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ELETROBRAS' ROLE IN THE DEVELOPMENT OF BRAZIL'S ELECTRICITY SYSTEM

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CONTENTS

Abstract

This paper aims to evaluate the current participation of Centrais Elétricas Brasileiras S.A. - Eletrobras in the development and expansion of the electrical power generation in Brazil. More precisely, it aims to analyze the company's role in the current electric sector model.

To that end, the first part of this paper will present a brief history of the formation of the electric power sector in Brazil, including the creation of Eletrobras and its subsidiaries, the opening up of the market during the 1990s, and the new institutional model for the power sector implemented in 2004. Following that time, and with the enactment of regulation that provided guidelines for a framework for a new regulatory structure for the sector, the expansion of the country's installed capacity began to be driven by auctions for new capacity and for specific structured projects, such as the Santo Antonio, Jirau and Belo Monte hydroelectric power plants. The company's performance in auctions is studied in the third and final section of this paper.

1. INTRODUCTION

The importance of electric power for a society founded on a high level of use of consumer goods is unquestionable. It is an essential input for industry and it has a significant participation in the build-up of production costs. It is a fundamental element for all segments of society, it has a significant influence on inflation rates and consequently on the performance of the economy.

The main characteristic of electricity as a product is its lack of storage capability. This signifies that available power must constantly be equal to demanded power plus losses, as there is no stock of electric power. With a continuous flow from production to consumption, forecasts of demand have an important role in ensuring the balance between supply and consumption.

Another noteworthy feature is the interdependence between all parties – generators, transmitters, distributors and consumers. A generator does not offer their product to a specific consumer. The power produced by each generator is aggregated to the system, forming part of the available electric power. The general situation of the power system will then determine the quality and quantity of power to be consumed.

As the demand for electric power varies over time, with moments of lower or higher consumption (peak periods), there is a need to offer excess capacity in the system in order to satisfy demand at peak times. In fact, the existence of idle generation capacity is a necessary condition in order to provide a degree of reliability in the system, reducing uncertainties over the provision of supply in the quantity and quality required by paying customers.

A structure based on vertically integrated companies, operating in a monopoly regime, was the market structure that naturally was consolidated during the development of the electrical sector. It can be said that the existence of natural monopolies is justifiable due to the existence of economies of scale in production. An increase in the quantity of a specific product implies a reduction in the average production costs, theoretically leading to lower prices for society.

Due to its relevance to the economic development of nations, and due to the external impact that it has and the peculiar characteristics of sector

organization (a networked industry), the presence of the State is generally crucial on the sector. Being a producer, as happened in Europe, or a regulator, a trademark of the American case, State presence has always been necessary to defend society's interests against the monopoly power of corporations.

For developing countries, the adoption of a sector structure that is vertically integrated and regionally monopolistic was motivated by this model's success where it has been adopted by developed nations and the fact that the transition from an agrarian to an industrialized economy was based on the development of manufacturing industries providing positive external impact. Due to the limited internal financing capacity, borrowing from international banks and the World Bank were critical factors in the choice of model to be adopted, as these same institutions financed power industry companies in developed nations.

In Brazil, the presence of the State in the sector was established during the Getulio Vargas government, with its nationalist ideals. Expansion of the country's power generating capacity to ensure that economic growth was not hindered by the lack of electricity was a constant concern. Present in the Planning Goals (*Plano de Metas*) of President Juscelino Kubitschek, and continued to be present in the National Development plans of the Military governments and can be seen more recently in the PAC (Growth Incentive Program) of the Lula government.

The Brazilian power sector has been developed gradually throughout the 20th century, initially through private capital, particularly foreign, and later through a strong presence by State public companies, particularly Eletrobras [1].

In December 2011 Brazilian electric power generation capacity was 116.8 GW, according to Brazilian Electricity Regulatory Agency – ANEEL (*Agência Nacional de Energia Elétrica*) data. The Eletrobras System was responsible for 35.6% of that total. The company operates in regions of the country through its six generation and transmission subsidiaries : Furnas Centrais Elétricas S.A.; Companhia Hidroelétrica do São Francisco S.A.

[1] Eletrobras refers to the Eletrobras holding and all its subsidiary companies, Eletrobras Sytem.

(Chesf); Centrais Elétricas do Norte do Brasil (Eletronorte); Eletrosul Centrais Elétricas S.A.; Companhia de Geração Térmica de Energia Elétrica (CGTEE) and Amazonas Energia. In addition to holding 50% of the world's second largest hydroelectric plant, Itaipu Binacional, and holding significant interests in several Specific Purpose Partnerships, the company also controls distribution businesses in the North and Northeast regions of Brazil.

Studies in recent years showed the need to diversify the Brazilian electric power matrix, in order to reduce the risks from a sector strongly dependent on hydroelectricity[2]. To that end, the Brazilian government agency in charge of studies and research in support of national energy sector planning –EPE (*Empresa de Pesquisa Energética*) – has outlined, in its Ten-Year Plan for Energy Expansion 2020, with one of its objectives being to establish a new structure for the country's generation capacity. Hydroelectricity remains the predominant source for a large part of power generation, totaling 67% of installed capacity, however there will be an increase in participation from thermal power plants, which will provide 15%. small power hydroelectric plants, wind farms and biomass will have a significant increase, reaching 16% of capacity, while nuclear plants will remain steady with 2.0%.

2. THE ELECTRIC SECTOR IN BRAZIL AND THE CREATION OF ELETROBRAS

The production of electricity on an industrial scale in Brazil began almost simultaneously with other capitalist countries, importing the technology being used at that time. By the end of the 19th century, Brazil had a widespread and dispersed population with predominantly agrarian characteristics, and the electrical sector developed at a relatively slow pace through the implementation of small isolated enterprises spread across national territory, (CARNEIRO, 2000).

Generation of electric power was therefore related to the economic development in the richer areas of the country, initially becoming a luxury

[2] Electric energy from hydraulic sources corresponded to 91% of the total generated in 2011 in the National Interconnected System. Data from the Electric National System Operator - ONS.

product and servicing the economic activity of national industrials – manufacturing industries, sugar cane plants, cereal mills and textile industries. The growth of cities and the ongoing urbanization process leveraged consumption, gradually separating its use from activities connected to exported goods, (PINTO JR., 2007).

The country's suitability for hydroelectric power generation is worthy of note, and has been a feature of the generating sector since its beginnings, in contrast to other regions in the world, where thermal generation, particularly coal-based, was predominant. In 1890, hydroelectricity corresponded to 20% of the country's generation capacity of 1,827 kW, reaching 82% of 152,401 kW in 1910, (PINTO JR., 2007).

Sector expansion in the first decades of the 20th century was funded by both national and foreign private capital. The first national electricity companies were formed, which were vertically integrated and operationally segmented, CARNEIRO (2000).

The concession of public services, specifically electricity, was granted locally under the political structure of the Old Republic (1889-1930), based on strong federalism and administrative decentralization. The posture of the State was to not interfere in private businesses.

> "Shortly prepared and dominated by the non-interventionist liberalist attitudes dominant at that time, the State generally based its actions in the economic field in general, and the electric sector in particular, on a commitment to ensuring remunerative conditions for capital, which had relative autonomy not only to establish the tariffs for energy, but also to decide on issues regarding when, and under what circumstances, the service should be offered" (CARNEIRO, 2000, p.93).

Brazil's electricity industry in the early 1930s consisted of 1,009 companies with a generation capacity of 779 MW. The two main foreign capital companies established in the country in this period, who were responsible for

supplying the principal Brazilian cities, were: i) The Canadian Company, Light - dominating the two main Brazilian markets, Rio de Janeiro and São Paulo - and, ii) the American Company, AMFORP. They possessed 40% and 15% of the installed generation capacity in the country, respectively. In parallel, small local initiatives, in the form of Municipal concessions, supplied the remainder of the Brazilian market (PINTO JR., 2007). This dominance of foreign companies occurred, according to CARNEIRO (2000), because of its large size and better conditions for obtaining loans and financing from overseas compared to that available for national companies. Moreover, the formation of oligopolistic market structures through mergers and acquisitions tends to occur when there are no significant institutional barriers to the concentration and centralization of capital, (ROSA, 1998 apud in CARNEIRO, 2000).

From the Decree 24,643 of July 10, 1934, known as the "Waters Code", the Brazilian government began to take a more incisive role in the sector. The nationalist stance of then President, Getúlio Vargas, started to restrict the use of the water resources by foreign capital companies[3], establishing ownership of the Federal government on all the country's existing hydropower resources, (PIRES, 2000). The decree established that the use of hydroelectric plants by Brazilians or companies incorporated in Brazil would be through authorizations or concessions. In addition, the Federal government began to regulate and control the activities of existing power utilities, as opposed to the decentralized approach that existed until that time when the States and Municipalities were responsible for it. In 1939 the National Council of Water and Power was created, the Federal government entity responsible for preparing plans, regulating the Legislation and dealing with conflicts between power utility concessionaires and the conceding authorities, (PINTO JR., 2007). In fact, the political and institutional reforms that took place during this period has as a backdrop the Revolution of 1930, breaking the ideals of economic liberalism and strong Federalism that prevailed in the Old Republic, (CARNEIRO, 2000).

Greater State intervention in the electric sector in the postwar period was due to the conception that foreign companies would not be interested in

[3] Suspended in 1942 (ANDRADE, 2012)

investing in the electricity generation industry. Thereby, the solution was to increase State participation through the creation of public companies, (ANDRADE, 2012).

For CARNEIRO (2000), the interventionist measures adopted in the sector during the administration of Getúlio Vargas resulted in reduced investment by power utilities, notably Light and AMFOP, due to additional State control over the electricity generation and distribution segments. Regarding the former, by restricting the operational freedom of power utilities and with respect to the later, establishing controls on remuneration and economic returns, creating an unattractive scenario to capital accumulation. The accounting of fixed assets at historical cost ad the basis for calculating tariffs caused great dissatisfaction among power utilities, given the inflationary process in the Brazilian economy at that time. Despite the capacity increase observed during the 1930s, as shown in Table 1**,** it should be highlighted that this evolution was mainly due to the maturation of investments initiated in periods prior to enactment of the new institutional framework mentioned above. Growth was only 1.2% per year when such projects are excluded, (CARNEIRO, 2000).

Table 1 - Evolution of the Installed Capacity of Hydroelectric Power in Brazil

Year	Installed Capacity (MW)
1930	630.1
1931	646.1
1932	650.0
1933	658.3
1934	665.3
1935	676.7
1936	745.7
1937	754.7
1938	946.9
1939	952.0
1940	1,009.3

Source: CARNEIRO, 2000

Table 2 - Evolution of Installed Capacity in Brazil and GDP Growth

Year	Installed Capacity (MW)	Annual Growth (%)	GDP Growth Real Annual Variation (%)
1930	778.80		-2.10
1934	828.66	1.56	9.20
1938	1,161.66	8.81	4.50
1942	1,307.67	3.00	-2.70
1945	1,341.63	0.86	3.20

Source: ANDRADE, 2012

The creation of the São Francisco Hydroelectric Company (Chesf) by President Getúlio Vargas in October 1945, and its subsequent constitution during the government of Eurico Gaspar Dutra in March 1948, is considered to be the beginning of Federal government intervention as an electricity producer. Formed with the aim of constructing the Paulo Afonso hydroelectric plant and providing low cost energy to an under resourced, low income region, the northeast of Brazil.

