Energy industry restructuring in Brazil: a critical vision

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Abstract
This article presents a critical analysis of the restructuring process in the energy industry in Brazil, emphasizing the influence of the country’s peculiarities. The analysis focuses initially on the general energy scenario, especially the main problems that led to reform in the energy sector. Then the two main energy sectors – petroleum/gas and electricity – are reviewed, with an emphasis on the basis and construction of the new models; principles and objectives of the models; and the role of the institutional participants. Reference is also made to problems associated with the period of transition to the new models.

Present difficulties such as the lack of investments, necessity of electricity rationing, and political pressures, are finally introduced into the scenario, allowing a critical vision of the situation, in which the main accomplishments and challenges are emphasized.

This summarized view of the recent changes in the Brazilian energy industry may be the basis for further work and discussions on the subject, and represents an experience that can be helpful for other countries or regions going through structural changes.
Brazilian energy scenario

Brazil is the largest country in Latin America as regards its economy, population, and territorial extent. The country is going through a process of economic growth, which depends strongly on the use of energy. Energy will also be needed to provide better infrastructure distribution across the country (about 15% of the population is still not supplied with electricity) and to guarantee the basic needs for a great part of the population (that forms part of the repressed energy demand). An efficient and environmentally integrated use of natural resources should also be envisaged, considering a sustainable development pattern.

The Brazilian energy matrix can be considered very ‘clean’ with regard to the environmental questions related to global warming. Table 1 shows the energy consumption structure in Brazil during the last two decades.

Brazil has been going through a series of structural changes in its evolutionary process. Intense debates during the last decade on the government’s role in the Brazilian society resulted in the decision to change to a regulatory state rather than an entrepreneur state. This choice had a significant impact on the national energy industry, leading to privatization of most of the energy companies. As a consequence, new investments are held by private capital, leaving to the state regulatory agencies the task of regulating the industry. The institutional role of the regulatory agent, as one responsible for acting in a constant search for the balance among the several participants in the market, has been consolidated within this period.

The strategic role of electricity in the country’s economic growth resulted in this industry going through a deep restructuring process, which was designed considering its peculiar characteristics and the decisive role of the regulatory agents in promoting the adequate and balanced development of the free and competitive market. An electricity regulator, ANEEL (National Agency of Electric Power), was created and has been playing an outstanding role in the new model of a free and competitive market. Besides the energy generated from large hydroelectric power stations (around 92% of the present electricity supply) and the thermal generation envisaged in the short term (using natural gas, mainly from Bolivia), generation from renewable energy sources (biomass, solar energy, wind energy, small hydro plants, and cogeneration plants) is also included and would get incentives in this new scenario. Experts in Brazil generally support the idea that the ideal energy matrix should be one that minimizes the current and future costs for society, considering the economic, technological, social, and environmental aspects. This needs to be kept in
Energy industry restructuring in Brazil: a critical vision

The path taken by the state in the electric power restructuring process was followed in the petroleum and natural gas sectors; that is, the competition among the participants in these markets would be regulated by an agency linked to the public sector. Therefore, the ANP (National Agency of Petroleum) was created to look at the continuous development of the petroleum and gas industries in Brazil.

Energy industry’s restructuring process
The energy industry as a whole: basic and integration aspects

The energy industry structure is related to the global economic scenario. The following structural transformations occurred and sustained this industry’s growth.

- Mechanical uses of energy grew quicker than the thermal uses that prevailed in the pre-industrial societies.
- New energy sources (coal, petroleum, hydroelectricity, natural gas, nuclear) have been inducted into the scenario along the years.
- The world regions now denominated as ‘developing countries’ (mainly in Asia) consumed more than half of the world energy production until Europe and North America overtook them during the first half of the 19th century. By the beginning of the 20th century, Europe and North America together consumed 75% of the world energy production.

Table 1 Energy consumption structure in Brazil (share in %)

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Year</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel</td>
<td>7.6</td>
<td>12.1</td>
<td>12.0</td>
<td>12.3</td>
</tr>
<tr>
<td>Fuel oil</td>
<td>9.4</td>
<td>12.5</td>
<td>5.6</td>
<td>4.5</td>
</tr>
<tr>
<td>Gasoline</td>
<td>10.5</td>
<td>6.8</td>
<td>4.3</td>
<td>6.0</td>
</tr>
<tr>
<td>Natural gas</td>
<td>0.1</td>
<td>0.7</td>
<td>1.8</td>
<td>2.4</td>
</tr>
<tr>
<td>Electricity</td>
<td>16.6</td>
<td>27.9</td>
<td>37.3</td>
<td>39.5</td>
</tr>
<tr>
<td>Mineral coal</td>
<td>2.4</td>
<td>3.7</td>
<td>4.5</td>
<td>4.1</td>
</tr>
<tr>
<td>Firewood</td>
<td>42.7</td>
<td>20.2</td>
<td>12.6</td>
<td>7.5</td>
</tr>
<tr>
<td>Alcohol</td>
<td>0.4</td>
<td>1.3</td>
<td>3.6</td>
<td>3.1</td>
</tr>
<tr>
<td>Others</td>
<td>10.3</td>
<td>14.8</td>
<td>18.3</td>
<td>20.6</td>
</tr>
</tbody>
</table>

