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## **INVESTMENTS AND FUNDING IN THE BRAZILIAN ELETRICITY SECTOR**

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## Chapter 1: **Introduction**

The purpose of this paper is to give an overview of the evolution of investment in the Brazilian electricity sector, to provide an understanding of the historical returns obtained by investors, the risks incurred, investors' profile and the historical funding for the investments, as well as highlight the main topics about the capital structure of a company, especially in this current period of large investments in Brazil.

This document shows that critiques about the active role of government and the sector charges<sup>1</sup> paid by consumers also existed in the past. It emphasizes many issues related to debt because the companies' borrowing capacities is decreasing and this may restrict their abilities to enact on new investments.

Investments in the Brazilian electricity sector started in the late nineteenth century and have increased significantly until today. Since it started, the sector has faced several changes related to investors' profiles, funding of the projects, risks, regulation and others.

Demand for energy is increasing continuously and requiring more and more investments in energy supply, either from public or private companies. The increase of energy tariffs, as well as the more relevant role of public companies, recall the debate and some critiques that existed in the past, such as: the effective need and the correct application of sector charges paid by consumers, the role of public and private companies, as well as the sources of funding for the aggressive investment plan required in order to meet the growing demand for energy. The funding for expansion of the sector becomes more relevant especially because many concessions in the generation, transmission and distribution segments will expire in 2015, with an expected reduction of energy prices, leading to a reduction of operational cash flow of the sector.

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<sup>1</sup> A share of the money paid by consumers to the distribution companies are transferred to different sector funds (RGR, CCC, CDE, ...) in order to cover the cost of fossil fuels mainly at the Amazon Region used to produce energy, provide funding for new investment, subsidy the cost of energy for people with very low income and others.

The electricity sector in Brazil could be divided in four periods: the first from 1879 to 1944 (Foreign Investment), the second from 1945 to 1989 (Public Investments), the third from 1990 to 2002 (Private Investment) and the fourth after 2002 (Public and Private Investments). The data for the first two periods were based mainly on information from the book *Panorama do Setor de Energia Elétrica no Brasil* (2006).

The second chapter will present the investments in the first period, 1879 to 1944, Foreign Investment. This chapter shows the first hydroelectric plants in Brazil and the investors and the motivations for these investments. In addition, it shows the expansion of Light and AMFORP in Brazil, emphasizing the funding and the tariffs practiced by these companies, as well as the motivation and ability to attend the investments required in the supply of electric energy in order to attend the increasing demand.

The third chapter will present the investments in the second period, 1945 to 1989, Public Investment. This chapter shows the creation and expansion of public companies and the funding for the investments in this period (tariffs, electricity sector charges, internal and external loans). It also analyzes the role of the private and the public companies as well as the crisis and decline of the electricity sector.

The fourth chapter presents the investments in the third period, 1990 – 2002, Private Investment. This chapter shows the changes carried on the electricity sector, privatizations, funding for the investments, the new projects, the crisis and the reasons for the unsustainability of the sector.

The fifth chapter presents the investments in the fourth period, after 2002, Private and Public Investment. It presents the changes in the electricity sector, the main intentions of this reform, the new commercial model, the funding and other relevant considerations about the new projects.

The sixth chapter, the Funding for the Expansion of the Sector, gives an overview about debt characteristics, fiscal benefits, company capital structure, limits, debt policies and other things to be considered about debt management.

Finally, the seventh chapter presents the main conclusions about the topics covered in this paper.

Chapter 2:  
**First Period (1879 to 1944) Foreign Investment**

Foreign money was the main source of funds in this period, having been invested in the sector through loans and equity investment (risk).

The first power plants in Brazil emerged in the nineteenth century. At this early stage, between 1880 and 1900, investments in the generation segment were mainly the construction of small power plants in order to meet the supply of energy for lighting public services and activities such as mining, processing of agricultural products, textile mills and sawmills. Investments at that time did not have long-term contracts or any type of rule that would guarantee a minimum return on the capital invested. The return of these investments was often related to the income of other activities, which required the energy from these plants, not the sale of energy to consumers, as occurs today.

The manufacturing sector, for example, which had as its primary energy source imported coal, began to use electricity from hydroelectric power because it was cheaper. Many times, the sites of the factories were defined according to the power plant sites. This favored the establishment of these next to waterfalls, because transmission systems were still in their initial stages. In addition, the high cost of large power plants, associated with low consistency of the operation of these facilities, were crucial factors in the choice to use steam engines and hydropower as sources of energy.

The first investments in the sector have been restricted to a few states, especially Minas Gerais, Sao Paulo, Rio de Janeiro and Rio Grande do Sul. In this period there were financial constraints and technical restrictions to the viability of projects, since the sector was starting to develop in the country. Some examples of investments made on a trial basis or that operated for a short period were: (i) 1883 - first hydroelectric plant in Brazil, in the Minas Gerais state, aiming to supply electricity to diamond mining; (ii) 1887 - another power plant also in Minas Gerais, to supply energy to gold mining and homes of the company employees; (iii) 1887 - establishment of Light and Power Company of Rio de Janeiro, which began to generate electricity through a small power plant. However, due to serious financial problems, the company was dissolved in 1888.

Besides these plants, which ran on a trial basis and for a short period, there were others that operated permanently. The following list shows a few more examples of these investments:

- **1883:** establishment of thermal plant, in order to provide energy for the municipal street lighting service in Campos, Rio de Janeiro;
- **1885:** establishment of thermal plant in Rio Claro, São Paulo, also to provide energy for the street lighting service;
- **1887:** establishment of thermal power plant in Porto Alegre, Fiat Lux, to supply electricity to commercial houses and residences in the city center;
- **1889:** establishment of a larger power plant called Quinces in Juiz de Fora, Minas Gerais. This plant was built to supply energy for a textile factory of the industrial Bernard Mascarenhas, thereby replacing expensive imported coal, and electricity for public lighting, private houses and other factories in the region.

As there was not efficient regulation, the charging for the services varied depending on each business. For Fiat Lux for example the bills were calculated based on the lamps installed by the company. It was up to the company to establish the service, at its own risk, with rates that it considered appropriate.

In the period 1880 to 1900, there were only 10 small power plants, with a total installed capacity of only 12,085 KW. By the early twentieth century, the main source of energy was thermal energy. However, with the startup of the first hydroelectric plant of Light Corporation, a Canadian company, hydroelectricity started to become more relevant.

The electric energy company Light has emerged in the final years of the nineteenth century and made important investments in the electric sector in the first half of the twentieth century. For these investments, the company obtained a concession for public transport in Sao Paulo, for a period of 40 years, and a concession to operate in the generation and distribution segments of the electricity sector.

It is worth mentioning that, regardless of the concession received to compete in the market, Light also had the required technical and financial resources. This helped the company to merge with or easily eliminate competitors.

Assured the monopoly of transport service and supply of electricity, the Canadian company arranged the necessary conditions for making investments in the sector, considering the financial and legal aspects. Consequently, Light managed to increase its generating capacity significantly in the first two decades of the twentieth century.

The decision of being in Sao Paulo was motivated by the rapid urban growth of this city, which offered extremely interesting investment opportunities to the three main activities of Light: public transport, generation and distribution of electricity.

In 1905, with a strong presence in Sao Paulo, Light expanded its activities to Rio de Janeiro. Rapidly, it monopolized the services of electricity, gas supply, public transport and local phone.

Light was closely related to the major trading banks and gradually became one of the largest foreign electric companies established in Brazil. The Light Group shareholders were Canadian; however, part of their board, management methods and funding policy were American.

As well as Light, there were also a significant number of small local companies, usually established by local dealers and farmers, that acted in the electricity sector in São Paulo. These companies were created, as they received a concession for public lighting, which was assured by contract issued by local councils. Consequently many cities in São Paulo's countryside, in 1910, managed to have many electric utilities companies responsible for public lighting and, in some cases, private residences.