The following years were marked by the emergence of State owned companies, which were developed according to the characteristics of each region. Initiatives taken by the State governments of Rio Grande do Sul and Minas Gerais stand out, while in the main industrial center of the country, São Paulo, the strong presence of the foreign-owned company, Light, greatly influenced the pace of State intervention (less than in other States). In São Paulo the private sector played an important role in the development of the local electrical power sector, (PINTO JR., 2007).

The need for supply of power and the imminent threat of rationing resulted in the foundation of Central Elétrica de Furnas by Decree Law 41,066 of February 28, 1957 (the name changed in 1971 to Furnas Centrais Elétricas S.A.). Included in President Juscelino Kubitscheck's Planning Goals, the company aimed to constructing the Furnas hydroelectric plant in the State of Minas Gerais. Initially under control of the National Bank for Economic Development (*Banco Nacional de Desenvolvimento* - BNDES) with equity participation from *Centrais Elétricas de Minas Gerais* (Cemig), the São Paulo

Department of Water and Power, and with foreign capital represented by São Paulo Light and by *Companhia Paulista de Forca e Luz* (CPFL), a subsidiary of AMFORP, (CENTRO DE MEMÓRIA DA ELETRICIDADE, 2012).

According to PINTO JR. (2007), up until the mid-50s, the Brazilian electrical sector was highly regionalized, with local enterprises. Over the years, roles within the sector underwent a natural division. Energy distribution - with smaller investments and lower risks - was provided by the private sector, whereas generation and transmission activities - with higher risk and significant investments - were undertaken by the public sector.

Between 1945 and 1962 there was strong expansion of electric power generation capacity. Up to the mid-50s, the foreign private capital that had dominated the Brazilian electric sector was unable to make the investments necessary to meet the increasing demand of a growing urban-industrial economy. Starting from the second half of the 50s, the State[4] increased its participation in the industry, leveraging its substantial investments and thereby becoming the main player in the sector, (Martins, 2009).

Table 3 - Evolution of Installed Capacity in Brazil by Energy Producer

Year	State		Private		Autoproducer	
	MW	(%)	MW	(%)	MW	(%)
1952	136	6.8	1,635	82.4	214	10.8
1955	538	17.1	2,248	71.4	362	11.5
1958	824	20.6	2,743	68.7	426	10.7
1960	1,099	22.9	3,182	66.3	519	10.8
1963	2,305	36.3	3,164	49.8	886	13.9
1965	4,048	54.6	2,486	33.6	877	11.8

Source: MARTINS (2009).

The 1960s and 1970s were important decades in the strengthening of State power over decisions relating to electric sector development. With the

[4] In this period companies owned by the States were responsible for the greatest increases in electric generation capacity, surpassing Federally-owned companies (ANDRADE, 2012).

establishment of the Ministry of Mines and Energy (MME) in 1960, and Eletrobras in 1962, the State was now in charge of planning, investment, construction, expansion, operation, financing and regulation of the electric sector, (PIRES, 2000). This process began in the 30s, was strengthened in the 50s, consolidated from 1964 onward, and reached its peak in the 70s (PINTO JR., 2007).

ECCARD (2011) highlights that seven years elapsed between the passage of the Law enabling the formation of Eletrobras and the constitution of the company. Several interestes opposed to the formation of the company postponed the start of its operations. State governments, BNDES and foreign power utilities were all against the concentration of power in the hands of a Federal enterprise, especially in a consolidated industry composed of over three thousand companies. With Eletrobras, the government assumed the lead role in the growth of electric generation capacity in Brazil.

As stated by PINTO JR. (2007), the role of the Federal government in the electric sector begun to be performed by the newly Eletrobrás, initially composed of Furnas, Chesf, CHEVAP (*Companhia Hidrelétrica do Vale do Paraíba*) and TERMOCHAR (*Termoelétrica de Charqeadas*) . The resources needed to provide the company's cash flow came from two different Federal government measures: a) ownership and management of the Electrification Fund investment portfolio was transferred to Eletrobras, which had previously been managed by BNDES and; b) a compulsory loan was established in favor of the company. Both measures were enacted by Law 4,156 of November 28, 1962. With this, the Federal government created the conditions necessary for financing the expansion of electric power generation capacity in the country.

Commencing in 1964, under the military government, further measures were implemented in line with the aims of consolidating a national electric system. The National Water and Electricity Council – CNAEE (*Conselho Nacional de Águas e Energia Elétrica*) was wound up and its duties split between Eletrobras and the Department of Water and Power –DNAEE (*Departamento Nacional de Águas e Energia Elétrica*) created in 1964. This organ then became the conceding power and supervisor of power utilities, as

well as being responsible for setting electricity tariffs. The Ministry of Mines and Energy was responsible for establishing sector policies, while Eletrobras would plan and execute the established policies, (OLIVEIRA, 1998 apud PIRES, 2000).

PINTO JR. (2007) also highlights other measures adopted after 1964: a) the adoption of a unified frequency across the entire country of 60 Hz, enabling the interconnection of different regions, given the states of Rio de Janeiro, Rio Grande do Sul and Espírito Santo operated at 50 Hz; b) acquisition of AMFORP and Light assets by Eletrobras, and; c) the introduction of monetary indexation of electric utility's fixed assets, thereby allowing tariffs adjustments and providing financial support for sector expansion.

Two new federal enterprises were created. Eletrosul in 1968 and Eletronorte in 1972 – both subsidiaries of Eletrobras. Eletrosul had the aim of expanding electricity supply in the South of the country, having in its portfolio thermal generation plants under Federal control in the states of Santa Catarina and Rio Grande do Sul and responsibility for concluding the construction of the Passo Fundo hydroelectric plant. Eletronorte was created without own assets with the aim of developing power generation capacity in the North of the country, having the construction of the Tucuruí hydroelectric plant with 8,370 MW installed capacity among its main projects.

Hence, the model of the Brazilian electric sector was consolidated. The negotiations between Brazil and Paraguay over the construction of Itaipu hydroelectric plant (in 1962) enabled the goals of forming a national electrical system, as the plant was connected to the S/SE interconnected transmission subsystem. Given the scale of this project, 12,000 MW[5], and the urgent need to coordinate the generation and transmission of electricity generated, the Coordinating Group for the Operation of the Interconnected Southeast and South Region was established. In the same way as with the construction of Furnas hydro-power plant in the 50s, Itaipu would provide enough capacity to supply the majority of national demand for electricity, ratifying the government model of a national electric power system, (PINTO JR., 2007).

[5] Currently the installed capacity of the plant is 14.000 MW.

Thus, by the late 70s and early 80s the model for the Brazilian electricity system was well defined. According to PINTO JR. (2007), the national electric system was subdivided as follows: 1) regional suppliers - Eletrobrás regional subsidiaries operating large power plants and the main transmission network; 2) vertically integrated power utilities - State companies operating in all three sector segments: generation, transmission and distribution of electricity. Cemig (State of Minas Gerais), Cesp (State of São Paulo), Copel (State of Paraná) and CEEE (State of Rio Grande do Sul) are examples of this; and 3) distribution companies - focused on the distribution of electricity to final consumers – both State and private electricity utilities found in this group.

> "Between 1967 and 1973 several assets were transferred from Eletrobras to State companies, namely those that had been acquired from AMFORP. The logic behind these transfers the decentralization of administration, with the Federal government remaining responsible for regional and national generation and the interconnected system" (PINTO JR., 2007, p.214).

In short, the industrial organizational model of the Brazilian electrical system, as with the industrialized countries of Europe, focused on forming vertically integrated State monopolies, with regulated tariffs based on the cost of service. The difference between the European and Brazilian structures was that due to its geographical size and the characteristics of the hydroelectricity produced in Brazil, several regional monopolies were created. Planning and coordination of operations centralized in the Federal government enabled the exploitation of economies of scale in electricity generation, primarily in the construction of large hydroelectric plants. Thus, "... the Brazilian electric power sector grew sustainably until the mid-70s, rapidly expanding consumer access to electrical services at cheaper tariffs" (PINTO JR., 2007, p.218).

Table 4 - Evolution of Installed Capacity and GDP in Brazil

Year	Instaled Capacity (MW)	Instaled Capacity Annual Var. (%)	GDP Annual Variation(%)
1963	5,525		0.60
1965	6,436	7.92	2.40
1969	9,444	10.06	9.50
1973	14,487	11.28	13.97
1977	21,741	10.68	4.93
1981	34,248	12.03	-4.25
1985	39,897	3.89	7.85
1989	47,894	4.67	3.16

Source: ANDRADE, 2012

2.1 THE 1980s CRISIS AND THE 1990s REFORMS

The need to expand electricity supply in the 1960's and 70's became a crucial issue to support the high economic growth rates observed in this period. According to Pires (2000) there was significant effort to make investments in this area. The substantial financial amounts involved in projects to expand capacity basically had three different origins: i) cash flow; ii) internal financing; and iii) external financing.

Cash flow is the reinvestment of profits from operational projects, which provides insufficient resources given the large values involved in infrastructure projects. The second was based on obtaining loans from domestic banks, funds from the national treasury and specific taxes aimed to providing funding for the sector, in particular the Single Electricity Tax – UEE (*Imposto Único sobre Energia Elétrica*)and compulsory loans in favor of Eletrobras. External funding was obtained from bank funds and multilateral lending agencies, (PINTO JR., 2007).

In a situation of rising inflation, the policy of not adjusting public utility tariffs adopted by the government - and put into practice since the late 70s –

had a significant impact on self-financing. According to ECCARD (2012), there was a gradual decrease on the real tariff charge from the consumers in the mid-70s and a loss of budget resources that significantly reduced the parcel of self-financing, mainly those which depends on public funds. In order to continue with the National Development Program – IIPND (*Plano Nacional de Desenvolvimento*), companies took advantage of favorable currency and liquidity conditions in the international markets and sought funds abroad, however thereby incurring debts in U.S. dollars.

The Brazilian economic crisis of the 80s threatened the success of the model adopted to the development for the national electrical power industry. On one hand, the projected growth in demand did not materialize due to Brazil's economy stagnation. On the other hand, the deterioration in financing conditions of external funding due to the interest shock in 1979 and the Mexican crisis of 1982 at first enhance and later diminished external funds available to the already indebted companies, notably Eletrobras.

For PIRES (2000) the crisis that affected the electric sector in the 80s was financial. With conditions worsening for external resources, companies turned to the domestic financial market. Just as with the international market, interest rates were high and did not favor long-term financing, in addition to which there was a low availability of domestic resources as a result of reduced domestic savings.