These structural changes cannot be dissociated from the world demographic growth, and more importantly, from the revolutions and transformations that resulted from them. Both economic growth and energy growth are mutually connected and influence each other depending on the time and the agreements between the involved nations. The current energy industry increasingly demands efficient patterns of competitiveness to reach larger market shares. From this point of view, the verticalization process of these industries becomes more and more important to achieve cost reductions and increase operational efficiencies. This process shows the need for a constant contextual understanding of the transformation that society has gone through in the past few years.

The petroleum companies, which are strongly represented in the global energy market, have been trying to optimize their operational and managerial resources. The petroleum industry has gone through several changes, with strong investments from major companies to keep up its continuous growth. This has led to the following major structural changes.

- **Verticalization** The trend to form a single energy market and the implementation of e-commerce in the near future (which can improve activities and businesses in the whole chain and create new businesses for companies in the industry, besides enabling the entrance of new participants from other economical segments).

- **Great partnerships and alliances.**

With the evolution of a highly competitive market, there is a greater struggle for a larger market share and, as a consequence, for company growth. Major companies attempted to capture a larger number of consumers in their home markets. This trend, which started at the end of the 19th century and the beginning of the 20th century, accelerated in the second half of the 20th century.

Another approach to develop the industry was through a diversification of products. The peculiar characteristics of the energy industry usually makes investment in multiple lucrative projects more feasible (less costly) than investment in separate projects. Therefore, petroleum companies became energy companies, taking advantage of the several vertical and integrated processes in the petroleum, gas, and electric power segments. This leads to the so-called convergence, which is one of the most important issues presently in the regulatory scenario due to its link with different regulatory agencies and its impact on the consumers' perception and treatment.

This general view of the energy industry as a whole and its international trend stresses clearly one basic responsibility of the regulatory
agencies, which is rather difficult to accomplish: to maintain the market free and competitive, in spite of economic trends, and one that guards consumers’ interests. This conflict is, in essence, the raison d’etre of regulation.

Petroleum and natural gas industries
The first Brazilian regulation for the petroleum industry appeared on 29 April 1938 in Law No. 395 through which the government created the CNP (National Council of Petroleum), directly subordinate to the president. The mission of the CNP was to make the decisions regarding development of the Brazilian petroleum industry.

On 10 March 1953, after many public and political debates, the petroleum monopoly was established through Federal Law No. 2004. It constituted the PETROBRAS, the Brazilian Petroleum Corporation, linked to the Ministry of Mines and Energy, and defined its role. The main functions of PETROBRAS included research, drilling, refining, processing, trading, and transportation (along with other associated activities) of petroleum obtained from various sources (wells, schist, and other rocks), petroleum products, natural gas, fluid hydrocarbons, etc.

The same law that authorized the creation of PETROBRAS also defined its performance conditions, specifying details regarding shareholders, management, and fiscal board. It also included the creation of subsidiaries, albeit with the approval of the CNP.

Later, the procedure adopted in the relationship between the CNP and PETROBRAS was established through a federal ordinance. The CNP holds orientation and monitoring duties and PETROBRAS holds the federal monopoly, including its subsidiaries. The monopoly extended from the exploration to the distribution, not including the commercialization of petroleum and its derived products. Even with the PETROBRAS monopoly, there were already several foreign companies in Brazil operating under the so-called ‘risk contracts’. Therefore, the scenario and history of the Brazilian petroleum industry are directly related to the performance of PETROBRAS, which held a monopoly over most of the activities related to the processes of this industry.

Until the mid-1970s, PETROBRAS was not very active in the exploration field, focusing more on terrestrial basin research. Since then, it gradually started to focus on ocean basin research, and, after the confirmation of the great potential of petroleum reserves in the Campos Basin in the state of Rio de Janeiro, PETROBRAS significantly increased oil production and improved its profits.

The industry restructuring began in 1997, with the passing of the Law of Petroleum, which determined the end of the PETROBRAS...
monopoly. The process of opening the market is increasing rapidly because PETROBRAS now shares the market with 34 other companies operating in the country, with 22 of them focusing on both exploratory blocks and production.