However, investments in the electricity sector were mainly associated with the dynamism of the urban markets of big cities, especially Rio de Janeiro and Sao Paulo. The increase of the energy demand for public transport and public lighting made them the two major consumers of electricity. On the other hand, public transport by animal traction and gas lamps gradually disappeared in urban areas.

The 1920s was highlighted by two aspects:

- 1) Construction of larger power plants, in order to meet the continuous growth of energy demand,
- 2) Strengthening of the process of concentration and centralization of utilities companies, which almost resulted in complete denationalization of the industry at the end of the decade.

The growth of the Brazilian electricity sector demanded a lot of investments for the construction and expansion of power plants, transmission lines and others facilities of the electric grid. Despite advances in their technical and organizational skills, local companies failed to meet the growing energy demand in São Paulo State, which was being impacted by industrialization and population growth.

The smaller companies did not have enough financial capital for the huge investments required, and faced great difficulties in obtaining loans in the international market. The projects, especially the hydroelectric plants, had very large scale, for the period standard, with costs growing inconsistently in relation to the investment capacity of domestic firms.

The American & Foreign Power Company (AMFORP), from the American Electric Bond & Share Corporation, was established in the countryside of Sao Paulo as well as in other states, in this period of growth and concentration of the activities of electricity sector. This led to a rapid and deep change in the ownership and operation of national companies in this sector.

In the second half of the 1920s, both Light and AMFORP undertook a strong movement of concentration and expansion, causing major changes in the Brazilian electricity sector. The attitude of these companies reflected the gains associated with economies of scale, observed on both the supply side and on the demand side. Thus, in 1930, these two foreign companies had a (virtual) monopoly of actually all developed areas of the country and the greatest potential for development.

The states of North and Northeast did not attract Light and AMFORP because they were the poorest in the country and did not offer any attraction for new investments. The demand for energy within these states, which was relatively low, was attended by several small companies, which used small thermoelectric units, maintained largely by the local governments.

In this period the consolidation of the role of foreign capital was evident in the electricity sector, continuing for the next two decades. Therefore, the period from 1889 to 1930 is noted by relatively non-interventionist position of the Government in the electricity sector, as well as in the economy. The Government did not interfere in the production and sale of energy; they just gave the authorization for operation of businesses.

With regard to tariffs, although federal law indicates periodic reviews every five years, the gold clause in the Concession Contracts actually made the companies adjust rates automatically, even monthly, according to currency devaluation. In the 30s, the tariff increased significantly due to the strong exchange rate depreciation, causing a reduction in energy consumption.

However, in the 1930s the government adopted another approach: it extinguished the gold clause in 1933, and enacted the Water Code in 1934, the basic legal instrument for regulating the water and electricity sector. The Water Code was important for the strengthening of the Government in the sector regulation, since it created the legal framework for the supervision of concessions, which wanted to: ensure the supply of adequate public services, to set reasonable rates and ensure the financial stability of companies. Although it covered only the water issues, the Water Code covered 80% of the generation segment of the electricity sector, because the generation was mainly by hydroelectric plants.

The service by its costs would consider: operating expenses, depreciation and fair return on the capital invested (10%). The basis for the assessment of the capital invested by the companies would be the historical cost, in other words, the original cost of the facility.

This criteria for setting tariffs was marked by resistance and criticism from key industry players: Light and AMFORP. Criticism of the Water Code was mainly related to the criterion of return on capital based on historical cost. The devaluations and inflation in our economy would result in losses to the companies. Although this methodology has been applied in the United States and England, it did not seem adequate to the Brazilian economy.

Although it has been legally established, the historical cost has never been applied effectively in the definition of tariffs. On the other hand, companies applied unauthorized increases at the utility tariff, which was contested by the Government.

The Government applied penalties for such utilities as a result of tariff increases, and established a deadline to return the same rates at 1934 levels.

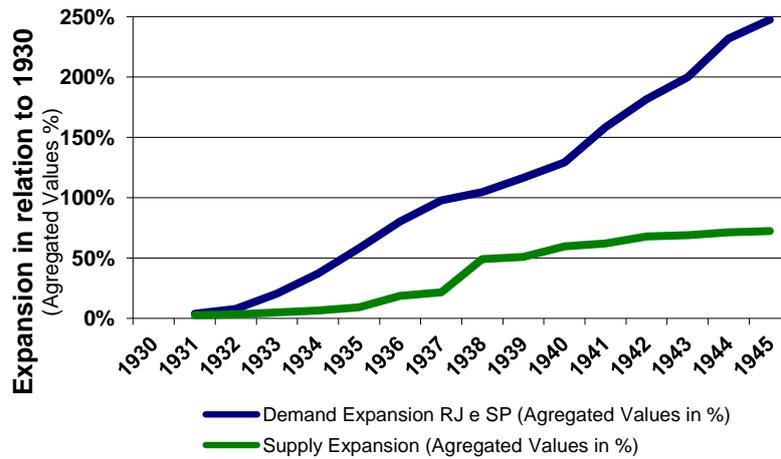
The definition of the rate by the historical cost and contracts revision did not occur. Thus, by the end of the Second World War, the Vargas government kept prices frozen, except for a small tariff increase granted by the criterion of "similarity and reasonableness," and not by the cost of service, as well as to meet the additional wage increases for workers in the sector.

According to some authors, the lack of new investments in the Brazilian electricity sector was due to the small capital available for the companies, as a result of the tariff policy based on historical cost, and the need for revision of the concession contracts. Other authors lay it in the restriction to the multinationals to build hydroelectric plants, an issue that was only made flexible by the war.

The investment was also below the required level needed for the sector, because the new projects were of very large scales. This required extremely high investment, increasing the risk of the business and exceeding the foreign investors budget. Similar to the situation of the local companies during the 30s. The risks associated with new projects, especially those of large hydroelectric plants, to the standards of the time, implied very high tariffs, inconsistent with how much the market would be able to pay. Besides the size of the projects, which implied financial restriction for firms, there was also a concern of foreign groups with respect to the exchange rate, since the profitability of their investments was determined in foreign currency. Another risk factor for these companies was related with the increased use of river basins, which were controlled by the government regulatory regime for the use of "water."

It is observed that in the period 1930 to 1945, demand for electricity has grown more than supply (Figure 1), resulting in the risk of power failure in the early 1940s. The system has come to operate at full capacity in certain areas of the country.

**Figure 1. The Growth of Demand and Supply Between 1930 - 1945**



Source: Panorama do Setor Elétrico and Own Analysis

In addition to the internal aspects of the sector mentioned above, it is worth noting that investments in this period (1930-1945) were also affected by the adverse external economic environment. During this period, for example, it was difficult to import equipment and capital goods required for the expansion of the electricity sector, because of the global economic crisis of 1929 and the Second World War.

Gradually, as a result, the private sector decreased its intention in making large new investments, starting thus a period in which the major investors in the sector were public companies.

Chapter 3:  
**Second Period (1945 – 1989) Public Investments**

With the end of World War II in 1945, there were two different chains that offered two options to the electricity sector in Brasil. The Associable chain defended a greater participation of the private sector, while the Nationalist chain defended government intervention, criticizing the foreign companies. Although the pro-privatization chain was not a homogeneous block, they had in common a criticism of the historical cost tariff principle, and the inflexibility of the tariff mechanism, which resulted in the stagnation of investment of the foreign companies, Light and AMFORP.

In this scenario, the private sector supported "fair" tariffs and adjustment of the Water Code especially about the maximum return on capital of 10%. In addition to these considerations on tariff policy and legislation on energy services, the private sector argued that the inflation recorded in those years and the current exchange rate policy discouraged investors.