In this scenario, according to ECCARD (2012), Eletrobras saw its role as a source of financial funds for the national electric sector lose strength, while the discontent of State governments against the centralizing role of the holding company grew. In fact, the scarce resources available were now directed to the three large-scale projects in construction that were under the control of Eletrobras' subsidiaries: Itaipu Hydropower Plant, Tucuruí Hydropower Plant and Angra I Nuclear Power Plant.

In the mid-80s, the Brazilian electric power sector found itself facing financial difficulties. The high indebtedness of power utilities, external credit rationing, low self-financing capacity and the country’s difficult fiscal situation - which restricted internal resources acquisition, significantly altered the future scenario for new investment decisions, (PINTO JR. 2007). In this new situation,

"... a growing process of decapitalization in the industry begins …" (PIRES, 2000, p.68). The analysis of the rate of growth in installed capacity after 1985 illustrates this fact, Tables 4 and 6.

The 1988 constitution further weakened the financial capacity of the sector. The IUEE tax specific to the electrical sector, was extinct and replaced by the general sale tax on goods and services tax –ICMS (*Imposto sobre Circulação de Mercadorias e Serviços*). Income tax rates for companies in the sector were raised and BNDES was prevented from lending money to State companies through National Monetary Council Resolution 1,464 of June 1988, (PINTO JR., 2007).

According to Andrade (2012), an important consequence of this process of financial weakening of electrical utilities can be observed within contracts. In fact, since the majority of power utilities were within the public domain, it seems there was no commitment to abide by the rules established in the concession agreements, especially with regard to payment for electricity sold by the generators to the distributors, "... which led to widespread default, exactly at a time when the financial crisis was at its worst", (PIRES, 2000, p.70).

For PINTO JR. (2007), the idea of reforming the Brazilian electrical sector began to take shape based on the argument that the State companies cannot keep on the expansion of power generation capacity due to the difficulties to obtain financing. Moreover, PIRES (2000) points out that in addition to financial issues, the defaults observed between utilities within the sector led to questions over the then current institutional structure in the electrical sector.

The solution contemplated at that time was based on the sale of public companies and sector deregulation, which signified unbundling vertically integrated companies and the introduction of competition. It was hoped that this would reduce costs and prices, as well as improving the quality of services. In other words, the entry of private capital was seen as fundamental to a return to investment and increased economic and operational efficiency within sector companies.

It is important to note that this process occurred in several industrialized countries, with the model adopted in the U.K. by the Thatcher government being used as a model. In Brazil, this process began under President Fernando Collor de Mello, in 1990, with proposals for liberal reforms in the Brazilian economy and a reduced role for the State as producer of goods and services, mainly in infrastructure areas. This government had the opening of the country's economy as one of its goals, particularly in the infrastructure sector, and announced a policy of undertaking administrative, fiscal and monetary policy reforms. In his context, it was elaborated the National Privatization Program – PND (*Programa Nacional de Desestatização*), which included companies such as Eletrobras. In 1989 (ANDRADE, 2012), 85% of installed power generation capacity in Brazil belonged to State-owned companies operating at the Federal and State level.

In fact, during the 1990s, public companies had their capability to invest in capacity expansion sharply curtailed by the Federal government, which had the aim of reducing State participation and increasing the level of private capital in the sector. Accordingly, the year 1995 saw 33 concessions previously given to Federal and State-owned companies being revoked by the Cardoso government - eight of them belonging to Furnas, nine to Eletronorte, six to Chesf and two to Eletrosul (CACHAPUZ, 2002, apud ECCARD , 2012).

Fernando Henrique Cardoso took office in 1995, and continued the neoliberal ideals adopted by the previous government, proposing to further extend the reforms initiated under President Itamar Franco, when he served as Minister of Finance. The new government sought to continue the privatization process of public companies, claiming that they were inefficient.

In parallel to seeking private capital for the acquisition of the assets of the public companies, it was also necessary to adopt measures relating to the institutional framework in support of the desired new sector structure. Thus, a process of establishing a new institutional model began in 1993, with the creation of new institutions that would regulate, audit, operate and define short-term prices for power generation. ANEEL (National Electric Regulatory Agency) was created in 1995, the *Operador Nacional do Sistema Elétrico* – ONS

(National Electric System Operator) and the *Mercado Atacadista de Energia* – MAE (Wholesale Energy Market) were created in 1998. Laws 8,987 and 9,074 (1995) were passed, relating to public services concessions, (PINTO JR., 2007).

As basis for the development of the new model, such institutions - along with the National Council for Energy Policy –CNPE (*Conselho Nacional de Política Energética*) and the Coordinating Committee for Expansion of Electric Systems – CCPE *(Comitê Coordenador do Planejamento da Expansão dos Sistemas Elétricos*) - would be responsible for the functional structure of the new system, with the latter being responsible for monitoring the system and planning expansion.

Although the process of privatization of public companies had been initiated during the government of Fernando Collor in the steel, petrochemicals and fertilizers industries, the first privatization in the electric sector only occurred during the Fernando Henrique Cardoso administration. More precisely, due to the financial problems of the distribution concessionaires previously mentioned, the government considered that the first companies to be sold should be those in this sector. Therefore, the conditions to sell the larger generating companies would be created, notably those belonging to Eletrobras, (REGO, 2007).

With the inclusion of Eletrobras companies in the National Privatization Program in 1995, its assets began to be passed to private companies. The process commenced on July 12, 1995 with the privatization of Escelsa (distribution company in the State of Espírito Santo), followed by the privatization of Light and CERJ (distribution companies in the State of Rio de Janeiro) in 1996. Between 1995 and 2000 twenty-four Brazilian electric sector companies were privatized, (Rego, 2007). In 1997, Eletrosul was divided in two: i) *Centrais Geradoras do Sul do Brasil* – GERASUL (Southern Brazil Generating Centers), holder of generation assets and liabilities - later sold to the Belgian Group Tractebel on September 15, 1998 for the amount of R$ 945.7 million; and ii) Eletrosul, responsible for transmission lines. In order to privatizing Furnas Centrais Eletricas, in 1997 was formed Eletrobras Termonuclear S.A.

(Eletronuclear) as a result of the split of the nuclear generation segment of Furnas, the nuclear power plant Angra I.

According to ECCARD (2012), significant political opposition relating to the privatization of Eletrobras System meant that the government's plan to sell the other subsidiaries to private capital did not advance. For PIRES (1999) the difficulties faced by the government in privatizing Furnas and Chesf were due to outstanding labor liabilities in the case of the former, and the lack of definition on waters regulations in the case of the latter. In the case of Eletronorte, the problem was due to problems in the economic and financial viability of the new companies formed from its cleavage, especially those whose concession areas were located in isolated systems in the northern part of the country.

Following the privatization process in the electric sector, there was a significant change in the management of generation and distribution activities in the period between 1995 and 2000. On the former, private companies increased their participation in installed capacity from 2.7% to 22%, while in the latter this percentage changed from 2.4% to 63 %, (CACHAPUZ, 2006 apud ANDRADE, 2012).

With this process of change in the role of the State in the economy, some important functions previously undertaken by Eletrobras became the responsibility of the newly created public entities. The National System Operator, ONS, became responsible for coordinating the operation of the interconnected systems, BNDES has become the main financier of the electricity industry, although sector funds such as "*RGR*" and "*CDE*"[6] continued to be the responsibility of Eletrobrás, planning became the responsibility of the Expansion Planning Coordinating Committee (*CCPE*), created to replace the old System Planning Group – GCPS *(Grupo Coordenador do Planejamento dos*

[6] RGR Fund: *Reserva Global de Reversão,* funded by consumers and providing compensation to all concessionaires for non-renewalor expropriation of their concessions. Used as source of funds for the expansion and improvement of the electrical energy sector.*CDE Account*: *Conta de Desenvolvimento Energetico,* the energy development account.

Sistemas Elétricos) - coordinated by Eletrobras and wound up after the establishment of the Ten Year Plan 2000-2009, ECCARD (2012).

Eletrobras therefore had its role significantly reduced as the reforms implemented by the governments of Fernando Collor and Fernando Henrique Cardoso. In addition to the above mentioned functions, the company lost control of the Escelsa and Light distribution companies with their privatization. However, with funding from the RGR fund, Eletrobras acquired the controlling stake in the State distribution utilities CEAL (*Companhia Energética de Alagoas*), CEPISA (*Companhia Energética do Piauí*), CERON (*Centrais Elétricas de Rondônia*) , CEAM[7] (*Companhia Energética do Amazonas*) and Eletroacre (*Companhia de Eletricidade do Acre*) - located in the North and Northeast of Brazil - between 1997 and 2000. It is important to highlight that this "Federalization" of State companies was aimed at their subsequent privatization, since no interested parties had come forward to acquire their assets due to their technical and financial liabilities. It was therefore the role of Eletrobras to sanitize the problems of these companies to enable their privatization - something that has not yet occurred. Additionally, the *Companhia de Geração Térmica de Energia Elétrica* - CGTEE (Thermal Electricity Generation Company) was incorporated into Eletrobras in 2000. The company was established in 1997, passing to Federal control in 1998 as part of the payment of a debt of the State of Rio Grande do Sul with the Federal government. Having a thermoelectric generation fueled by coal, with 490 MW capacity at that time, the company originated from a split from the State distribution company, CEEE.

In short, from all the attribute that had been incorporated in its 40 years of existence (2002), from being the leading company and the highest authority in the development of the electric sector, the company was left with the function of a holding company for sector players awaiting privatization and administrator of Federal programs for the electric sector such as “Luz no Campo”, PROCEL and RELUZ[8], ECCARD (2012). Following a period with policies that sought to

[7] Currently Eletrobras Amazonas Energia.

[8] Luz no Campo - universalization of the electrical supply network in rural areas; PROCEL - National Program for Energy Conservation; RELUZ - National Program for Efficient Public Lighting.

reduce the role of the State as a producer in favor of the State as a regulator, the company remained virtually stagnant in terms of investment. Moreover, one of the principal functions inherent in achieving a balance between supply and demand in the electric sector was removed from the company: long-term planning.

For PINTO JR. (2007), the implementation of reforms in the electric sector should follow a sequence of events that, in the case of Brazil, did not occur. The flaws in implementing the new model became apparent with the rationing crisis occurred in 2001. The perception of unfinished reforms led to the discontinuation of investments in expanding energy supply, due to a high degree of uncertainty. Finally, a severe financial crisis hit the distribution companies during 2001-2003 due to the decline in revenue resulting from the rationing of electricity consumption.

Following this line, PIRES (1999) argues that the trajectory of reforms did not follow consistent and articulated steps. Rather, it was "...an *ad hoc* and gradual process that only became more comprehensive, consistent and coordinated in 1997 ...” (PIRES, 1999, p.141). The author also points to the fact that privatizations and regulatory reforms occurred in parallel, with no prior definition of the rules that would be applied in the sector.

COSTA AND PIEBORON (2008) corroborated the idea that a still incipient institutional environment was responsible for the downturn in investments for expanding power generation capacity. Even with a high risk of energy deficit, which would lead to higher product prices, the perceived political and regulatory risk inhibited investors, causing a mismatch between supply and demand in 2001.