This scenario has come about mainly because PETROBRAS increased its partnership portfolio in 1998, and also because the ANP (National Agency of Petroleum), created under the above law, started the period of area concession auctions in 1999. Significantly, 44 of the 119 existent exploratory concession areas are not explored by PETROBRAS.

Another important factor is the strategic importance given to development of activities in foreign territories by PETROBRAS. This, it was felt, would consolidate its position as a competitive company in the global scenario. This strategy is yielding results today, exemplified in the following: exploration of wells in Nigeria and Equatorial Guinea, production of 20,000 barrels a day in Colombia and 19,000 barrels a day in Angola, export of crude petroleum to China, the United States, and France, besides partnerships with French and Japanese companies and with the Ukraine to explore gas and petroleum in the Black Sea. PETROBRAS has thus become a global company acting in a strategic manner, with partnerships with other companies, and diversifying its activities.

Today, Brazil has the second largest oil reserve in South America (Venezuela has the largest), and it is predicted that the country will become self-sufficient in petroleum production in just a few years.

Like in the petroleum industry, the natural gas market used to be regulated such that the exploration, production, processing, import, export, and transport activities were under federal monopoly and the distribution, storage, and commercialization activities were under the control of the federation states.

Exploration and production structures in Brazil are also similar and related to the petroleum market. The processing units are similar to the petroleum refineries. Afterwards, the industry started to operate as a network, showing similarities to the electric power industry.

After the Law of Petroleum, the natural gas industry has evolved significantly, going from a monopoly in the exploration and production activities and a few state agents holding the commercialization activities to a competitive market situation.

Natural gas has a share of only 2.4% of the Brazilian energy matrix today, with about 4820 km of distribution pipelines and 4240 km of transport pipelines (excluding the Brazil–Bolivia gas pipeline). The prospect of increasing its share in the energy matrix and building on the gas pipelines acted as the drivers for reform. The government
hopes to attract international capital by providing the necessary incentives for the market to be competitive, thereby bringing both financial and quality benefits for both investors and consumers.

Summarizing, it is possible to state that the petroleum and the natural gas industries have gone through several structural changes in the last few years. In 1997, as mentioned earlier, ANP was created through the Law of Petroleum. As stated in this law, ANP is responsible for regulating the industry opening process for both local and foreign companies. Today, PETROBRAS no longer holds the exploration, production, distribution, refining, and importation monopoly in Brazil. With the reality of a competitive market, there is the expectation of market growth and, therefore, the necessity for the regulating agency to establish the rules to support it.

The new model: principles and objectives
In this period of transition from a monopolistic to a free market, based on partnerships, alliances, and new contracts that regulate the petroleum and natural gas activities, Brazil needs a new regulatory model. This model should facilitate a competitive market and provide, as a consequence, technical-scientific development.

The regulatory agency ANP must establish uniform criteria to be followed within the whole national territory; compare the quality indicators of several participants at the national level; settle technical, economical, and juridical conflicts between state and municipal agents; regulate the Federal Ordinary Law and, most important, regulate its performance in agreement with the Consumer Defense Code issues.

The public services that are regulated by the state must follow five basic principles.
1. Permanence: Imposes the continuity of the service
2. Generality: Imposes the same level of service for all consumers
3. Efficiency: Demands constant service updating
4. Reasonable costs: Demands reasonable tariffs
5. Courtesy: Good performance for benefit of the public.

The regulatory agency must re-establish appropriate market operation in the case of lack of any of these requirements.

The Federal Law No. 9478 of 6 August 1997 in the Constitutional Amendment No. 5/95 denominated the Law of Petroleum discussed earlier. The Law of Petroleum deals with the basic rules to be followed in the formulation of national energy policies – including electric power, petroleum, and natural gas – and not merely with the petroleum-related subjects. Therefore, it demands special attention.
in its interpretation and applicability. It is a legislative matter exclusively related to the Federal Union, as established in Article 22 of the Federal Constitution of 1988.

With the end of the Federal Union monopoly and the participation of the private initiative in field exploration with all its risks, the state focused its attention towards promoting competition.

Juridical questionings and interest conflicts exist now, as several agents now participate in economic activities that were once monopolistic. Just the petroleum and natural gas exploration, development, and production are based on concession contracts, once they involve exclusive Union’s exploratory rights. Within the present framework, the utility has the obligation of exploring the field or group concession contracts, but it will only pay the government’s share if the production is successful.