However, the guidelines of the Government in relation to energy were nationalistic and statist, but interested in foreign capital due to lack of internal resources. These guidelines emphasized the intervention and massive government involvement in the production of electricity, the importance of the Water Code and the principle of progressive nationalization of hydraulic sources. The Government was not satisfied with the level of foreign investment by major utilities that while they were making profits in their activities, were not expanding the generating capacity to attend to the increasing demand. The private domestic firms were small and also did not make the necessary investments, since they were unable to get loans required for the investments, which were high and had long payback periods.

In order to increase the energy supply to meet the growing demand, the Government had to invest directly in the sector by public companies, both state and federal. Thus, the problem with the supply was solved, avoiding changes in the tariff issue, and consequently the Water Code.

The Government became responsible for a relevant investment program in generation and transmission activities through state and federal companies created just for this

purpose. This new period of the electricity sector set up a hypothetical division of work between the public and private companies.

The government became responsible for the expansion of the generation of electricity, which required more investment and which was the main issue of the crisis. The private sector would remain focused on the distribution segment, which required less fixed capital, and on the existing generation. This division was not established through legal means, and therefore was not rigid or inflexible. It was only a division of issues, in which the government acted with more emphasis on the generation of electricity, that required more investment and the private sector in distribution. Despite this division, the public companies could act in the distribution area, if it proved imperative, or private companies invest in the generation of electricity, whenever it was interesting and profitable.

The Government aimed to provide cheap energy, avoiding a significant increase in the tariffs of consumers, in line with the Nationalist chain. Thus, the investment of public companies were not intended to achieve profits or returns according to the risks incurred, but the expansion of the sector (demand for electricity), regardless of the financial return obtained on the equity invested.

In order to provide funding for the investments of the public companies, the Government established in 1953 the Federal Electrification Fund (FFE), managed by the National Development Bank (BNDE). This Fund was established with Federal tax money.

Thus, the FFE enabled the money for power sector expansion, without having to reform the tariff methodology defined in the Water Code. In this way, the Government avoided changing the law, which limited the profits made by private companies and therefore restricted the available capital for new investments of these companies. Increasing the tariff would imply higher profits for foreign companies and consequently a negative pressure in the national balance of payments occurred at profits distribution, which was not desirable due to the lack of foreign exchange.

The Brazil-United States Economic Development Commission, established in 1950, supported the application of foreign capital, especially from the United States, without sector restrictions.

According to a report of the Joint Commission, the outputs for the development and expansion of the electricity sector would depend on changes in federal government relations with the utilities companies. The priority, according to the document, would be the regulations of the Water Code in favor of higher profitability in the private concessionaires. The Joint Commission understood it was necessary the end of the historical cost tariff definition, updated tariffs and expanding the limits of return on the invested capital.

The more relevant participation of private investment in the sector required a reform of the tariff legislation, which gained strength as public resources became insufficient.

The alternative, increasing BNDE investment, was rejected by the Development Council, as it would impact on other important sectors of the economy in which the bank operated. The slowdown in the construction of power plants was not reasonable, as it would worsen the electricity supply crisis. As an increase in tax revenues was not possible, because it would impact the tariff, the only alternative considered effective for assuring the investment required was tariff reform.

The government actually made a project of Law in 1956, which aimed to solve this tariff issue, adjusting the historical cost of investment by the inflation, and increasing the annual rate of return from 10% to 12%. In this way the Government expected to increase the private utilities companies' intention to invest. However, the nationalist chain opposed to this project, which was never approved.

Consequently, private companies participation in electric utilities decreased, such that in the early 60s there were two major companies, the Light group (Rio de Janeiro and Sao Paulo), the AMFORP group, as well as a small number of small companies with national capital, specially in the South and Southeast of Brazil.

The market share of the public companies continued to increase, ending up with the complete nationalization of the sector, with the purchase of the companies AMFORP, in 1964, and Light, in 1979. Private capital was limited to small domestic companies, which had a insignificant generating capacity and generally lacked the resources to make the investments required. Therefore, although there was no restriction on the participation of private capital in electricity services, the nationalist policies practiced by the government led to the almost total nationalization of the electricity sector.

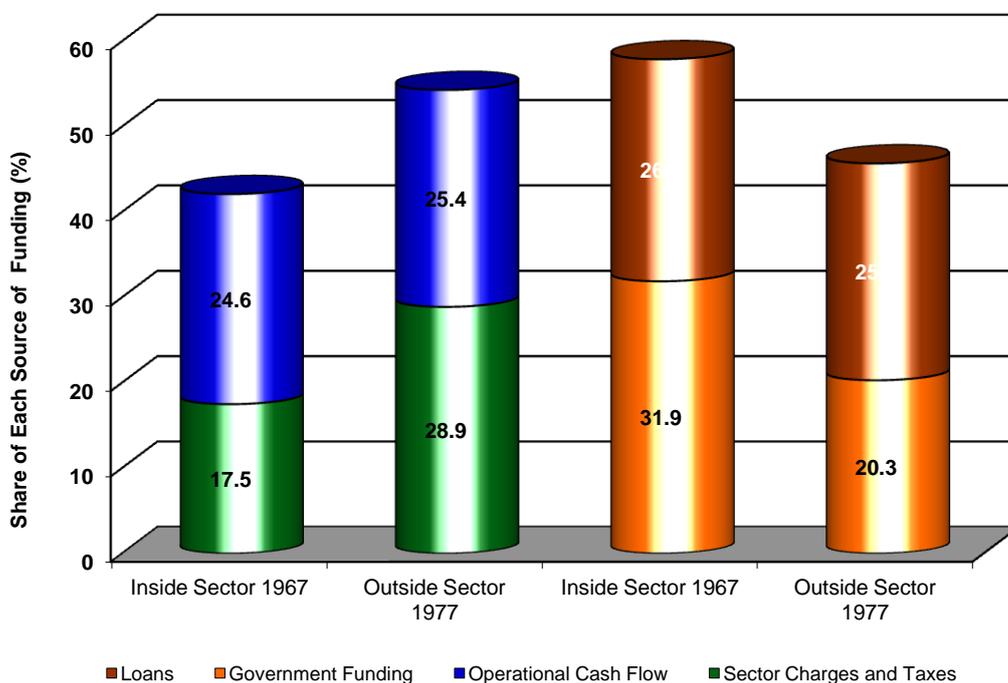
The rates of the electricity sector were adjusted, implementing a policy of "fair" prices. The electricity sector began a cycle of balanced growth and self-sustained as a result of this policy of "fair" tariff and the establishment of several fund-raising mechanisms triggered by the government (compulsory loans to Eletrobrás and changes of the taxes on revenues). This adjustment in the tariffs strengthened the financial situation of public companies, making it easier to them get new foreign loans from private banks and multilateral lending agencies like the World Bank (IBRD) and the Interamerican Development Bank (IDB).

This financial strengthening was important to increase the operational cash flow for new investment and reduce funding pressures on the National Treasury.

The restatement of fixed assets for the purpose of valuing the return on investment considered at the tariffs, was finally established in 1964, ending the tariff policy based on historical cost, which was so much criticized by the private sector. This measure would result in large increases in the tariffs due to the big participation of this item in the tariff calculation.

Between 1967 and 1973 it was observed that the return on investment continued to be benefited by the favorable tariff framework. Overall, prices in this period increased at higher levels than inflation, resulting in higher rates of return for investments. During these six years (1967 to 1973), with a tariff increase above inflation, the electricity sectors company increased the sector cash flow, making this funding more important. In 1973, the sector cash flow was about 54.3% (Figure 2), in which 25.4% of this amount was due to internal operational cash flow and 28.9% due to sector charges and taxes (IUEE, RGR, Compulsory Loan, Other).