For REGO AND PARENTE (2008), low investments in the expansion of installed capacity are a consequence of the introduction of competition in the electric sector resulting from the liberalization of trade between producers and distributors. There were no incentives for new investments, given that an increase in supply would lead to a reduction in prices, reducing the profit of energy suppliers.

Many arguments have been put forward in order to explain the causes for power rationing in 2001; however, "... what is known is that investments were insufficient, so much so that there were several regional blackouts in 1999 and in 2001 there was electricity rationing", (ANDRADE, 2012, p.39).

Table 5 - Investments in the Electric Sector (% GDP) in Brazil

1971 -1980	1981-1990	1991-1993	1994-1996	1997
2.1%	1.5%	0.9%	0.6%	0.6%

Source: ANDRADE, 2012

Table 6 - Evolution of Brazilian Installed Capacity and GDP variation

Year	Installed Capacity		Annual Var. GDP
	(MW)	Annual Var.(%)	(%)
1990	49,761		-4.35
1991	50,852	2.2	1.03
1992	51,760	1.8	-0.47
1993	52,751	1.9	4.67
1994	54,105	2.5	5.33
1995	55,534	2.6	4.42
1996	57,194	3.0	2.15
1997	59,150	3.4	3.38
1998	61,982	4.8	0.04
1999	64,473	4.0	0.25
2000	71,046	10.1	4.31
2001	74,877	5.4	1.31
2002	80,315	7.3	2.66

Source: DE ANDRADE 2012

2.2 THE REFORM OF THE REFORM

Given the situation of the Brazilian electric sector as previously described, the newly elected government of President Luiz Inácio Lula da Silva

sought to solve the problems inherited from the previous administration, notably seeking to strengthen the institutions responsible for providing reliability to the system and creating an environment favorable to recovery of investments. New rules for electricity trading were created by Laws 10,847 and 10,848 approved by the National Congress on March 15, 2004 and Decree 5,163 of July of the same year, changing the fundamentals of energy auctions and creating new companies and government agencies in order to plan and coordinate the complex national electric system.

Some factors contributed to the new government to having enough time to implement the desired changes, in particular the surplus of electricity at that time. CACHAPUZ 2006 (apud ANDRADE, 2012) states that this excess of electricity was due to the fact that there was a low economic growth in the previous years, reduction in consumption due to rationing, migration of large industrial consumers to the auto-producers category, and new generation units. With respect to the latter, REGO (2007) remember that besides the Thermoelectric Priority Program – PPT (*Programa Prioritário de Termeletricidade)* - launched in 2000, which made available several natural gas thermal power projects, and hydropower plants that had been auctioned but had not yet entered operation during the Cardoso administration, contributed to this oversupply. In addition, the build-up of hydro reservoir reserves and a population that had learned to economize energy during rationing contributed significantly to the scenario described above.

By means of Decree 5,163, the rules that would govern energy trading were established. Two distinct markets were created: a) the Free Contracting Market – ACL (*Ambiente de Contratação Livre*); and b) the Regulated Contracting Environment – ACR (*Ambiente de Contratação Regulada*). The difference between these markets rests with the energy purchaser. In the first case only consumers classified as “free” may purchase energy. In the case of the ACR, only distributors are entitled to purchase energy from supplying agents - concession holders, authorized generators or importers.

The Energy Research Company - EPE was created by Law 10,847, with the primary function of preparing studies relating to the need to expand the

supply of energy in the country and assisting in energy sector planning – effectively performing the duties of the extinct CCPE - Expansion Planning Coordination Committee, created in 1999. Among its main responsibilities, stand out the obtaining environmental previous licenses for new projects to be bid, enable projects to be auctioned, and the calculation of the reference marginal cost for power purchase auctions.

The Electricity Trade Chamber – CCEE (*Câmara de Comercialização de Energia Elétrica*) was established by Law 10,848, replacing the old Wholesale Energy Market – MAE (*Mercado Atacadista de Energia*), in order to operationalize power auctions and register all contracts between sector parties, whether free or regulated contracting. A private, nonprofit company, this operates under authorization of the conceding power and audited and regulated by ANEEL.

The Electricity Sector Monitoring Committee -CMSE (*Comitê de Monitoramento de Setor Elétrico*), directly linked to the Ministry of Mines and Energy, was also created by Law 10,848, with the Minister as chairman of the entity. It seeks to continuously monitor and assess the continuity and security of electricity supply nationwide.

It is important to point out that it was the same Law 10,848 that withdrew some Eletrobras companies from the National Privatization Program (distribution companies in the N/NE regions remains eligible for privatization) and re-qualified Eletrosul to operate in the electricity generation sector. According to Article 31, paragraphs 2 and 3:

1) "*Centrais Elétricas Brasileiras S/A* - ELETROBRÁS and its subsidiaries are excluded from the National Privatization Program - PND: *Furnas Centrais Elétricas S/A; Companhia Hidroelétrica do São Francisco* - CHESF*, Centrais Elétricas do Norte do Brasil S/A* - ELETRONORTE and *Empresa Transmissora de Energia Elétrica do Sul do Brasil.* "

2) "*Empresa Transmissora de Energia Elétrica do Sul do Brasil S/A* – ELETROSUL is authorized to provide public services for generation and transmission of electricity, through concession or authorization, as required by law, and may adjust its statutes and its corporate name to incorporate these activities."

3. THE CONCESSIONS LAW AND THE ELECTRIC SECTOR

3.1 THE FIRST AUCTIONS

The mandatory requirement for prior approval for granting new electricity generation concessions was established by Law 8,987 of 1995 (known as the "Concession Law") with wording amended by Law 9,648 of 1998. According to Parente 2008, of the three judging criteria prescribed by law, the conceding authority at the time, the National Department of Water and Power - DNAEE, later replaced by ANEEL (1996), defined the criterion of highest offer as the defining criteria for the granting of a concession. That is, the company that offered the highest payment for the use of public property, or the highest premium compared to a minimum price previously stipulated by the conceding authority, would be declared the winner bidder.

An important point to note is the risks taken by investors in new project auctions with respect to the environmental license. COLLET (2005 apud Gomes, 2006) point out that for new projects auctioned up to April 2005 was an obligation to the winning bidder to obtain the necessary permits from the responsible entities. These licenses could take up to three years to be obtained, or in some cases denied.

In this sense there were several auctions to grant new concessions. For REGO and PARENTE (2008), the high premiums seen in these auctions, in some cases more than 3,000%, were due to the perception of large electricity consumers - cement, aluminum, mining producing companies, etc. - of the possibility of an increase in electricity prices due to the model adopted by the government. As such, these companies participated in the auctions as auto-producers, to ensure their electricity demand at a reasonable price. On the other hand, companies that focused participate in the market, namely independent power producers, accepted the challenges posed by the new model and its bidding process. In fact, the premiums recorded in these bids achieved unexpected values, prompting the government to celebrate the success of the auctions.

Despite having being auctioned, many of these plants ended up not entering into operation by 2005, with work started but not finished, or even not started at all. Such ventures were subsequently nicknamed *Botox* plants, i.e. old projects, with their concessions enacted prior to Law 10,848 of 2004, but they "looked" new, because they have been dealt with under the new regulation. In all, there were 46 plants summing an installed capacity of 10,017 MW and assured energy of 5,278 MW, (REGO and PARENTE, 2008).

3.2 THE NEW MODEL

As discussed earlier, the Lula government made significant institutional changes in the electric sector, mainly due to the failure of liberal reforms of President Fernando Henrique Cardoso, which culminated in energy rationing. According to REGO and PARENTE (2008), the change in criteria for obtaining a generation concession, from the highest offer to the lowest rate for the provision of a public service, aimed to provide economies of scale in procurement, share risks and benefits of the contracts and equalize the supply costs for distributors, as well as seeking moderateness tariffs for public service delivery.

Security of supply began to have a strong relationship with long-term actions. To reduce uncertainty, the government started to pursue the expansion of the system by creating favorable conditions for investment in the sector. New generation plants would be able to enter into long-term *Power Purchase Agreements* (PPAs). PPAs could be obtained in the new energy auctions. Thus, the excess supply of energy is no longer a problem for investors, since their product is already pre-sold at previously contracted prices.

Regarding to financing projects to be bid, project finance structure was adopted. This provides the lending financial institution (in most cases BNDES) with security from the future cash flows of the projects. When entering into long-term contracts with distributors, future project revenue projections can therefore be performed with greater accuracy. Thus, the problem of financing projects, at least in terms of offering financing securities, appears to be covered.

In order to achieve moderateness tariffs and ensure sector expansion, contracting energy in the regulated market is accomplished through auctions in which the winning bidders formalize contracts between themselves and the distribution utilities.

The requirement for auctions is established by the distributors, who must ensure 100% coverage of their captive markets by contracts in the regulated environment. The distributors have a period of 60 days prior to the auction to inform the amount of energy they intend to contract for the next five years, i.e., the distributors are responsible for the projections of market demand. Based on the sum of the demand of individual distributors, EPE calculates the total amount that will be contracted during auction. In short, contracting in the ACR determines sector expansion requirements. The pool system reduces the risk of default, since the generator signs contract with all the distributors.

The competition among generators is *ex-ante.* It takes place based on competition for exclusivity of electricity supply during a given period of time. The competition only takes place at the bidding stage, through competitive bids. The competition is in the form of an auction, in which the company that offers the lowest price for the sale of energy to the pool wins, thereby ensuring the lowest possible tariffs.

Another rule adopted in recent auctions, more specifically in the auctions of the two hydroelectric plants on the Madeira River - Santo Antônio and Jirau, and later Belo Monte - was the possibility for investors to sell energy from these new projects into the free market (ACL) as well. Previously, all assured energy from new projects was destined exclusively to the regulated market (ACR). In these auctions, entrepreneurs could sell a minimum of 70% of assured energy in the regulated market and 30% in the free market. The aim of the measure is also to ensure further expansion of the free market, which represents just over 25% of the total electricity market in Brazil.

3.3 – AUCTION TYPES

Auction may be A-5, A-3, A-1 or adjustment auctions. The government may also hold auctions for certain specific types of sources of energy. These auctions may have contracts similar to ordinary auctions, such as the specific auction for alternative sources held in June 2007, or may have backup power contracting, i.e. an amount of energy that the government decides to contract plus an amount demanded by distributors. There are also specific large auctions for structuring projects, such as the auctions for the hydroelectric plants on the Madeira River in Rondônia, Santo Antônio (3,150 MW) and Jirau (3,300 MW) and Belo Monte (11,233 MW) on the Xingu River in Pará.

3.3.1 A-5 AUCTIONS

A-5 auctions are the longest contracting period. Theoretically, this it is the auction that will bring about expansion of the electric generation sector; since it is expected that the energy to be contracted will come from new projects. The timing for commencing power delivery is five years, a time period considered adequate for a large hydroelectric project enter commercial operation. Also, in theory, this would be a way to ensure expansion of the hydroelectric sector, in line with the Federal government's political and strategic policies.