The objectives initially planned for restructuring the petroleum and natural gas industries in Brazil can be summarized as new incentives for the economy, promotion of national development, greater social justice, market expansion, increase of technological knowledge, and protection of the citizen/consumer interests and the environment.

Role of institutional participants: government (CNPE) and regulatory agencies

The government is mainly responsible for the energy development process in a country. Even if it does not act as an investor, it must create mechanisms to promote the sustainable growth of that segment. Recognizing this concept, the CNPE was created to advise the president and to formulate policies and strategic guidelines for the energy industry.

The CNPE was created by the Law No. 9478 (Law of Petroleum), regulated by the Ordinance No. 2457 of 14 January 1998, and its operation is authorized by the Resolution No. 1 of 7 November 2000.

The CNPE has the following goals.

- Promote the rational use of energy resources
- Expand the country’s competitiveness in the international market
- Assure, based on regional characteristics, energy supply to the most remote or inaccessible areas in the country
- Periodically review the energy matrix in different areas of the country, considering the conventional and the alternative sources and also the available technologies
- Establish guidelines for specific alternative sources such as natural gas, alcohol, other biomass, coal, and thermonuclear energy usage programmes
Establish the guidelines for import and export, to fit the internal consumption needs, for petroleum and its derived products, natural and condensed gas

Assure the appropriate operation of the National System of Fuels Inventory

Guarantee the execution of the Annual Plan of Strategic Fuels Inventory.

The CNPE is formed by the Minister of State of Mines and Energy; the Minister of State of Science and Technology; the Minister of State of Planning and Budgeting; the Minister of State of Finance; the Minister of State of the Environment; the Minister of State of the Industry, Trade and Tourism; the Secretary of Strategic Subjects of the Presidency; a representative of federal states and districts; and a Brazilian citizen who is a specialist in energy issues.

The government, represented by the CNPE, must interact permanently with the regulatory agencies to assure an integrated process that will get the results initially set.

The ANP, which is regulated by the president through Ordinance No. 2455 of 14 January 1998, was established as an autarchy under special regime, with patrimonial, administrative, and financial autonomy.

Although ANP is linked to the Ministry of Mines and Energy, it must act as an autonomous agency for the petroleum and natural gas industries, preserving the interests of the Brazilian society. Therefore, the directors chosen to run the agency must go through an approval process of the Congress before assuming their positions.

The law stipulates regulatory and monitoring (with penalization, if needed) functions besides the task of promoting concession auctions. The ANP is supposed to undertake only those studies and research leading to political decisions that will result in industrial, technical, and economic development of the country.

The ANP has the following principles and objectives.

- Supervise the operators’ market power
- Organize the entrance of new operators
- Care for the implementation of a new organizational model
- Arbitrate conflicts between the participants
- Complete the regulation process
- Stimulate both efficiency and innovation.

Therefore, the ANP acts in practically all stages of the petroleum and gas industries, excluding the piped gas services.

To establish its credibility, ANP had to overcome several challenges. These included the provision of regulations still missing,
PETROBRAS’s transition to the new model, the market opening process, and the temporal asymmetry between the regulator and the market.

The ANP must communicate to CADE (Administrative Council of Economic Defense) in case of any irregularity or infraction. The council will adopt reasonable procedures based on the pertinent legislation. The functions of CADE are to monitor the market practices and to promote the competent administrative process to investigate any infraction of economic order, acting both preventively and repressively.

The main objective of the ANP, together with CADE, is to assure competition to protect consumer rights. It protects the market dynamics – free competition – a general principle of any economic activity.

An innovation that occurred not only with the ANP but also with other regulatory agencies was their economic and financial independence, obtained through endowments consigned at the Union General Budget, government stakes, donations, etc.

Along with the ANP, the following characterize the post-monopoly period.

- The change of the state’s role from entrepreneur activities to regulatory tasks
- A larger regulation of the industry through the ANP
- The implementation of the exploration area auctions
- Increasing investments from both national and international companies
- The Brazil–Bolivia pipeline, the largest investment for the natural gas market, with the possibility of a second gas pipeline to assist in the growing demand of natural gas in Brazil.

Electric power industry

The new model: principles and objectives

Due to its enormous territorial extent and its heterogeneous social, political, and economical characteristics, Brazil had to modify the bases of its electric power structure model to keep pace with the development of other nations.

Problems related to the old structural model, such as high levels of debt, bad management, and lack of control, resulted in redirecting the focus of the state’s actions mainly to promote the social development of the country. This new definition included the redirection of its operations such that it would focus, at least ideologically, on the actions related to social issues and also to the progressive expansion of the private sector in the infrastructure sectors. So it has been
possible to identify the intention of the state in acting as a regulatory entity in several public sectors and services, leaving business performance to private companies.