**Figure 2. Evolution of the Funding obtained from the Sector Cash Flow and Outside the Sector Sources, between 1967 and 1973**



Source: Panorama do Setor Elétrico and Own Analysis

The 5655 Act adjusted the tariff as it increased by two percentage points the maximum rate of return on investment, establishing minimum and maximum returns of 10% and 12% respectively. The tariff was now adjusted annually, allowing any correction needed due to insufficient or excessive returns recorded in a given year.

From 1972 to 1975, the progressive reduction in the rate of income tax of 17% to 6%, also contributed to the cash generation of the concessionaires.

The outside sectors funding, loans, decreased from about 32% in the period 1967/1968 to about 20% in 1973, however, the internal and external loans had different trends. Because of the high liquidity in the international market and the final cost of the loans, the electricity sector preferred to raise funds in this period at foreign markets instead of at internal market. The loans obtained in the country decreased from about 15% to approximately 4.1% in 1972 and the external funding increased from about 13% in 1967 to 23% in 1972. Between 1967 and 1973, utilities had more opportunities to obtain external money, because of the increase in the internal cash flow of these companies, which was a consequence of the increase in the real rate of return on investment.

Summarizing, the large investments of public companies and the strengthening of Eletrobrás was the main point in this period, 1967 and 1974.

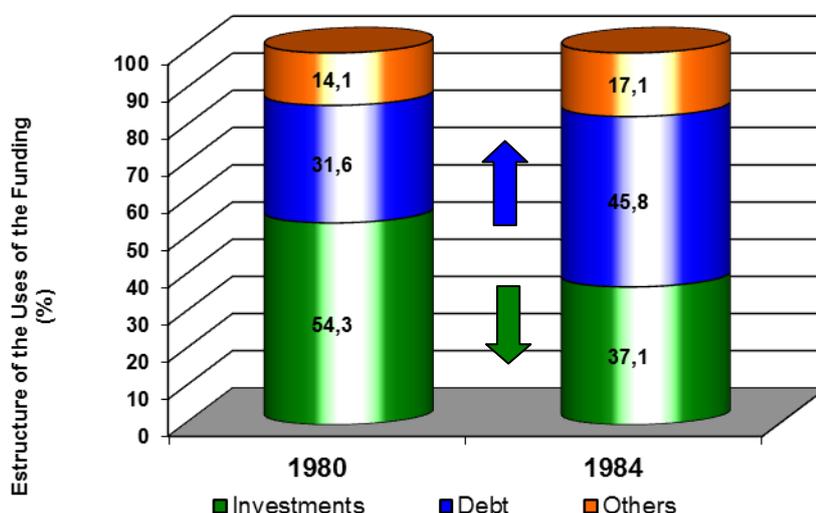
This condition changed radically between 1974 and 1979. During this period, it was not applied the “fair” tariff policy, and, as companies operational cash flow decreased, money for the investments were raised through debt.

The exchange rate and floating interest rates became the main financial risk for companies. The debt payment of these companies was also impacted by lower pay back periods, lack of loans from private banks, increase in the interest rate, due to the second oil supply crisis in 1979.

Even so, the sector until 1982, had a net inflow of funds in foreign currency. However, after 1982, with the Mexican foreign debt default, the raising of funds for investments, or debt payment became more difficult, especially from private international banks. This resulted in the decrease of external funding, setting companies in difficult financial situation. The Mexican crisis was an important reference associated with the previous funding strategy for the electricity sector, because it lead to an aversion to investments and loans for undeveloped countries.

In 1984, it was observed a decrease in investment. The attraction of external money was exhausted and the government without action, because of commitments with the International Monetary Fund (IMF) to reorganize the public deficit.

**Figure 3. Evolution of the Uses of the Funding between 1980 - 1984**



Source: Panorama do Setor Elétrico e Own Analysis

The Government's attention was on inflation control, therefore public utilities tariffs were used as instrument for this objective.

The investments of Eletrobrás Group began to be questioned by other companies such as: Cia Energetica de Sao Paulo (CESP), Cia Energetica de Minas Gerais (Cemig) and Cia Electricity Paraná (Copel). In the middle of financial crisis, these companies criticized the priority given by the government to invest in expansion of Eletrobrás group and the mechanisms of funding transfer within the sector. In 1987, the main concessionaires of the South and Southeast of Brazil decided to stop the payment of quotas from the Global Warranty (RGG) and the Global Reversion Reserve (RGR), and started to postpone payment of energy supplied by federal companies.

The most critical financial period for the electricity sector was in the early 90's. The ability of companies to make new investments was impacted by funding shortage and the decision of main market players to stop energy payment. Thus, this sector model, which was structured on public companies investment had to be redesigned to attract private investment.

## **Third Period (1990 - 2002) - Private Investments**

In the first half of the 90's, at Fernando Collor government and others, occurred the electricity sector liberalization, due to the crisis of the public companies, lack of funding for investment and inability to increase funding by tax or foreign debt. In this period the government promoted the liberalization of the sector in order to encourage private capital (domestic and foreign) and competition between energy producers companies. It was expected, therefore, greater efficiency in investment, as there is a tendency for higher added value in private enterprise and competitive markets.

Sector cost was not used as an instrument for monetary policies aiming inflation control and the tariffs were adjusted in line with the actual cost of the services. This liberalization process became more relevant in Cardoso government, in the second half of the 90's, with the reduced role of government, privatization of existing companies and expansion of electricity supply, giving preference for private capital (national and foreign).

The sector reform also included the following measures:

- Split-up of the generation, transmission, distribution and commercialization;
- Agents Liberalization and setting up an electricity market (WEM);
- Free access and regulation of transmission and distribution services;
- Establishment of an independent system operator (ONS) and a regulatory agency (ANEEL). (SILVA, 2006)

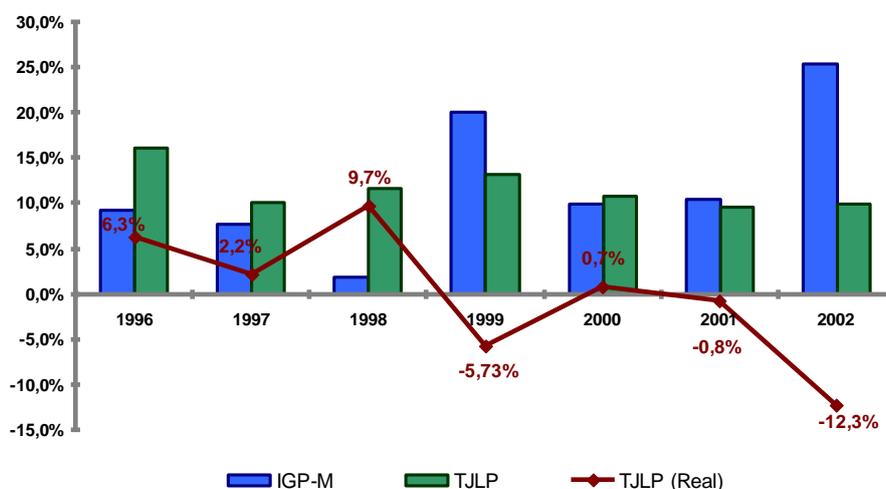
Privatization began in 1995 with the privatization of the Distribution Company Escelsa. The decision to start the privatization by the distribution segment was in order to find a solution of the lack of payments of these companies with the generators, which was one of the main obstacles to attract private investors for the generation and transmission segment. The privatization of these two segments would occur in a second period, as it was essential first to have a clear perception that the distribution companies would be able to pay for the power supply. Thus, the privatization of federal and state distribution companies occurred rapidly, solving the financial problems of these companies, chronic no payment, as well as increased the efficiency of them.

The privatization program was successful, at least in the distribution segment, attracting private capital, national and foreign (European and American), for the electricity sector. In 2001, about 90% of distribution companies had already been privatized. On the other hand, about 80% of generation capacity remained concentrated in public companies.