3.3.2 A-3 AUCTIONS

A-3 auctions are for delivery energy with effect from the third year after signing a contract. This auction has the main goal of allowing distributors to make corrections in hiring future energy. For generators, in theory, it is an auction primarily designed for thermal power projects (except coal), or projects that require no more than three years of construction, such as the Small Hydro Plants and wind power farms.

In general, the price of electricity traded in A-3 auctions is more expensive than A-5 auctions. The first reason is that power contracted in an A-3 auction should be ready in three years, less than the allowed time for the A-5

plants. The second reason is that in general the fuel source is more expensive than energy produced from hydro resources.

3.3.3 A-1 AUCTIONS

An A-1 auction is an auction of existing energy, i.e. projects that have already been built. The goal is to service distributors who may not have contracted 100% of their demand for the base year "A". Supply contracts traded in this auction are for five years, beginning with the delivery of power for the year following the auction (A-1).

3.3.4 ADJUSTMENT AUCTION

As with the A-1 auction, the adjustment auction also includes trading existing un-contracted energy. The aim is complement the power necessary to service the consumer market of distribution companies, up to the limit of 1% of this load.

However, the contract model is different from the one used in an A-1 auction. In the adjustment auction, short-term supply contracts are negotiated. For example, in the 2009 auction, traded products were four, seven or ten months of duration, starting from the month following the auction.

3.3.5 RESERVE AUCTION

To complement energy contracted via the ACR, the government has included contracting so-called reserve power (*energia de reserva*) in the regulatory model through Decree 6,353 of January 16, 2008. The aim is to increase electricity supply security in the national interconnected system – SIN (*Sistema Interligado Nacional*) with energy from power plants specially projected for this purpose.

3.4 – CONTRACTING MODELS AND ICB CALCULATION

With respect to the energy contracting model, there are differences between hydroelectric and thermal sources. Power from hydro sources is contracted by quantity (MWh) for a period of 30 years, whereas thermoelectric power is contracted by available capacity (MW) for a 15-year term. In the latter case, the generation company enters into something similar to a "rental contract" for the power plant in return for fixed compensation over 15 years. Costs are therefore passed on to the system, and consequently to the consumer, since the generator will have revenue guaranteed for 15 years regardless of power produced. The obligation of the generator is to maintain the power plant in working conditions for any eventual need, as may be determined by the System Operator, ONS. In summary, thermal generation sources are intended to operate at peak demand or in periods of drought, while hydroelectric generation sources meet the daily load curve, (COSTA AND PIEBORON, 2008).

In order to allow different power plants to participate in the same competitive bidding system, the government created a cost-benefit index –ICB (*Índice Custo Benefício*). The ICB allows the auction administrator to place an economic order per MWh for thermoelectric generation projects contracted by availability (MW). Briefly, the EPE applies the variable unit cost –CVU (*Custo Variável Unitário*) of the power plant, as informed by the generator, to the projected working period of the power plant over the 15-year period for which it is contracted, in accordance with the 10-year plan for energy expansion.

In summary, the ICB for each generation project is defined as the ratio between its total cost and its energy benefit, and can be calculated on a monthly or annual basis by applying the following formula:

$$ICB = \frac{\text{Fixed Costs} + E(\text{Operating costs}) + E(\text{Short-term economic costs})}{\text{Guaranteed Power Delivery}}$$

3.5 – RESULTS OF NEW ENERGY AUCTIONS

Thermoelectric and hydroelectric projects are negotiated separately in new energy auctions, as well as price and the quantity of energy to be sold. Auctions use downward bidding, i.e. bid prices are decreased in relation to a maximum price previously established by the public notice. The starting price of the auction is the lowest price of that set by the EPE (reference price) and the price set by the Ministry of Mines and Energy (maximum price), (COSTA AND PIEBORON, 2008).

Decree Law 5,163 of July 30, 2004, established the sale price criteria for energy from new projects, considered to be those that were not yet granted, as well as for *Botox* plants, as described in Section 3.1. In the first case, the decree stipulates that the generator shall commercialize their energy in the ambit of the ACR, however with a part being traded via the ACL, or used for own consumption, subject to an adjustment on the price offered in the interest of moderateness tariffs. It was decided that *Botox* plants would be treated as new projects up to year 2007. After that time they would be considered "existing energy" bidders, i.e. they would have a lower sale price. For *Botox* plants, the aforementioned Decree stipulates in Article 23:

> "Article 23. In auctions of energy generated by new power generation projects, in the case of participation of projects that already have concessions resulting from bidding rounds where the maximum UBP payments was applied, the energy offered will be subject to the following:
>
> I - It shall compete under the same conditions as the offers from other participants in the auction, to be established by the conceding authority, including in relation to the reference value of the UBP for the project, and
>
> II - the difference between the UBP actually paid as a result of the original auction, which resulted in the granting or approval of the ***caput*** and the reference UBP set forth in Item I, shall be incorporated to the generator´s revenue in the CCEAR."

Another feature of the new model is that all new projects already have a preliminary environmental license issued by the responsible entities, reducing this risk for investors. Subsequent to the auction, the winning bidder must

obtaining the remaining licenses required by Brazilian legislation – the installation and operating licenses for the projects.

Since the new electric sector model was regulated in July 2004 through to December 20, 2011, when the last A-5 new energy auction took place, 13 new energy auctions have been undertaken, including seven A-5, five A-3, two specific auctions for projects using alternative energy sources, three reserve auctions and the specific auctions for Santo Antônio (3,150 MW), Jirau (3,300 MW) and Belo Monte (11,233 MW) hydroelectric power plants.

SECTION 3.5 METHODOLOGY

The aim of this chapter is to analyze the participation of Eletrobras in new energy auctions that form part of the new electric sector model. As previously discussed, it is these auctions that define the expansion of installed national capacity. The aim is therefore to study the way that the company has contributed to the expansion of Brazil's installed capacity, moderateness tariffs and reliability set forth by Law 10,848 of March 15, 2004.

In order to perform this task, data, information and analysis were collected from the websites of ANEEL, CCEE, EPE and *Instituto Acende Brasil*. The data used for the analysis refers to projects that were auctioned off and the quantity of energy sold on the ACR, the price ceiling set by the government, and the bid price offered by the winning companies. In relation to the latter, the purpose herein is to compare the average bid prices of Eletrobras companies, with or without partners, with that of other participants. The average price was calculated pondering using as the amount of energy sold in each auction.

As the information published by the responsible entities (ANEEL and CCEE) are not standardized throughout the period of the new regulatory framework, the analysis was necessarily subject to some adjustment. Information relating to the first new energy auction was obtained from researches conducted by REGO (2007), REGO and PARENTE (2008), and SENJU and GOMES (2006).

3.5.1 THE FIRST NEW ENERGY AUCTION

With high expectations and a certain degree of distrust from sector players, the first A-5 energy auction took place on December 16, 2005. The price ceiling of R$ 116.00 per MWh for hydroelectric power plants and R$ 140.00 per MWh for thermal plants defined by the Federal government did not please the market, being considered far below expectations.

> "... in analysis by Pactual Bank, only four out of the thirteen projects proposed by the government would be viable. Private investors such as CPFL Energia and Energias do Brasil, very important players in the recent expansion of installed capacity, have already declared that with this price ceiling there will be no offer". (SALES, 2005, p.1).

According to data provided by EPE, of the 49 projects that negotiated energy, 20 were new generating units, 9 were thermal plants and and 11 were hydroelectric, totaling 3,286 MW contracted, and with 5,607 MW total capacity added to the system.

Eletrobras traded energy through its subsidiaries Furnas, Eletrosul and CGTEE. With regard to the 3,286 MW contracted, the company and its subsidiaries accounted for 23.3% of this total.

The table below shows some of the characteristics of these projects:

TABLE 7

Project	Assured Energy Sold (MW)	Eletrobras Participation (%)	Bid Price R$/MWh	Discount (%)
HPU Baguari	77.00	Furnas - 15.0*	115.68	0.28
HPU Passo São João	37.00	Eletrosul - 100.0	113.22	2.40
HPU Simplício and SHP Anta	185.00	Furnas - 100.0	115.88	0.10

HPU Retiro Baixo	36.00	Furnas -49.0	115.36	0.55
HPU Paulistas (Batalha)	47.00	Furnas - 100.0	114.72	1.12
HPU Manso	90.00	Furnas - 70.0	**	-
HPU Candiota III	292.00	CGTEE - 100.0	124.67	10.95

Source: Elaborated from data collected from ANEEL and SENJU and GOMES (2006).

*Furnas´ currently participation in the venture is 40%.

** HPU refers to Hydroelectric Power Units and SHP refers to Small Hydro Plants.

*** Information not available.

In relation to hydroelectric generation, the discount offered by Eletrobras companies, with the exception of UHE Manso, was 0.53%, with an average bid price of R$115.40 per MWh. With regard to thermoelectric generation, an average price of R$124.67 per MWh resulted in a discount of 10.95%. In the latter case, PIEBORON and COSTA (2008) argue that the large share of *Botox* thermal plants was responsible for the high discount observed.

Due to lack of further information regarding the bid price of other ventures, benchmarking between Eletrobras and the other participants at the event was not completed.

3.5.2 SECOND NEW ENERGY AUCTION

Eletrobras System companies did not trade energy in this auction.

3.5.3 THIRD NEW ENERGY AUCTION

The third A-5 auction took place on October 10, 2006. The price ceiling of R$125.00 per MWh for hydroelectric projects and R$140.00 per MWh for thermal projects established for the second auction was once again applied, and once again displeased the market. This was manifested by a decrease in offer from 9,013 MW to 3,596 MW after the prices had been announced, since

the qualification phase of the project took place before the publication of the bidding documents, (REGO and PARENTE, 2008).

For new projects, the public notice sets different prices (reference price) for the projects - Dardanelos, Mauá, Barra do Pomba, Cambuci, Salto Grande and Baixo Iguaçu.

The table below shows the respective reference prices for the projects:

TABLE 8

Project	Ceiling Price (R$ per MWh)
HPU Dardanelos	120.00
HPU Mauá	116.35
HPU Barra do Pomba	125.41
HPU Cambuci	152.54
HPU Salto Grande	124.02
HPU Baixo Iguaçu	123.01

Source: Elaborated from data published by ANEEL and SENJU and GOMES (2006).

On completion of the auctions 1,104 MW was contracted, corresponding to 99.6% of the power demand to the market in 2011, added the results of previous auctions, according to EPE reports. Eletrobras System and its partners won the Dardanelos and Mauá hydroelectric projects, corresponding to 339 MW in traded energy, or 30.7% of the total. The Barra do Pomba and Cambuci plants were bid, but did not find good conditions to trade their energy. The following table presents the characteristics of the Eletrobras projects that closed bids for their energy production:

Table 9

Project	Assured Energy Sold (MW)	Eletrobras Participation (%)	Bid Price (R$/MWh)	Discount (%)
HPU Dardanelos	147.00	Eletronorte - 24.5 Chesf - 24.5	113.09	5.76
HPU Mauá	192.00	Eletrosul - 49.0	113.15	2.75

Source: Elaborated from data published by ANEEL.