In that context, a programme to decrease the state presence in the Brazilian economy, the Programa Nacional de Desestatização, was started in the early 1990s through the privatization of metallurgical parks and petrochemical plants. This programme was strengthened in 1995 with the promulgation of the Law of Public Services Concessions, analysing the privatization of the public utilities, and it became a landmark in the identification of a new political strategy for the country.

The creation of regulatory agencies of public services was prioritized. These agencies should establish minimum conditions for the development of the respective markets and also prioritize social achievements.

ANEEL, the National Agency of Electric Power, was created in 1996 to regulate the electric power market and to reach a balance among its participants.

The restructuring process, which started with the redefinition of state strategies and was strengthened by the Law of Concessions, is now facing decisive questions, ranging from the implementation of the chosen model to the statement of policies to consolidate the changes required to achieve a competitive market, capable of bringing significant improvements to the country's energy development.

The principles of the electric power industry restructuring were based on (1) competitiveness and efficiency, (2) supply to serve the demand, (3) stability of rules, (4) rationalization of both supply and demand, (5) industry's investment capability, (6) respect for the environment, (7) the regulatory and monitoring state, (8) private participation through investments, and (9) quality and fair price to the consumers.

Several important factors motivated the restructuring process in Brazil: the reinvestment needed because of the interruption of construction of the facilities, lack of government resources, obsolete technologies in use, and the growing consumer consciousness regarding its rights.

The basic conceptual model

The idea of restructuring the Brazilian electric power sector was not new. The RE-SEB (Restructuring the Brazilian Electrical Sector) project was planned with the objective of formatting a new structure for energy, one that would allow the continuous development of that market.
Defining the project’s basic guidelines was held by the government through the Ministry of Mines and Energy. Some relevant points that would direct the whole process were identified, and, with the approval of the Conselho Nacional de Desestatização, the project was begun. After that, the Reference Term, a document that established some criteria to be followed, was considered. This document included 34 items that were considered by the participants involved in the restructuring process.

The RE-SEB project was effectively started on 1 August 1996, with a very short deadline, due to the high priority assigned by the government at that moment to solve the probable supply problems. These deadlines were taken into account, and in August 1998 the project was, at least preliminarily, finished.

The new model was based on the fundamental concept of a free and competitive market, to be regulated by a federal regulatory agency.

The first step for the establishment of this model was taken with the de-verticalization, or segmentation by activities, of the electric utility to achieve a more competitive environment and to avoid the formation of monopolies. Three segments were defined: generation, distribution, and transmission. Table 2 shows how these three segments would be regulated by the regulatory agency.

Several other characteristics regarding the new model can be listed.

- The fundamental participation of private participants in the new market composition.
- Entry into the sector regulated by the Law of Concessions.
- Free access to monopolistic facilities to avoid imbalance in the industry.

### Table 2 The new electric power industry structure in Brazil

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Segment</th>
<th>Situation</th>
<th>Types of enterprises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deregulation</td>
<td>Generation</td>
<td>Competition</td>
<td>Small hydro plants / hydro thermal / wind / other sources</td>
</tr>
<tr>
<td>Regulation</td>
<td>Transmission</td>
<td>Natural monopoly</td>
<td>Lines of the ‘basic network’</td>
</tr>
<tr>
<td>Regulation</td>
<td>Distribution</td>
<td>Natural monopoly</td>
<td>Lines – generation of restricted interest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lines – distribution</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Distribution installation</td>
</tr>
<tr>
<td>Deregulation</td>
<td>Trading</td>
<td>Competition</td>
<td>Does not have electrical systems</td>
</tr>
</tbody>
</table>

Source: ANEEL (2001)
Freedom to choose the supplier, starting in 2005.
An indicative planner that would act together with the development policies of the country.

The National Congress determined the creation of the ONS (National System Operator) and the MAE (Electrical Energy Wholesale Market) in 1998.

The ONS is a private entity responsible for coordinating and controlling the operation of the generation and transmission facilities through the Brazilian interconnected network. It is a civil association that includes generation, transmission, and distribution companies, energy importers and exporters, and free consumers. The Ministry of Mines and Energy is also a member, with the power to block the decisions that might not be in accordance with the government policies established for the sector.

The ONS is responsible for assuring the quality and the best economic performance of the energy supply and for assuring free access to the basic network.

The MAE is considered as a virtual environment, where energy-trading activities are held through bilateral contracts and short-term negotiations.

The MAE has the following objectives and responsibilities.

- Establish and conduct the market efficiently
- Promote continuous market development
- Take co-responsibility for the Brazilian electric industry's operation and development.