In the generation segment, the most important privatization was the company Gerasul (today Tractbel). It was planned to privatize other federal generation companies: Furnas, Eletronorte and Chesf, which were actually enrolled in the National Privatization Program (PND), but have not been privatized, and was subsequently removed from the program. Economic stabilization obtained with the Real Plan in 1994, contributed to the entry of private capital in the sector and the acquisition of federal and public companies.

BNDES was the main financial agent for the sector, providing long-term loans for the construction of new projects, especially for business structured as project finance, through the constitution Special Purpose Companies (SPC). In addition, loans had better financial conditions, such as long pay back periods (about 14 years) and lower interest rates than those practiced on the short run capital market, having even negative rates (in real terms) in years with high inflation (Figure 4). Thus, it did occur a few partnerships between builders, operating companies, pension funds and others.

**Figure 4. Evolution of IGP-M (Inflation Index) and TJLP (BNDES interest rate) from 1996 - 2002**



Source: IPEA-DATA and Own Analysis

The government auctioned the concession for some hydroelectric plants, however, afterwards it was criticized the way it was done. The concessions were granted to companies who offered the highest value for the award of the concession and not by the lower rate of service. This policy was not sustainable because it would lead to an increase in energy prices for final consumers, which would not be sustainable in the long run. Measures such as self dealing, created to encourage investment in generation, proved to be inefficient, since it created questionable situations. Some companies received high prices for a thermal energy sold to another company from the same Group, but effectively provided by a hydroelectric plant, which received an extremely low price for its energy.

This model focused on private capital was not sustainable for several reasons, some structural, or related to the model itself, and others related to the conjuncture (to the period). Castro, Cavalieri and Bueno (2006) pointed out that the main problems of this period were:

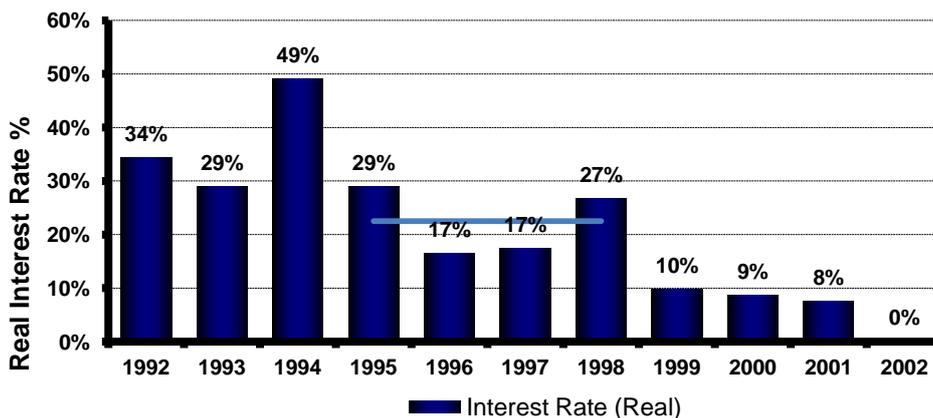
- The fact the Government concentrated its effort in the privatization of public companies leaving the energetic planning as a second issue. However, the energetic planning is a strategic variable in the Brazilian electricity sector, as it has an energetic matrix mainly composed by hydroelectric energy, leading to investments below the required level.
- The new players in the Brazilian electricity sector did not have sufficient guarantees for the required investments. This new players applied their capital on the acquisition of existing assets, mainly in the distribution segment and not at the construction of new power plants. The Treasury priority was to get the highest value in the sale of the existing assets, to ensure resources for the government national account.
- The fact that the main generation and transmission companies were public, having its investments restricted, as it was expected to sell them and there was the obligation for this companies to contribute to the Government's national account.

In addition to these points, it is important to highlight that the Brazilian economy and the electricity sector model did not have a record of predictability and stability that would provide a high expectation of cost and investment recovery. These factors are important to attract capital from investors, especially because it is long-term investments with long payback periods, long-term returns.

The extremely high real interest rates, especially in the period 1995 to 1998, about 22.5% p.a. made short term returns in the financial market very attractive reducing investors intention to apply capital at the electricity sector (see Figure 5).

**Figure 5. Real Interest Rate Evolution (Selic)**

(the values were obtained subtracting the average of the two inflation indexes: IGP-M and IPCA)



Source: IPEA-DATA e Own Analysis

Note: At 1994 it was considered only the interest rate praticed in the second half<sup>2</sup>

Another important point that inhibited the investments at new power plants was that the concession for new plants did not have preliminary environmental license and did not considered any obligation for investors build the plant according to a specific schedule. Furthermore, no agent was directly responsible for the expansion of the generation segment. The government only made an indicative planning, without assuming the responsibility for the effective expansion of the sector, and the agents were under no obligation to expand the offer, doing only what was on their particular interest.

Besides the points mentioned, there were specific characteristics in the electricity sector that made it difficult to achieve market competition in this segment. The fact that the Brazilian electricity sector has large economies of scale, with a large concentration of capital, transmission restriction and low price elasticity on demand, increased market power of agents. This scenario does not promote a great competition between agents to ensure an expansion of energy efficiently, without the risk of cyclical crises of supply. To ensure conditions for market competition without excessive market power,

<sup>2</sup> In the first half of 1994 the real tax rate was very high (1044%), due to the establishment of the Real Plan. In order to enable the graph show more clearly the data, it was not considered the first half of this year.

according to Araújo (2001), "it would require three conditions: slow growth in demand; cheap alternatives generation and a comfortable margin of spare capacity of the system (generation, transmission and distribution). Conditions completely different than those observed in Brazil at: 1993, 2001 or 2006. "(Correia et al., 2006).

Another critic to this model was related to the energy prices volatility traded in the Short Run Energy Market (MAE). This price volatility was a major point of uncertainty for investors, especially to be strongly associated with the hydrological regime of large river basins, which is a random variable. This uncertainty inhibits the entry of new players in the sector and increased the option value of waiting, or not to invest.

Thus, there was a supply crisis in the Brazilian electricity sector in 2001, due to the delay on the construction of the main generation projects and the extremely poor hydrological framework at that year, it was worst rainfall in 40 years. This stopped the privatization process and led to an end of this model toward privatization. Consequently, in May 2001 there was a need to reduce by about 20% consumption, in order to avoid any energy shortage. Although this period was distinguished by the government intention to give priority to private capital, most of the investment and new generation capacity had the participation of public companies.

This forced energy consumption reduction resulted in a short-term financial crisis, which affected directly the economic and financial equilibrium of the companies, especially in the distribution segment. This conjuncture problem was minimized by an especial credit line offered by BNDES. However, after the end of this period of forced energy consumption reduction it was observed that there had been a change in the demand curve for electricity in all types of consumers. The result was that pre-crisis consumption levels were only recovered a few years later, also as a result of low economic growth.

## **Fourth Period (After 2003) – Public and Private Investment**

The 2001 crisis of the electricity sector, together with several other factors, led the government to re-evaluate its intention of market liberalization and privatization of public companies. The government changed the electricity sector guidelines and stopped privatization. The intention of having a liberalized market, with no integrated energy planning did not work, especially because the Brazilian energy matrix relies mainly on water.

The new government, which started in January of 2003, reformulated the sector model in order to restore a background in which new investments would be done by private and public companies. Although private capital has an important role in the expansion of the sector, the public capital would continue to compose a significant market share of the investments, mainly because the larger companies in the generation and transmission segments were public companies and were out of the privatization plan. The public debt also declined significantly since in the previous period there was investment restriction and a guideline for paying down existing debts without renewing them. The lower debt and the changes implemented in the sector model, which will be presented later, strengthened the financial situation of the public companies, which is allowing the public companies to more easily raise new debt for investment.