The average bidding price for energy traded by the Dardanelos and Mauá projects was R$113.12 per MWh, 1.7% higher than the bidding price offered by other competitors. It is important to highlight that other hydroelectric enterprises that sold energy were *Botox* plants with significant correction in their sale price, as shown in the following table:

Table 10

Project	Assured Energy Sold (MW)	Eletrobras Participation (%)	Bid Price (R$/MWh)
HPU Monjolinho	42.00	113.15	122.63
HPU Salto Pilão - DME	20.00	104.80	133.34
HPU Salto Pilão - Camargo Corrêa	20.00	107.45	135.98
HPU São Salvador	148.00	112.9	135.01
HPU Dardanelos	147.00	113.09	112.68
HPU Mauá	192.00	113.15	112.96

Source: Elaborated from data published by ANEEL.

3.5.4 FIRST ALTERNATIVE SOURCES AUCTION

Eletrobras System companies did not trade energy in this auction.

3.5.5 FOURTH NEW ENERGY AUCTION

Eletrobras System companies did not trade energy in this auction.

3.5.6 FIFTH NEW ENERGY AUCTION

Held on October 16th, 2007, the fifth new energy auction (A-5), contracted 2,312 MW, a quantity 10% higher than the demand forecast by distributors for 2012. All hydroelectric projects that closed contracts for electricity were characterized as *Botox.*

The average price fixed by the public notice for hydraulic sources was R$ 126.00 per MWh, against R$146.00 per MWh for thermal plants. In practical terms, this value less inflation for the period reflected real values lower than those for the previous auction, (REGO, 2007).

Eletrobras System marked a presence, trading energy from the Serra do Facão, Foz do Chapecó and São Domingos projects. It is important to highlight that the participation of Furnas in the first two projects was due to the lack of interest from former partners, who claimed the enterprises were not feasible under the new regulatory model, (REGO, 2007). In addition to these, the expansion of Santa Cruz thermal plant (natural gas), controlled by Furnas, also traded energy. With this, Eletrobras participation in this auction reached 33.2% of the total traded in terms of MW, considering the projects in which the company is a shareholder.

The following table presents some characteristics of the Eletrobras projects that traded energy in this auction.

Table 11

Project	Assured Energy Sold (MW)	Eletrobras Participation (%)	Bid Price (R$/MWh)	Discount (%)
HPU São Domingos	36.00	Eletrosul - 100	126.00	0.00
HPU Serra do Facão*	121.00	Furnas - 24.7	90.05	28.53
HPU Foz do Chapecó**	259.00	Furnas - 19.7	123.09	2.31
TPU Santa Cruz***	351.00	Furnas - 100	129.34	11.41

Source: Elaborated from data published by ANEEL

* Furnas Centrais Elétricas owned 49.9% of Serra do Facão Participações, which owns 49.5% of HPU Serra do Facão.Currently, Furnas own 49.5% of this plant.

** Furnas Centrais Elétricas owned 49.3% of Chapecoense Geração, which owns 40% of HPU Foz do Chapecó. Currently, Furnas own 40.0% of the plant.

***TPU refers to Thermal Plants Units.

Eletrobras subsidiaries average price for hydroelectric plants was R$113.73 per MWh, resulting in an average discount of 9.74% against the stipulated price ceiling. For the other hydroelectric projects, there was an average discount of 2.05% for an average bid price of R$123.42 per MWh.

With regard to thermoelectric power, the average discount from the other companies was 2.05% at an average price of R$123.42 per MWh. Eletrobras System, through Santa Cruz thermal plant, offered a price of R$129.34 per MWh, providing a discount of 11.41%.

It is worth noting the fact that hydroelectric projects that traded energy in this auction were all *Botox*, as mentioned above. Thus, according to the rules of the new model, such enterprises had their sale prices adjusted as shown below:

Table 12

Project	Assured Energy Sold (MW)	Bid Price (R$/MWh)	Sale Price (R$ / MWh)
HPU São Domingos	36.00	126.00	125.57
HPU Serra do Facão	121.00	90.05	131.49
HPU Foz do Chapecó	259.00	123.09	131.49
HPU Estreito	256.00	123.00	126.57
HPU Funil	43.00	125.90	125.90

Source: Elaborated from data published by ANEEL.

3.5.7 SANTO ANTONIO POWER PLANT AUCTION

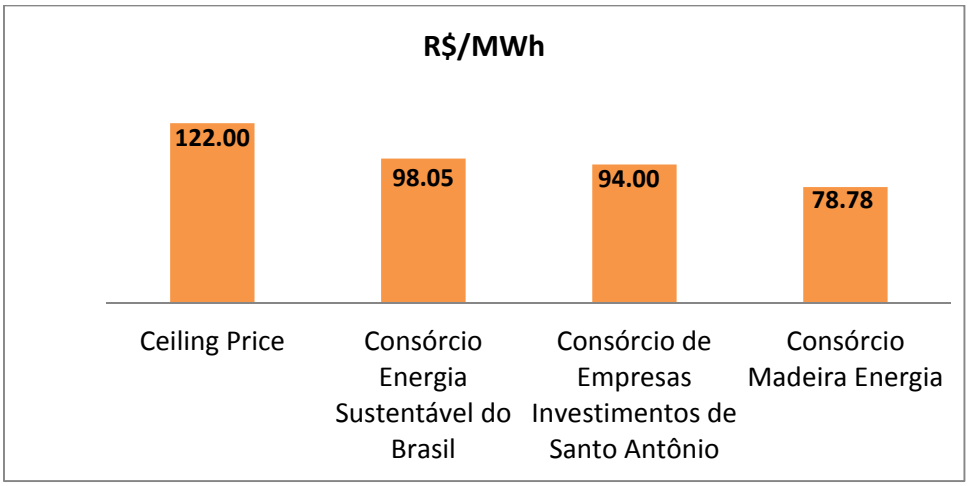
Considered to be one of the major projects to be auctioned by the Federal government and defined as a structured enterprise due to its strategic importance, magnitude of power to be generated and the significant investments required, the A-5 auction was held on December 10th, 2007. The plant is located on the Madeira River in the state of Rondônia, and has an installed capacity of 3,150 MW and assured energy of 2,218 MW. Investments are forecast to be in the vicinity of US$ 9.5 billion according to studies by the EPE.

Eletrobras was the winning bidder, through its subsidiary Furnas Centrais Elétricas, which owns a 39.0% interest in the Madeira Energia consortium. The other partners in the enterprise are Odebrecht Investimentos em Infraestrutura Ltda. (17.6%); Construtora Norberto Odebrecht S.A. (1.0%); Andrade Gutierrez Participações S/A. (12.4%); Cemig Geração e Transmissão S/A (10.0%); and Fundo de Investimentos e Participações Amazônia Energia (FIP - comprised of the Banif and Santander banks) (20%).

The discount seen at the auction was 35.4% below the ceiling price of R$122.00 per MWh established by EPE. The bidding price of R$78.87 per MWh

was considered surprising by the marked, especially when compared to bids offered by various other competitors, as can be seen in the following graph:

GRAPH 1



Source: Elaborated from data published by Instituto Acende Brasil.

Analysis by market agent of the low price offered by the winner bidders can be summarized in the fact that 30% of the energy generated by the project will be traded on the free market. In other words, they are betting on higher prices in the ACL. Moreover, an earlier delivery of energy on the free market will also increase the profitability of the enterprise according to the winning consortium.

For the Federal government, the auction was a success in terms of moderateness tariffs and in terms of demonstrating to the market the viability of large hydroelectric projects in the Amazon region. In the words of EPE´s CEO Maurício Tolmasquim:

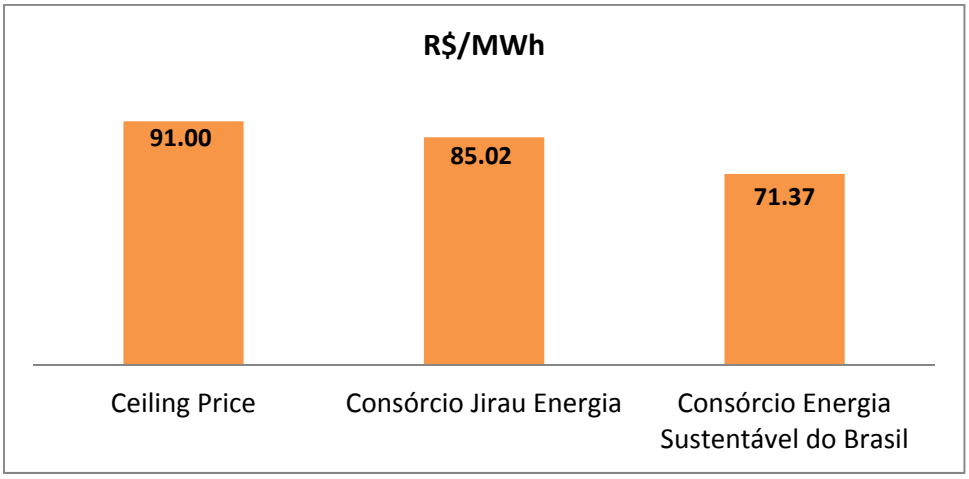
> "Many believed that exploiting the hydroelectric potential of the Amazon would mean more expensive energy. This auction showed just the opposite: you can have competitively priced energy in projects in that region. Today, the New Sector Model has truly got under way". (EPE, Informe à Imprensa, 2007).

3.5.8 JIRAU POWER PLANT AUCTION

Held on May 19, 2008, the A-5 auction of the Jirau hydroelectric power plant contracted 1,975 MW of power for delivery starting in year 2013. The plant is located on the Madeira River in the State of Rondônia and has an installed capacity of 3,300 MW. It is located 130 km from the State capital, Porto Velho, and represents investments around R$8.7 billion.

As with the prior auction of HPU Santo Antônio, the discount offered by the winning consortium surprised the market. In this case, the technical characteristics of the project, considered of higher costs than HPU Santo Antônio, as well as a lower load factor and more complex logistics would lead, in theory, to a higher tariff. However, the price of R$71.37 per MWh offered by the Consórcio Energia Sustentável do Brasil, with the participation of the subsidiaries Chesf (20%) and Eletrosul (20%) resulted in a price 9.4% lower than the price of electricity contracted from HPU Santo Antônio. The graph below shows the bids of the participants in the auction:

Graph 2:



Source: Elaborated from data published by Instituto Acende Brasil .

In fact, a discount of 21.6% on the ceiling price was justified by the winner bidders due to the possibility to anticipate energy delivery, to be traded on the free market, as well as the possibility of selling 30% of generated energy

on that market, as it happened in the case of UHE Santo Antônio. In addition, the winning consortium already planned changes in the generation capacity of the project, as allowed by the regulator entity, increasing the plant's assured energy by 207 MW.

3.5.9 FIRST RESERVE AUCTION

Eletrobras System companies did not trade energy in this auction.

3.5.10 SIXTH NEW ENERGY AUCTION

Eletrobras System companies did not trade energy in this auction.