The implementation of this new model has the following objectives: to assure expansion, increase operational efficiency, supply the energy at a fair price, and offer supply quality and continuity. Table 3 shows a comparison between the old and the new models.

Role of the institutional participants: government (CNPE) and regulatory agencies

The CNPE, the agent responsible for determining the energy policies in Brazil, defines the objectives and actions to be taken to achieve continuous development of the energy sector. It interacts with other agencies of the sector to achieve satisfactory development in the electrical power industry.

Despite adversities faced since its creation, it has executed its regulatory tasks in an autonomous and efficient way. It has accomplished several goals while conducting the regulatory process, with a positive balance overall.
Some of the positions and actions taken by ANEEL are as follows.

- Regarding regulation, ANEEL has focused its actions on the establishment of rules that result in market development. It interacts with society through public audiences, in which proposals and new ideas are taken for the solution of specific problem. Resolution Minute for the Universalizing of Electrical Power Public Services, published recently by ANEEL, has contributed to the actions aimed at serving the population that has no access to electrical power.

- ANEEL prioritizes the entrance of new participants with proven capacity to supply electrical power and quality services. It has frequently held public bids for transmission lines and hydroelectric plants, with great success.

- ANEEL has monitored 100% of the public utilities, resulting in several recommendations that have been accepted or are under the implementation process. It has also applied several penalties to the utilities that had not covered all the contractual requirements. The quality and continuity indicators have improved after the intervention in some utilities. There has also been a process of delegating and decentralizing its structure through integration with the federation states agencies to expand the area to be monitored.

- ANEEL has set up a centre of ‘ouvidoria’ (hearing) to keep a direct and active relationship with the several participants in the market. It also seeks to assist their demands of complaints, critiques, opinions, and praises, and to keep an interactive connection with society.

- The agency has been involved in R&D, and it has been seeking to reach knowledge niches to help solve the needs that arise from constant technological innovations in the energy field.

### Table 3 Comparison of the old and new electrical power industry models

<table>
<thead>
<tr>
<th>Old model</th>
<th>New model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing through public entities</td>
<td>Financing through public (BNDES)(^a) and private entities</td>
</tr>
<tr>
<td>Vertical state-owned companies</td>
<td>Utilities divided by activities: generation, transmission, distribution, and trading</td>
</tr>
<tr>
<td>Monopolies with no competition</td>
<td>Free competition - competition in both generation and trading</td>
</tr>
<tr>
<td>Captive consumers</td>
<td>Free consumers</td>
</tr>
<tr>
<td>Prices regulated by the DNAEE(^b)</td>
<td>Prices defined by the market</td>
</tr>
</tbody>
</table>

\(^a\)BNDES – National Bank of Economic and Social Development; \(^b\)DNAEE – National Department of Water and Electrical Energy

**Source** Ministry of Mines and Energy (2001)
It has shown good ability to mediate the divergent interests and to solve several conflicts in the market.

With regard to its autonomy, in spite of the normal difficulties faced as a function of political actions of the National Congress and other government members, it has been trying to act in an exemplary way, searching for alternative solutions for problems and acting in the interests of society.

But there is some dissatisfaction regarding its performance in some of its activities, especially the definition of the tariffs for the consumer. The society questions the profits made by the utilities (distribution), which have obtained very good financial results due to the tariff-updating mechanisms. There are also a great number of uncertainties regarding the rules and the operation of the energy wholesale market. ANEEL also lacks synergy with the CNPE, which is responsible for defining the energy policies for the country.

ANEEL has been contributing to the balanced development of the electric power market. However, only through an integration of the several participants, with each one playing its role, will the energy industry develop. Thus, collective integration has been one of the main issues during the transition to the new model.

Critical vision of the current scenario

Petroleum and natural gas industries

Uncertainties and issues regarding transition and institutional role: accomplishments and challenges

The history of the petroleum industry has been one of great profits and great losses. There is no guarantee given to the explorer/producer in either the national or the foreign legislation. The only certainty for the explorer/producer in the concession contract is that, for a certain period of time, it will have the exploration and production exclusiveness in the area granted by the Union, represented by the ANP.

The ANP is now developing the third ‘big round’ of new areas to be auctioned for exploration—much smaller areas than the first two.

In addition, the ANP has several challenges to be faced in the short term, namely to promote technological development and rational use of energy, to collaborate in the promotion of the natural gas development, and to consolidate the monitoring of the new auction rounds. In spite of the challenges faced up to now, Brazil is on the road to improved development and self-sufficiency in petroleum production.