The government has no longer a pro-market guideline, deciding to give priority to energetic integrated planning and regulation of the sector.

Currently, there are many important projects in the generation and transmission segment. Although Brazil still has significant hydroelectric potential to be explored, the new medium and large plants are outside the consumption centre, in the Amazon region for example, and are facing huge environmental challenges. Brazil is gradually diversifying its energy matrix increasing the share of other sources of energy; including, thermal coal, natural gas, biomass, wind and nuclear.

The new guidelines for the electricity sector are:

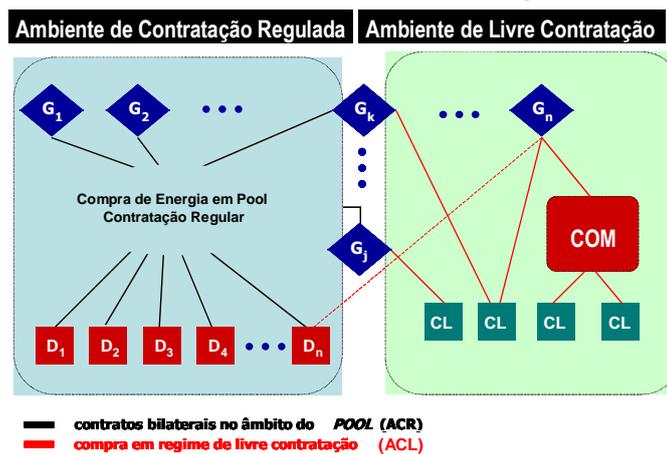
- Avoid pricing pressures to the consumer - low tariffs;
- Create an environment that attracts investment and provides a reasonable return for private and public investors;

- To mitigate the environmental risk in the generation plants' concessions, by setting auctions with projects that already have preliminary environmental licenses;
- Create a new bidding process for the concession of generation, giving priority for the lowest fare;
- Buy energy for all distribution companies in the country at a joint auction, in order to achieve economies of scale, sharing risks and benefits of contracts and equalize supply tariffs;
- Offer new transmission lines concessions through public auction, winning the company that offers the smallest transmission tariff. The concession of transmission lines last for 30 years.

The 10.848/2004 law changed previous laws, establishing new rights and duties for agents of the electricity sector, in order to reflect the main guidelines mentioned.

In addition to these guidelines, the government implemented a new energy commercialization model with two business environments: (i) the Regulated Market (ACR) or (ii) the Free Contracting Market (ACL). The distribution companies have to buy electricity in the regulated market, through public auctions, while other agents are allowed to freely deal their demands in the ACL (Figure 6).

**Figure 6. The two Business Environment for Dealing and Contracting Energy**



G, — Generators; D, — Distributors; CL — Free Client; COM – Commercialization Agent

Source: João Carlos Mello Presentation, from Andrade Canellas.

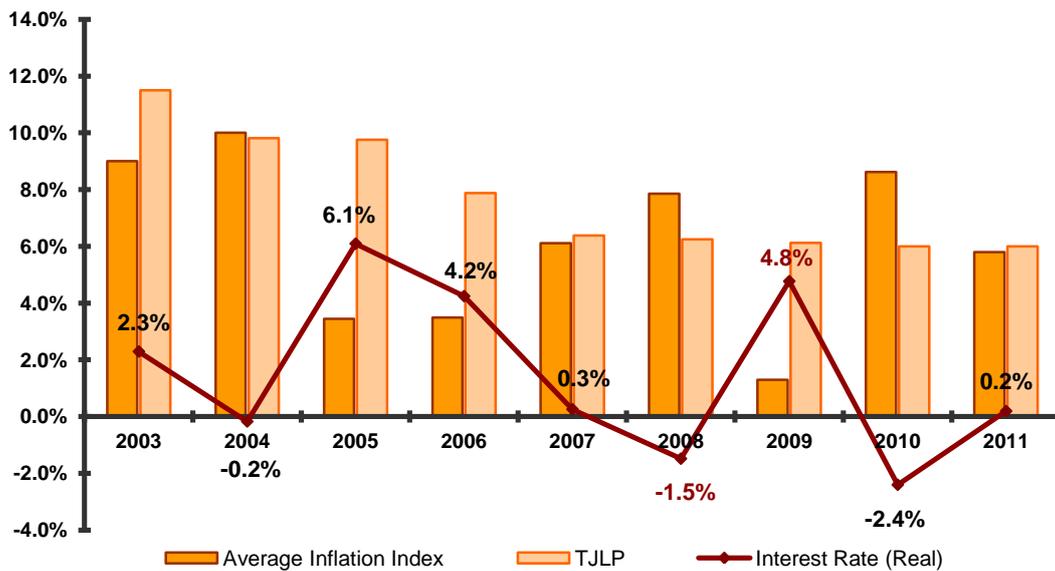
At the regulated market (ACR), businesses are made between distribution and generation companies. The distribution companies have to buy 100% of the energy they need.

The electricity supply contracts, which previously had a short-term focus, became long-term, in order to reduce price volatility and create a Power Purchase Agreement (PPA) market that would be used as guarantee for the financial system (Silva et al, 2005).

The auctions to hire the energy are done three or five years in advance of the beginning of the supply. The contracts signed for the acquisition of new generation lasts for 15 and 35 years depending on the source of the energy. Therefore the risk for the generators decreased, as the construction of the project starts with a revenue contract granted since the beginning (Silva et al., 2005).

The BNDES continued as the main financial agent for the electricity sector providing long term funds with special rates (Figure 7), contributing to the low tariff policy. Loan periods for large projects reached up to 25 years.

**Figure 7. Evolution of Inflation Index (IGP-M and IPCA) and TJLP (BNDES interest rate) from 2003 to 2011**



Source: IPEA-DATA and Own Analysis

The capital market is also acting as an important alternative source for raising fund by the issue of bonds, receivables funds and equity. However, the low costs loans offered by BNDES restrict the development and a more relevant participation of loans from the private sector.

As in the previous period, the companies do not have the responsibility to invest in the expansion of generation and transmission, they only do it when it is attractive and fits their financial capacity. This second point is very important because it allows companies enacted in a lot of investments or with very high debt to postpone new projects, matching their investments plans with their borrowing capacity and operational cash flow.

Although the actual guidelines aims for low tariffs, there's no restriction to an increase in energy prices, as seen in the past (period of public investment) in order to avoid inflation pressure. The energy price depends on the existing supply and costs of new projects.

It is in this context that it is observed a resumption of investment in the generation segment. Investors have contracts setting the price of energy, price adjustment and other conditions. Thereby the risk was reduced, avoiding government interference at the price of energy, as it was observed in the past, in order to control inflation.

The current energy auctions are reverse in nature when compared to traditional auctions, winning the generator that offer the lowest price. Therefore, it is an auction of demand (or reverse) in which prices are reduced gradually until supply equals demand. The decision of the generator to sell or not to sell at the auction is strongly related to the project cost, opportunity cost and energy price at the auction. It is in this scenario, that it is observed two separate struggle: (i) between the investors, looking for the concession of a specific hydroelectric plant (ii) between the several projects alternatives. In both struggle, the return on investment is crucial (Correia et al., 2006).

The auctions allow a power struggle between the various generation alternatives. There may occur, for example, struggle between hydroelectric, thermal and wind energy. Prices and availability of a given source varies significantly depending on the type of plant, equipment and process. (BELT et al., 2006).

This struggle between projects makes companies to be as efficient as possible, looking for the lowest cost to ensure higher returns. The financial strategy of the projects holder is very important as it allows then to offer more aggressive bidding in the auctions to those who have a lower costs funding.