3.5.11 SEVENTH NEW ENERGY AUCTION

Eletrobras System companies did not trade energy in this auction.

3.5.12 EIGHTH NEW ENERGY AUCTION

Eletrobras System companies did not trade energy in this auction.

3.5.13 SECOND RESERVE ENERGY AUCTION

Held on December 14, 2009, this auction differed from others, being a process exclusively for contracting wind power energy. This event traded 753 MW with 20-year duration contracts from 71 new enterprises located in 5 States: Bahia (18), Ceará (21), Rio Grande do Norte (23), Sergipe (1) and Rio Grande do Sul (8). In total 1,806 MW of capacity was added to the national electrical system.

An important characteristic of this type of auction is that contracts are made between the companies and the CCEE by Reserve Energy Contracts – CERs (*Contratos de Reserva de Energia*). It is highlighted that there will be a contractual review every four years to mitigate against uncertainties related to

the intensity of the winds, because there are no long-term studies or consistent historical data relating to the behavior of winds in Brazil.

Eletrobras System sold energy through its subsidiaries Eletrosul, Eletronorte, Furnas and through the holding itself. In relation to the total energy traded at auction in terms of MW, the company and its partners were responsible for 14.5% of the total.

The table below shows the characteristics of these wind farms projects:

TABLE 13

Project	Assured Energy Sold (MW)	Eletrobras Participation (%)	Bid Price (R$/MWh)	Discount (%)
Coxilha Negra V, VI and VII *	33.00	Eletrosul - 90.0	131.00	30.69
Mangue Seco 2	12.00	Eletrobras - 49.0	149.99	20.64
Miassaba 3	22.00	Furnas - 24.5 Eletronorte - 24.5	152.07	19.54
Rei dos Ventos 1	21.00	Furnas - 24.5 Eletronorte - 24.5	152.77	19.17
Rei dos Ventos 3	21.00	Furnas - 24.5 Eletronorte - 24.5	153.07	19.01

Source: Elaborated from data published by ANEEL.

*Currently Cerro Chato I, II and III.

It shows that with respect to the ceiling price of R$189.00 per MWh stipulated by the government, the average discount on the bid price of the consortium in which Eletrobras participated was 21.25%, with an average price of R$148.83 per MWh. The other participants average price was R$145.79 per MWh. The largest discounts were at Eletrosul plants, 30.61%.

3.5.14 BELO MONTE POWER PLANT AUCTION

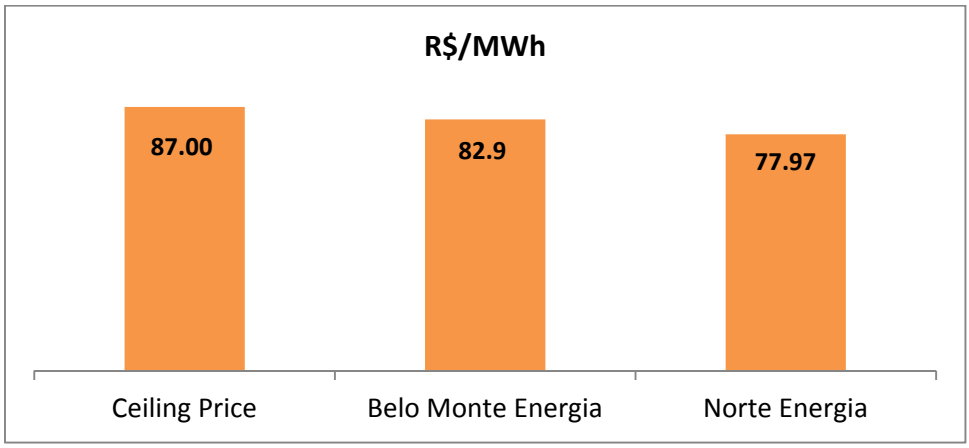
Given the size of the UHE Belo Monte project, the auction was held under many protests from indigenous communities, NGOs and society as a whole. Due to the need for dislocation of communities and the large flooded area, several court injunctions were issued in an attempt to cancel the auction.

Considered strategic by the National Council for Energy Policy (CNPE) Resolution No.5 of 2009, the plant is located on the Xingu River, approximately 40 km from the city of Altamira, State of Pará. With an assured energy of 4,571 MW and an installed capacity of 11,233 MW - slightly less than the Three Gorges plant in China and Itaipu Binacional on the border between Brazil and Paraguay. Investment is estimated at R$19.0 billion according to EPE, including the portion allocated to mitigation of environmental impacts that will be caused by the project.

The price ceiling was considered too low by the market, at R$83.00 per MWh, leading to the withdrawal of the private capital consortium led by private companies Odebrecht, Camargo Corrêa, and CPFL Energia. With the risk of failure of the bidding process due to the presence of only one company, i.e. the lack of competition in the bidding process would result in zero discount, the Federal government made significant effort in order to bring another competitor to the bidding process. On the eve of the auction, Norte Energia Special Purpose Company was formed, led by the Eletrobras subsidiary Chesf.

With the auction held on April 20, 2010, Norte Energia was the winning bidder with a price of R$78.00 per MWh, a discount of 6.02%. The chart below shows the bid prices:

GRAPH 3



Source: Elaborated from data published by Instituto Acende Brasil.

The incentives offered by the government were essential to enabling the price offered by the winning consortium. Among these incentives, the possibility to sell 30% on the ACL (but 10% of this energy must be used by auto-producer shareholder), a discount of 75% on income tax, special credit lines offered by BNDES, such as funding 80% of the project over 30 years, and the subsequent incorporation of strategic partners to the consortium.

Norte Energia consortium was formed by Companhia Hidro Elétrica do São Francisco (49.98%), Construtora Queiroz Galvão S/A (10.02%), Galvão Engenharia S/A (3.75%), Mendes Junior Trading Engenharia (3.75%), Serveng-Civilsan S/A (3.75%), J Malucelli Construtora de Obras S/A (9.98%), Contern Construções e Comércio Ltda (3.75%), Cetenco Engenharia S/A (5.0%) and Gaia Energia e Participações (10.02%).

3.5.15 TENTH NEW ENERGY AUCTION

Eletrobras System companies did not trade energy in this auction.

3.5.16 THIRD RESERVE ENERGY AUCTION

Eletrobras System companies did not trade energy in this auction.

3.5.17 SECOND ALTERNATIVE SOURCES AUCTION

Held on August 26, 2010, 714.3 MW was negotiated, being 48 MW from Small Hydroelectric Plants, contracted by quantity, and the remainder contracted based on available capacity. Of the 666.2 MW sold, 96.7% came from wind power sources.

Eletrobras System traded energy in this auction through its subsidiary Chesf. All the projects were wind power plants located in the state of Bahia, with 20-year contracts. In comparison with the total, Eletrobras System accounted for 13.9%, considering the total amount of the projects in which the company has a stake.

The table below shows the characteristics of these wind farms projects in which the company is a shareholder:

TABLE 14

Project	Assured Energy Sold (MW)	Eletrobras Participation (%)	Bid Price (R$/MWh)	Discount (%)
Pedra Branca	12.20	Chesf - 49.0	132.50	20.66
São Pedro do Lago	13.20	Chesf - 49.0	132.50	20.66
Sete Gameleiras	12.50	Chesf - 49.0	132.50	20.66
Casa Nova	61.40	Chesf - 100.0	131.50	21.26

Source: Elaborated from data published by ANEEL.

The average bid price for wind projects in which Eletrobras is a shareholder was R$131.88 per MWh, providing an average discount of 21.3%. The average discount of the other wind projects was 19.46%, with an average bid price of R$134.50 per MWh.

3.5.18 ELEVENTH NEW ENERGY AUCTION

This A-5 auction took place on December 17, 2010, resulting in the contracting of 968 MW of two hydroelectric power plants, Santo Antônio do Jari and Teles Pires, which together added 2,120 MW of installed capacity to the national system.

Eletrobras, through its subsidiaries Furnas and Eletrosul, won the competition for HPU Teles Pires. Located between the states of Mato Grosso and Pará, on the Teles Pires River, the plant has an installed capacity of 1,820 MW and requires investment of R$3.7 billion. The company, Consórcio Teles Pires Energia Eficiente (CTPEE), is composed by Furnas (24.5%), Eletrosul (24.5%), Neoenergia (50.1%) and Odebrecht (0.9%). The table below shows the characteristics of the project:

TABLE 15

Project	Assured Energy Sold (MW)	Eletrobras Participation (%)	Bid Price (R$/MWh)	Discount (%)
HPU Teles Pires	778.00	Furnas - 24.5 Eletrosul - 24.5	58.36	32.99

Source: Elaborated from data published by ANEEL.

In relation to the HPU Teles Pires, there was a discount of 32.99% in comparison with the ceiling price determined by the EPE of R$87.00 per MWh. The highlight was the lowest price offered in new energy auctions since the implementation of the new regulatory framework, at R$58.36 per MWh. The winning consortium's justification for the high discount was the opportunity to: i) sell 15% of the assured energy untraded (137.4 MW) to the ACL; ii) reduce costs for the planned works; iii) reduce the plant construction schedule to thirty eight months, with an early start to the generation and the possibility to sell this “extra” power on the ACL; and iv) change the original design, using only five turbines instead of the six identified by the public notice.

The HPU Santo Antônio do Jari sold its energy by the same price determined by EPE, R$ 104.00 per MWh.

3.5.19 TWELFTH NEW ENERGY AUCTION

Held on August 17th, 2011, this A-3 auction contracted 1,652 MW of assured energy. Of this total, 13% were from hydroelectric sources (expansion of HPU Jirau), 6% from biomass, 29% from wind power, and 52% from natural gas. Together, these projects will provide 2,745 MW of installed capacity for the national generation system.

Eletrobras commercialized energy through its subsidiaries Eletrosul and Chesf. In total, there were 20 wind power farms with Eletrosul participation, in addition to expansion incapacity of the Jirau hydropower plant, in which Chesf is also a stakeholder. Will be added 930 MW to national installed capacity, with 480 MW provided by wind plants and 350 MW from the expansion of the Jirau hydroelectric plant. Eletrobras and its partners were responsible for commercializing 24.5% of the total MW traded.

