle would prepare the LDC's and CSPE for a legal separation in 2011. Legal separation of distribution and trading is necessary to avoid information asymmetries, privileges and cross-subsidies that would block competition development. In the United Kingdom, for example, competition has developed properly when British Gas was obligated to separate legally transportation, commercialization and distribution activities. The prohibition that any upstream parties to participate in the end-user gas trading is also important. The effective separation of gas supply, trading, transportation and storage is crucial to ensure non-discriminatory third party access and efficient regulation (IEA, 1998).

Distribution tariff should consider as fixed cost the firm allocated capacity, and as variable cost, the physical gas movement only. This would reflect in a clearer gas tariff, illustrating an economic rationale on firm and interruptible contracts. Something similar was done in upstream regulation by ANP, through resolution Number 29/05, inspired in the FERC order number 636 of 1992 in the USA.

Open access through a regulated renting capacity is important to competition development, allowing a fair remuneration for LDC's. In USA and United Kingdom this is done through a tightly regulated rate-of-return basis (IEA, 1998).

Long term contracts and take-or-pay clauses between LDC's and shippers may also injure the LDC's. Long term contracts are artificial, don't reflecting market reality. Competing fuel prices in the short and medium term may change significantly depending on oil prices. As described before in this section, if gas doesn't follow this rationale, it may reflect in gas oversupply or shortages. Take-or-pay clauses may be even more harmful to LDC's, obligating them to pay for a gas that they didn't sell (in the low demand periods or due to competition pressure). In the USA, in the period of gas bubble, unregulated gas was cheaper, and some LDC's were injured because of their long-term contracts with take or pay clauses (Lee, 2004). The State regulator CSPE should articulate with ANP some incentives to stimulate the changing from long term to short-mid term contracts, and also the demise of take-or-pay clauses.

Standardization and Harmonization of rules and procedures is necessary to avoid information asymmetries between parties. Daily Online Bulletins should be published by the three LDC's of Sao Paulo State, including information about natural gas nomination, capacity, allocation and balance.

The monitoring of gas contracts between LDC's and shippers is important to avoid shortages. A close work together with federal agency for supply and demand flexibilization is also important, focusing in the security of supply. Also, risk management tool should be used, together with a contingency plan (to be elaborated together with ANP, LDC's, Petrobras and the government). The probable gas oversupply in 2011 and the Petrobras LNG stations will help security of supply, through a supply flexibilization.

Also, with the development of competition, State Regulator should give a special attention on possible antitrust practices, like manipulation and cartels (Viscusi et al, 2005).

Even if with the measures above competition is not established, an effective gas delivery program should be formulated to provide an amount of new gas to new agents, as it happened in the United Kingdom. In the occasion, 10% of new gas available was addressed to new parties. With time, new parties gained bargain power.

## **4. Conclusions**

Regulation of the natural gas industry is recent in Brazil. The agencies regulating this industry, both in Federal and state levels, were set up only in the late 90'. The state of Sao Paulo will have the largest part of its industrial and electricity generation market matured by 2011.



However, competition will not freely develop in these sectors from 2011 if upstream and downstream and regulation stays as it is. If nothing is done, 2011 will just be a regulatory mark, without any practical inferences.

Basically, if there is space and gas available in the pipeline, it's possible to stimulate lower price through pipeline optimization, through the creation of a spot market, interruptible contracts, and allowing open access for third parties. Competition is developed if a potential producer has sure that its gas will be delivered to end user without any problem, with a reasonable renting for transport and distribution systems.

Bill 334/07 for the upstream and the downstream framework proposed in this paper would be the initial condition to stimulate competition in Sao Paulo State. If both were implemented, it would probably: 1) create a wholesale and a retail gas market; 2) stimulate risk management tools, i.e. derivative instruments; 3) promote a shift from long-term to short-term contracts between LDC's and shippers; 4) create a spot and future markets; 5) promote a move towards spot and futures gas price indexation in mid- and long-term supply contracts. Competition would probably bring end-user prices down, as it happened in USA and the United Kingdom (IEA, 1998). However, government and regulators should work together on planning activities and the security of supply, to avoid possible shortage problems that happened in these countries.

## 4. References

ANP. Indústria Brasileira de Gás Natural: Histórico Recente da Política de Preços. Agência Nacional do Petróleo. Rio de Janeiro, RJ. 95p. 2001.

ANP. Participações Cruzadas na Indústria Brasileira de Gás Natural. Agência Nacional do Petróleo. Rio de Janeiro, RJ. 24p. 2002.

BESP. Balanço Energético do Estado de São Paulo: Ano base 2005. Secretaria de Energia, Recursos Hídricos e Saneamento. São Paulo, SP, 2006. 210p.

CSPE. Nota Técnica Nº 3: Cálculo das Margens Máximas e Fator X da Comgás. Comissão de Serviços Públicos de Energia, 2004.

Department of Trade and Industry's. DTI, Energy Markets Limited. Conditions for Truly Competitive Gas Markets in the EU, Volumes 1 and 2. Brentford Middles, 2005

GORDON, D. V.; GRUNSCH, K.; PAWLUK, C. V. A natural monopoly in natural gas transmission. Energy Economics. Elsevier, v.25, p.473-485, 2003.

HOSMER, D. W.; LEMESHOW, S. Applied Logistic Regression. Second Edition. John Wiley & Sons. New Jersey, USA. 2000. 375p.

IEA. Natural Gas Pricing in Competitive Markets. International Energy Agency, Paris, FR. 179p., 1998.

IEA. Regulatory Reform: European Gas. International Energy Agency, Paris, FR. 122p., 2000.

LEE, W. US lessons for energy industry restructuring: base don natural gas and Califórnia electricity incidences. Energy Policy. Elsevier, v.32, p.237-259, 2004.

MME. Balanço Energético Nacional 2006: Ano base 2005. Ministério de Minas e Energia (MME). Brasília, DF, 2006b. 188 p.

Petrobrás S/A. Plano Estratégico 2007-2011. Rio de Janeiro, 2006.

VISCUSI, K., W.; HARRINGTON, J., E.; VERNON, J., M. Economics of Regulation and Antitrust. The MIT Press, EUA, 4ª edição. 928p., 2005.