## The Funding for the Expansion of the Sector

The funding is one of the most important issues for the success of a project. High debt levels may make it difficult for a company to raise new loans for its investment plan, or lead to very high interest rate, decreasing the shareholders return and the project attractiveness. The aggressive investment plan enacted especially by public companies is gradually increasing their debt level, decreasing the borrowing capacity of these companies. The ability to raise new loans may decrease significantly after 2015, as a reduction of energy prices is expected as a result of the end of the concessions of many assets at the distribution, transmission, and generation segments. Therefore, this chapter attempts to give an overview about debt characteristics, fiscal benefits, company capital structure, limits, debt policies and debt management, as this may become one of the most important issues for the enactment of investment plans for the electricity sector.

Debt is usually cheaper than equity, as lenders have priority in receiving the money back than the shareholders. In addition, interest payments implies in a tax benefit, reducing profits and resulting in a lower income tax. However, this only applies if the business is profitable.

The tax benefit that a company gets with the debt can be represented by the following formula: (Brealey and Myers, 1998).

$$\text{Tax Benefit} = T_c ( r_D D )$$

where:

$T_c$  = income tax rate (34% in Brasil)

$r_D$  = debt cost (interest rate)

$D$  = amount of debt

Therefore, the increase in the amount of debt can add value to the business, considering there is no bankruptcy risk. (Brealey and Myers, 1998).

In addition, as stated in the second Modigliani and Miller proposition (MM): the rate of return of shareholders of a company without debt increases proportionally to the ratio of debt (debt / equity), calculated based on market value. The magnitude of the growth in shareholder returns depends on the degree of difference between the return on

assets and return (cost) of debt. The next equation shows this reasoning: (Brealey and Myers, 1998).

$$r_e = r_a + (D / E) * (r_a - r_d)$$

where:

$r_e$  = equity return

$r_a$  = asset return

$r_d$  = debt cost

D = debt

E = equity

This equation, proposed initially by MM, was adjusted afterwards in order to consider the effect of tax benefit of debt. In the presence of tax, there is a reduction of the increase of shareholders risk and consequently the required return for them. The next equation shows the adjusted equation: (Ross, 1996)

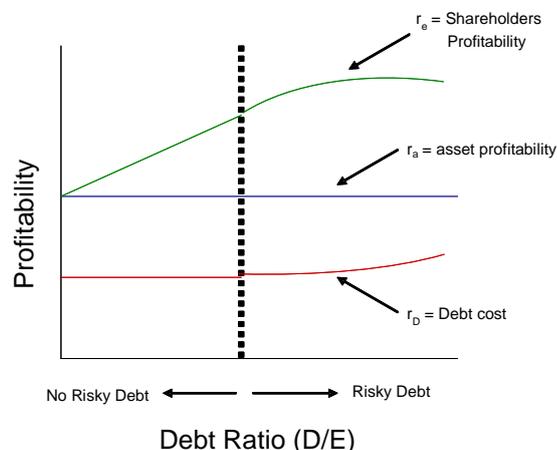
$$r_e = r_a + D / E * (1 - T_c) * (r_a - r_d)$$

where:

$T_c$  = tax rate

But, as the company debt increases, there is a higher default risk. Consequently the company has to pay higher interest rates. The second MM proposition states that, when this occurs, the growth rate of  $r_e$  slows down (Brealey and Myers, 1998). In other words, the more leveraged the firm is, the lower the  $r_e$  sensitivity to the additional debt. Figure 8 shows these considerations.

**Figure 8. Increase of the Shareholders Profitability, as Debt Increases**



Source: Brealey e Myers, 1998

OBS: The return on asset ( $r_a$ ) is the return of the investment with no debt

## The Target Capital Structure

A firm's optimal capital structure is defined as the structure that would maximize its stock price. It is useful to analyze the situation and attempt to determine the optimal structure; however, it is difficult to do this with much confidence. As a result, in practice, many managers think of the optimal capital structure more as a range (e.g. from 40% to 50% debt) rather than as a precise number (e.g. 45%). Other firms study the situation; reach a conclusion on the optimal structure; and then set a target capital structure, such as 45% debt. If the actual debt ratio is significantly below the target level, management will raise capital by issuing debt, whereas, if the debt ratio is above the target, equity will be used. The target may change over time as conditions change; but at any given moment, management has a specific debt ratio in mind. (BRIGHAM, 2009)

Setting the capital structure involves a trade-off between risk and return:

- Using more debt will raise the risk by shareholders;
- However, using more debt generally increases the expected return on equity.

The higher risk associated with using more debt tends to lower the stock's price, but the higher debt-induced expected rate of return raises it. Therefore, it has to find the capital structure that strikes a balance between risk and return so as to maximize the stock price.

There are several factors that influence capital structure decisions, the four primary factors are the following (BRIGHAM, 2009):

- Business risk: the greater the firm's business risk, the lower its optimal debt ratio.
- The firm's tax position: a major reason for using debt is that interest is tax deductible, which lowers the effective cost of debt. However, if most of a firm's income is already sheltered from taxes by depreciation tax shield or interest on currently outstanding debt or tax loss carry-forwards, its tax rate will be low. In this case, additional debt would not be as advantageous as it would be to a firm with a higher effective tax rate.

- Financial flexibility: the ability to raise capital on reasonable terms even under adverse market conditions. When money is tight or when a firm is experiencing operating difficulties, it is easier to raise debt than equity capital and lenders are more willing to accommodate companies with strong balance sheets. Therefore, the firm's potential future need for funds and the consequences of a funds shortage combine to influence its target capital structure – the greater the probability that capital will be needed and the worse the consequences of not being able to obtain it, the less debt the firm should have on its balance sheet.
- Managerial conservatism or aggressiveness: some managers are more aggressive than others; hence, they are more willing to use debt in an effort to boost profits. This factor does not affect the true optimal, or value maximizing, capital structure; but it influences the firm's target capital structure.

The others factors that are generally considered when making capital structure decisions are: (BRIGHAM, 2009)

- Sales stability: A firm whose sales are relatively stable can safely take on more debt and incur higher fixed charges than a company with unstable sales. Utilities companies, because of their stable demand, have historically been able to use more financial leverage than industrial firms.
- Asset Structure: Firms whose assets are suitable as security for loans tend to use debt relatively heavily. General-purpose assets that can be used by many businesses make good collateral, whereas special-purpose assets do not. Thus, real estate companies are usually highly leveraged, whereas companies involved in technological research are not.
- Operating leverage: Other things the same, a firm with less operating leverage is better able to employ financial leverage because it will have less business risk.
- Growth rate: Other things the same, faster growing firms must rely more heavily on external capital. Further, the flotation cost involved in selling common stock exceeds that incurred when selling debt, which encourages rapidly growing firms to rely more heavily on debt. At the same time, however, those firms often face higher uncertainty, which tends to reduce their willingness to use debt.
- Profitability: It is often observed that firms with very high rates of return on investment use relatively little debt. Although there is no theoretical justification for this fact, one practical explanation is that very profitable firms such as Intel,

Microsoft, and Google do not need to do much debt financing. Their high rates of return enable them to do most of their financing with internally generated funds.

- Control: The effect of debt versus stock on management position can influence capital structure. If management currently has voting control (more than 50% of the stock) but is not in a position to buy any more stock, it may choose debt for new financings. On the other hand, management may decide to use equity if the firm's financial situation is so weak that the use of debt might subject it to serious risk of default. The reason is that if the firm goes into default, managers will probably lose their jobs. However, if too little debt is used, management runs the risk of a takeover. Thus, control considerations can lead to the use of debt or equity because the type of capital that best protects management varies from situation to situation. In any event, if management is at all insecure, it will consider the control situation.
- Management attitudes: No one can prove that one capital structure will lead higher stock prices than another. Management, then, can exercise its own judgment about the proper capital structure. Some managers tend to be relatively conservative and thus use less debt than average firm in the industry, whereas aggressive managers use relatively high percentage of debt in their quest for higher profits.