The following table presents the figures for these wind farms projects:

TABLE 16

Project	Assured Energy Sold (MW)	Eletrobras Participation (%)	Bid Price (R$/MWh)	Discount (%)
Ibirapuitã 1	9.60	Eletrosul - 49.0	96.49	30.58
Cerro Chato IV	3.30	Eletrosul - 49.0	97.17	30.09
Cerro Chato V	4.00	Eletrosul - 49.0	96.85	30.32
Cerro Chato VI	9.30	Eletrosul - 49.0	96.39	30.65
Chui I	10.20	Eletrosul - 49.0	102.55	26.22
Chui II	8.90	Eletrosul - 49.0	102.89	25.98

Chui IV	8.80	Eletrosul - 49.0	102.91	25.96
Chui V	12.50	Eletrosul - 49.0	103.78	25.34
Minuano I	9.40	Eletrosul - 49.0	101.34	27.09
Minuano II	10.10	Eletrosul - 49.0	100.62	27.61
Verace I	8.50	Eletrosul - 49.0	98.5	29.14
Verace II	8.30	Eletrosul - 49.0	98.64	29.04
Verace III	11.00	Eletrosul - 49.0	98.19	29.36
Verace IV	13.10	Eletrosul - 49.0	97.74	29.68
Verace V	12.40	Eletrosul - 49.0	98.21	29.35
Verace VI	7.60	Eletrosul - 49.0	98.47	29.16
Verace VII	12.70	Eletrosul - 49.0	97.86	29.60
Verace VIII	10.80	Eletrosul - 49.0	98.19	29.36
Verace IX	12.70	Eletrosul - 49.0	98.21	29.35
Verace X	12.10	Eletrosul - 49.0	98.43	29.19
Ampliação HPU Jirau	209.30	Eletrosul - 20.0 Chesf - 20.0	102.00	0.00

Source: Elaborated from data provided by ANEEL.

The average discount at the auction, considering only the bid from wind sources without Eletrosul interest, was 28.33%, priced at R$99.62 per MWh. Considering only Eletrosul, the average price was R$99.28 per MWh, resulting in an average discount of 28.57%, lower than that offered by other companies in the sector.

3.5.20 FOURTH RESERVE ENERGY AUCTION

With the aim of contracting reserve energy to increase security of supply, this auction was held on August 18th, 2011, contracting 460.4 MW with 91.7% from wind sources and the remaining 8.3% from biomass thermal plants. These projects will add 1,218 MW of installed capacity to the national electric system, with investments of around R$3.2 billion. According to the EPE information bulletin, the geographic was 60% of the total contracted in the Northeast, 20% in the Southeast, 11% in the South and 9%, in the Central-West.

Through its subsidiary Furnas Centrais Elétricas, Eletrobras commercialized energy from four wind projects located in the Northeast region, corresponding to 8.2% of the energy traded at the auction. In relation to total installed capacity, the projects in which the company participates will add 85 MW to the national system. The following table presents the project characteristics:

TABLE 17

Project	Assured Energy Sold (MW)	Eletrobras Participation (%)	Bid Price (R$/MWh)	Discount (%)
Famosa I	10.40	Furnas - 49.0	99.70	31.71
Pau Brasil	7.10	Furnas - 49.0	99.70	31.71
Rosada	12.80	Furnas - 49.0	99.70	31.71
São Paulo	7.60	Furnas - 49.0	99.70	31.71

Source: Elaborated from data provided by ANEEL.

A comparison of the discounts offered by Eletrobras System and the remaining auction participants shows that the average price offered by the company was higher than the average price offered by others. The average discount from Eletrobras was 31.71% at an average price of R$99.70 per MWh,

while other companies offered an average price of R$96.51 per MWh, with an average discount of 33.90%.

This auction was considered a milestone by the government due to the prices achieved for wind generation projects. In the words of the EPE president:

> "The fact that wind plants have been contracted at a two-digit final price, below R$100.00 per MWh, is the something that was unthinkable until recently. This is a result of the competition promoted by auctions." (EPE - Informe à Imprensa, 2011).

3.5.21 THIRTEENTH NEW ENERGY AUCTION

Held on December 20, 2011, this A-5 auction contracted 555.2 MW to supply demand from distribution utilities from 2016 onwards. Of this, 75.9% comes from 39 wind plants, 20.6% from hydroelectric plants and the remaining 3.5% from two thermal plants. In terms of installed capacity, 1,211.5 MW will be added to the national electric system.

Eletrobras expanded its wind generation capacity by commercializing energy through Furnas Centrais Elétricas at 10 plants, all located in the state of Ceará with a total installed capacity of 204.4 MW. Considering the total assured energy contracted, the company and its partners were responsible for 15.8%.

The table below shows the characteristics of these wind farms projects in which the company is a shareholder:

TABLE 18

Project	Assured Energy Sold (MW)	Eletrobras Participation (%)	Bid Price (R$/MWh)	Discount (%)
Goiabeira	8.70	Furnas - 49.0	107.70	3.84
Jandaia	11.70	Furnas - 49.0	107.70	3.84
Jandaia I	8.70	Furnas - 49.0	107.70	3.84

Pitombeira	12.20	Furnas - 49.0	107.70	3.84
Santa Catarina	7.50	Furnas - 49.0	107.70	3.84
São Januário	7.90	Furnas - 49.0	107.69	3.85
Ubatuba	5.10	Furnas - 49.0	107.69	3.85
Ventos do Horizonte	6.40	Furnas - 49.0	107.69	3.85
Nossa Senhora de Fátima	11.20	Furnas - 49.0	107.69	3.85
São Clemente	8.20	Furnas - 49.0	107.69	3.85

Source: Elaborated from data provided by ANEEL.

Analyzing only wind projects at this auction, it can be observed that the average bid price of Eletrobras was R$107.70 per MWh, resulting in an average discount of 3.84% from the ceiling price of R$112.00 per MWh. Projects from other investors had an average discount of 6.70% with an average bid price of R$104.50 per MWh. As in the fourth reserve energy auction, the price offered by companies within the Eletrobras System was, on average, higher than that offered, on average, other participants in the auction.

3.5.22 SUMMARY OF AUCTION RESULTS

The following table summarizes the MW values traded in the previously mentioned auctions, specifying the participation of projects in which Eletrobras has interest and other participants:

Table 19

Auctions	Average MW Contracted	Eletrobras and Partners (MW sold)	Other Participants (MW sold)
1^0 New Energy	3,286.0	764.0	2,522.0

2⁰ New Energy	1,682.0	-	1,682.0
3⁰ New Energy	1,104.0	339.0	765.0
1⁰ Alternative Sources	186.0	-	186.0
4⁰ New Energy	1,304.0	-	1,304.0
5⁰ New Energy	2,312.0	767.0	1,545.0
HPU Santo Antônio*	1,552.6	1,552.6	-
HPU Jirau*	1,382.5	1,382.5	-
1⁰ Reserve Energy	548.0	-	548.0
6⁰ New Energy	1,076.0	-	1,076.0
7⁰ New Energy	3,125.0	-	3,125.0
8⁰ New Energy	11.0	-	11.0
2⁰ Reserve Energy	753	109	644
HPU Belo Monte*	3,199.7	3,199.7	-
10⁰ New Energy	327.0	-	327.0
3⁰ Reserve Energy	445.1	-	445.1
2⁰ Alternative Sources	714.3	99.3	615.0
11⁰ New Energy	968.0	778.0	190.0
12⁰ New Energy	1,651.6	404.6	1,247.0
4⁰ Reserve Energy	460.4	37.9	422.5
13⁰ New Energy	555.2	87.6	467.6
Total	**26,643.4**	**9,521.2**	**17,122.2**
	100.0%	**35.7%**	**64.3%**

Source: Elaborated from data provided by ANEEL.

*The figures refers to the amount of assured energy sold at auction - in these cases, 70% of the total assured energy of the projects.

CONCLUSION

State intervention in the electricity sector occurred in the mid-1930s, based on the consideration that electricity is an essential public service and requires State presence. Imposing limits on private companies profits in order to provide the population with "low" prices seems to have inhibited private capital to continue the process of capital accumulation that had been developing since the arrival of the foreign power utilities in Brazil. This seemed to provide the first sign that in an unfavorable environment for obtaining large profits, private capital retracts its investments.

After reflecting on the reasons that led to Eletrobras' creation by the Federal government in 1962, and the functions attributed to it up to the 1990s reforms, it can be seen that its performance was essential for the development of the Brazilian energy matrix. The expansion of generation capacity up to that period was based on Eletrobras projects and, to a lesser extent, local State-run companies.

With the national electric system reform in 2004, following the failure in the implementation of neo-liberal policies culminating in electric power rationing in 2001, the company has reassumed its role as a supporting player in the expansion of the national electrical sector. The company has been active in bidding processes and has been successful, achieving the government's intended targets, particularly: i) expansion of the generation capacity and; ii) moderateness tariffs.

A significant portion of future electric energy demand will be supplied by companies in which Eletrobras is a shareholder as we could observe in the analyses of the auctions, notably in the table 19.

The rules for commercializing energy from new projects, which establishes the sale of electricity for periods up to 30 years, created a positive scenario for the return of investments in the sector. The risk of trading energy generated at unsatisfactory prices has been restricted to the ACL. Almost all the energy that will be produced has already been bought by distributors. Those plants that traded their energy in reserve auctions and alternative sources

auctions ensure increase security of supply, but this cost will be shared among all consumers. However, the benefits of increased investment in the Brazilian economy due to the elimination of a historical bottleneck will be reaped by society as a whole.

Analyzing the other variable, the sale price level of energy from new generation capacity, shows that the company's performance will bring significant benefits to the country's economic development. It can be seen that the prices offered by Eletrobras companies, with or without private partners, have generally been lower than those offered by other players in the market, whether they are privately or publicly owned (regional State -run companies). It provides positive externalities to society and impact directly in the inflation indexes. In fact, the pursuit of moderateness tariffs, now enforced by law and reflected in the ceiling prices determined for energy auctions, has been severely criticized by the market and has caused a reduction in offers and the removal of projects by private investors, especially in the first bidding processes.

We highlight as Eletrobras's most significant contribution to the expansion of Brazilian generating capacity its acting in auctions for major structuring projects, considered to be strategic due to the magnitude of investments involved and the quantity of power to be generated. In the auctions for the Santo Antônio, Jirau and Belo Monte plants, the company was the winner bidder due to offering significant discounts on the ceiling price determined by the Federal government, and considered unattainable by private players.

The technical know-how acquired during fifty years of operation, and development of expertise in the national hydroelectric potential seem to provide significant competitive advantages to the company in the execution of projects, and consequently in the prices bid during auctions.

Many projects auctioned under the new regulatory model are already operating, such as HPU Santo Antonio, and many more are in construction. The company has begun investment in wind power plants, contributing to the diversification of the national electricity matrix and increasing the security of supply.

The history of the Brazilian national electric system provides good examples of private capital withdrawing its investments in a scenario incompatible with high returns. The opportunity cost is high in an economy with historically high interest rates.

The government is responsible for the provision of electric energy. Here, the private investor is merely a concessionaire, contracted by the public administration to provide a public service. The cost of a lack in such important good to society will be paid by the government since, ultimately, electric power is a public utility that must be provided with quality, reliability, and at a price compatible with the level of wealth of society.

Together with the strengthening of the institutions responsible for the operation and coordination of the electric system created by the new regulatory framework, the reliability of the national electric system appears to improve with the direct participation of those responsible for supplying the product.

Therefore, success in the electric energy auctions promoted by the Federal government through ANEEL is essential to continue supporting the economic development of the country by producing cheap electric energy. The above analysis gives us a sample of the benefits in terms of reliability and security of the system and the reduction in consumer prices that the company's presence can generate.

In conclusion, the question posed at the end of this paper is whether it would have been possible to provide a reliable supply of electric power in Brazil, with a moderate price, without Eletrobras.

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