Regarding natural gas, PETROBRAS has a strategic plan for tripling the gas pipelines before 2005, thereby increasing the transport
capacity to 95 million cubic metres and also indicating a share of 10% of this fuel in the national energy matrix.

The Brazilian natural gas market is based on the expansion of its use in the industry and in electric power generation, which is a growing international reference. Logically, that will not be easy since the regulatory picture of the natural gas market is complex due to the existence of correlated problems, such as free access, price of the transport, and the imbalance of powers among the states.

The important issues are the introduction of competition and the enlargement of the investments with clear rules, since natural gas will replace petroleum in several of its uses, mainly due to environmental reasons.

Natural gas is gradually occupying a larger slice of the national energy matrix. This growth is because of (1) the discovery of new reserves, (2) the development of new technologies associated with the rational use of the gas, (3) the specific characteristics of the natural gas (less pollutants, more abundant, etc.), (4) the restriction to the use of pollutant sources by society, and (5) the substantial increase of new investments by private agents after the Law of Concessions.

The ANP, which is responsible for the regulation of the natural gas market, has always tried to act in a positive way. Through new regulations, the resolution of conflicts, the search for the balance among the agents, and through the creation of a structure capable of spurring the growth of the intensive use of this source, the agency has shown its ability to promote the development of this market.

The electric power industry

Uncertainties and issues regarding the transition and the institutional role: accomplishments and challenges

The changes accomplished until now delineate a new model for the Brazilian electric industry, focusing on efficiency. The model allows, through the creation of a strong and active regulatory agent, society to act as an important participant in the maintenance of quality and reliability in energy supply. That model was based on the creation of a competitive market, with the regulatory agent acting to maintain a balance, providing adjustments to any signs of imbalance.

The restructuring model adopted for the Brazilian electric industry has been greatly discussed due to the recent energy crisis in California, United States, due to its similarities. This situation, however, should not be seen solely as negative. It is necessary to make a critical evaluation of the operation of that market, taking into account specific Brazilian characteristics, and create the mechanisms capable of avoiding any disorder in the national energy industry.
Additionally, the present real perspectives of rationing (due to the lack/delay of investments in generation and transmission and increase in demand, aggravated by the impact of a poor monsoon) have sensitised society to the energy policies defined by the government. The BNDES (National Bank of Economic and Social Development) has pointed out the following as major causes that led the country to this situation: (1) lack of investments through the 1990s; (2) the vague stance on the privatization model of energy companies that are still under state control; (3) the uncertainties regarding the regulation of the system; and (4) the lack of coordination among electric power, petroleum, and natural gas policies.

In this context, during the period of transition to the new model, and challenges for all the participants, the performance of the regulatory agent will be crucial. Many discussions and suggestions are being put on the table now, the pace and model of privatization is being re-evaluated, emergency solutions are being addressed to avoid the imminent possibility of rationing, political issues are being over-stressed, society is reacting for being called to pay a non-taken debt. The regulatory agency is an active and main player in this scenario, taking on its shoulders a great part of the responsibility to ensure that the appropriate measures are taken in time. In this sense, this crisis can be a good opportunity for strengthening the regulatory agent so that a better scenario may arise when the clouds are dispersed.

Another important regulatory issue, not only during emergency conditions, is related to Brazil’s continental dimensions and regional differences, which reinforce the importance and necessity of the partnerships of the federal agency with the state regulatory agencies, seeking not just to overcome the problems related to geographical distances but also to strengthen the relationship with the consumers through local public power. The focus of ANEEL must always be the satisfaction of the needs of the majority, considering, evidently, the divergent interests of the market. Therefore, it is important to interact continuously with the society.

The main aspects and facts presented in this work show the improvement achieved in the construction of the new Brazilian electricity sector model over time. There is still much work to be done. In this context, it is important to emphasize that the implementation of a free and competitive electric power market demands constant attention by society. Society should act as the promoter and also the main interested party in the creation of an atmosphere that makes possible continuous development of the nation. The link of the regulatory agency to the society is then an important foundation for the success of the envisaged model.
The following observations from people living under the transition process can be useful for countries that will restructure their energy industries.

- The state is the entity responsible for supplying quality energy at fair prices; it does not matter if it acts as a regulator entity or an investor.
- The best restructuring model is one that considers all the cultural, political, economical, social, and geographical peculiarities of the country.

Energy industry and the country scenario

For a better and broader understanding of the present Brazilian energy scenario and its trends, it is important to consider other general aspects, some of which are directly connected to the energy industry and some are from the energy sector interrelations with the whole country scenario.

The most important of these aspects involving social, political, environmental, and economic issues are listed below with brief comments. It is only a general and simplified view of the questions, since their full treatment is complex and beyond this paper’s objective.

- The question of privatization. There are still many groups arguing against privatization, which creates the risk of going to a final hybrid (part-privatized and part-government participation) model, different from the one initially envisaged. This would require significant adjustments and changes of routes. Any difficulty that occurs in this transition period is used as an argument against privatization, which makes the question complicated. It can broadly be considered a political issue that involves not only Brazil’s internal situation, but also its external relations, since the initial aim of the privatization process was to get money to decrease the country debts.

- Other strong pressures against the changes. Different groups, some with a social agenda and others due to the risk of losing the relative advantages they enjoy in the present status quo, put pressure against the changes. These pressures come from practically all the actors in the scenario: consumers, politicians, investors, technical people, and so on. Thus, a political decision may be needed to solve the problems.

- Lack of complete, structured, and clear rules. Investors blame the lack of clear-cut rules for the paucity of investments. This again raises the question: should all the rules be determined before starting the changing process? There is a feeling that if this had happened, the process would still have been under debate and the
present situation would have been worse. The need now is for a stronger effort to establish, as soon as possible, the major part of the rules. For this, the present questions and pressures should be faced more quickly. The rules in the energy market too are not fully set: there are many points still under discussion, which involve the regulatory agency also, even though the market is already working. This ‘delay’ in establishing the rules has led to much debate on to the penalty for the delay in starting operations at the nuclear plant Angra 2. Perhaps, the present crisis can force a quicker solution to these problems.

- Environmental questions Although Brazil’s environmental legislation is considered to be very advanced, there are important questions to be considered such as the different views of society and investors, the weak effort to promote ‘real and consistent’ environmental education, the pressure of economically and politically oriented groups, and the lack of people in the environmental agencies to deal, in due time, with the large number of processes that are under way.

- Economical and financial aspects The so-called ‘Brazil’s risk’ makes it difficult for the investors to find the guarantees required for structuring a ‘project finance’ process. The rate of return is low when compared to other countries and other investments such as telecommunications. The government tried to solve part of these problems by using state institutions as long-term energy buyers to guarantee the contracts and for creating some special financing schemes. But these are only limited solutions and do not structurally solve the problem.

- Lack of a country industrial policy Lack of an industrial policy for Brazil, associated with the lack of an energy development strategic plan, was also a factor that negatively influenced the energy scenario. This seems to have been addressed with the recent establishment of the CNPE, but it is too early to determine if it has had a positive impact.

- There are other important questions too that are specific to the petroleum and natural gas sectors, which are under the regulatory framework of the ANP. The main difficulties are in dealing with PETROBRAS, which is still a politically powerful company; the necessity of implementing a gas distribution network, which is today limited within the country; implementing the free access to gas ducts, after dealing with the initial reaction of PETROBRAS to open the access to the Bolivia-Brazil gas duct; dealing with the gas price, already addressed in this paper, which resulted in the delay of the gas-based electricity generation programme and is
still subject of discussions, which, in the Brazilian model, involve harmonic actions of two regulatory agencies, ANP and ANEEL. 

The Brazilian electricity and petroleum/gas sectors presented, since the beginning, different contexts and challenges. Thus, it is difficult to directly compare both processes, but some comments can be made, taking into consideration the interrelation of those sectors through natural gas and the objectives of increasing efficiency and quality. 

With regard to natural gas, the two regulatory agencies usually work harmonically. Despite this, there are some issues that remain unsolved for a while, since they depend on government policies. One example is the delay in the emergency plan on thermal generation due to the risk associated with the unstable money exchange rate, since natural gas is bought from Bolivia in US dollars and the electricity tariff is in Reais, and adjusted yearly.

With regard to efficiency and quality in both sectors, improvements are taking place and actions are being taken to speed up the process. The barriers that still exist should be addressed.

The present improvement is associated with the indexes and requirements placed in the contracts and monitored each year by the regulatory agencies.

The actions to speed up the process result from the projects, presently going on, developed by the companies under the obligation of applying a percentage of their gross sales in efficiency and R&D. These projects also involve Brazilian universities and research institutes and are approved and monitored by the agencies.

The main barriers to the efficiency and quality questions are economic, cultural, and legal. On the part of the consumers, they are not fully informed of their rights, although the agencies and companies have provided facilities to connect to the consumers. In general, people are not educated and conscious of the importance of the efficiency actions and energy-related issues in their present and future life, and a majority of them cannot afford to shift to efficient technologies. As for investors, there are many legal procedures that still allow them to ‘run away’ from some regulatory requirements and go to the court to continue their non-proactive actions or to gain time to implement the changes required to cope with these requirements.

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