Those points largely determine a firm's target capital structure, but operating conditions can cause its actual capital structure to vary from the target. For example, a company's actual stock price might for some reason be well below the intrinsic value as seen by the management. In this case, management would be reluctant to issue new stock to raise capital, so it might use debt financing even though this would cause the debt ratio to rise above the target level. However, the company would probably take steps to return the capital structure to its target level as soon as the stock price approached its intrinsic value. (BRIGHAM, 2009)

The electricity sector companies usually meet many of the factors (sales stability, asset structure with many receivables suitable as security for loans, low operating leverage and reasonable growth rate) for a capital structure with a relatively high debt level.

The only segment that faces periodically relevant decreases on its tariffs, as a result of the revision process, is the distribution segment. It would be better that eventual decreases of the tariff could be postponed in order to be cancelled with the future

increases to keep the companies' borrowing capacity stable. Relevant variations of revenues decrease the company's ability to raise loans that may affect the company's ability to meet its investment plan.

### Business and Financial Risk

The two main risks considered related to capital budgeting area are:

- Business risk, which is the riskiness of the firm's assets if no debt is used. Business risk varies from industry to industry and among firms in a given industry. Further, business risk can change over time. In summary business risk depends on the variability of the firm's operational cash flow (revenues and costs), and on the operating leverage (the extent to which costs are fixed). If a percentage of its costs are fixed (and hence do not decline when demand falls), the firm will be exposed to a relatively high degree of business risk. Regulated activities, such as utilities, usually have low business risk. However, in the electricity sector in Brazil the end of the concessions may be considered as the main business risk, as it may decrease significantly operational cash flow of companies at the three segments: distribution, transmission and generation.
- Financial risk, which is the additional risk placed on the common stockholders as a result of using debt. Leverage increases the variability of shareholders expected cash flow. The debt holders will receive a fixed payment and it will come before the stockholders receive their payments.

There is not a standard for debt policy, however companies usually consider the following points as a guide for raising new loans: (DONALDSON,1964)

- Borrow the maximum available at the lowest market rate
- Borrow the maximum consistent with an A rating company
- Limit the principal amount of (long-term) debt to a determined percent of total capitalization
- A minimum earnings coverage standard
- The control of risk other than by limiting the amount of debt

In order to pursue the first two debt policies the company must observe the main points analyzed by banks rating agencies:

- Probability of default
- Loss given default
- Financial ratios
- Management
- Industry
- Collateral
- Subordination

The table below shows some references of financial ratios (Standard & Poors) observed for different companies rating at the US, but that could be applied for the main Brazilian companies that are traded in the US: (HANDORF, 2012)

Financial Ratios		AA	BBB	B
TIE (x)	Ebit / Interest	13.6	4.2	0.9
CFO / Total Debt (%)	Operating Cash Flow / Total Debt	77.5	34.6	10.1
LTD / Capital (%)	Long Term Debt / Long Term Debt + Equity	34.8	45.6	74.2

The times-interest-earned (TIE) ratio gives an indication of how vulnerable the company is to financial distress. This ratio depends on three factors: (1) the percentage of debt, (2) the interest rate of debt, and (3) the company's profitability. Generally, low-leveraged industries such as pharmaceuticals and aerospace / defense have high coverage ratios, whereas industries such as utilities, which finance heavily with debt, have low coverage. (BRIGHAM, 2009)

In addition banks usually consider the financial ratios presented in the table below: (HANDORF, 2012)

	Good	Bad
Cash: (Cash + Securities) / Asset	> 1%	< 1/2%
Current: Current Asset / Current Liability	> 220%	< 150%
Operating Cash Flow: CFO / Term Debt	> 30%	< 0% (compared to term)
Debt: Total Liabilities / Asset	< 50%	> 80%
Return on Equity: Net Income / Equity	> Risk Free Rate	< 0%

Higher rated companies usually present: (HANDORF, 2012)

- lower debt ratio,
- higher ROA (return on assets) and CFO (operational cash flow),
- lower earnings variability,
- collateralized
- lack of subordination

After the 2008 crisis liquidity became a critical element of financial management. Firms now are looking to increase their current ratios by increasing cash and decreasing current liabilities. Long term debt helps to avoid liquidity problems; however they are more expensive due to premium in yield curve.

The table below shows some financial ratios for selected industries at the US, but that could be applied for the main Brazilian companies that are traded in the US.

	Current Ratio	Debt Ratio (1)	Return on Equity
Auto and Truck	1,41	64,89	17,06
Homebuilding	2,18	58,14	9,81
Industrial	1,76	49,66	12,2
Telecommunications Services	0,86	53,23	13,09
Water Utilities	0,52	52,63	10,59

(1) The debt ratio in this table is calculated as the sum of all debt (current liabilities, deferred taxes, long term debt, and preferred stock) divided by total assets

Source: Value Line

The aggressive investment plan some public companies are enacted are leading to a lower current ratio as debt increases and to a higher debt ratio. These investments, especially at the generation and transmission segment, don't impact significantly the return on equity on the short and middle term, as they have long periods of construction, about 02 years on the transmission segment and 05 years on the generation segment, and uses a lot of debt on their funding. The current strategy of structuring projects through special purpose companies also impact some financial indicators as the revenues are not registered at the company just the profit that usually is low at the beginning due to the high debt.

### Other things to be considered

- Lender and rating agency attitudes: Regardless of manager's analysis of the proper leverage factors for his or her firm, the attitudes of lenders and rating agencies frequently influence financial structure decisions. Corporations often discuss their capital structures with lenders and rating agencies and give much weight to their advice. For example, Moody's and Standard & Poor recently told one large utility that its bonds would be downgraded if it issued more bonds. This influenced its decision, and its next financing was with common equity. (BRIGHAM, 2009)
- Market conditions: Conditions in the stock and bond markets undergo long and short-run changes that can have important bearing on a firm's optimal capital structure. For example, during a recent credit crunch, the junk bond market dried up and there simply was no market at a "reasonable" interest rate for any new long term bonds rated below BBB. Therefore, low-rated companies in need of capital were forced to go to the stock market or to the short term debt market, regardless of their target capital structures. When conditions eased, however, these companies sold long term bonds to get their capital structures back on target (BRIGHAM, 2009). The current low interest on the international market as well as the expectation that Brazilian currency will keep stable makes it attractive to raise loans abroad.
- Reserve borrowing capacity: the ability to borrow money at a reasonable cost when good investment opportunities arise. Firms often use less debt than specified by the MM optimal capital structure in "normal" times to ensure that they can obtain debt capital later if necessary. (BRIGHAM, 2009)

Firms whose investment opportunities outstrip operating cash flows, and which have used up their ability to issue low-risk debt, may forego good investments rather than issue risky securities to finance them. This is done in the existing stockholders' interest. (KUKETAYEV, 2012)

Firms should go to bond markets for external capital, but raise equity by retention if possible. Firms can build up financial slack by restricting dividends when investment requirements are modest. The firm should not pay a dividend if it has to recoup the cash by selling stock or some other risky security. (KUKETAYEV, 2012)

It is important to notice that the firm's management will usually prefer to use retained earnings other than debt. The advantage of using funds already within full control of management, available without delay, uncertainty, negotiation, interference, publicity, or apparent cost to the shareholder is undoubtedly of major importance to management.

Recognizing the priority given to retained earnings as a source of funds in practice, it is apparent that a potential income advantage as an incentive to borrow is operative only internally generated funds prove inadequate to meet the recognized need for funds. Then the issue lies between debt, on the one hand, and the sale of additional shares of stock, on the other. It is generally agreed that debt has a distinct advantage. With ultimate performance being judged largely in terms of market price of common stock and Earning per share, the disadvantages of financing by means of an increase in the number of shares are apparent. Within the normal range of profitability, interest rates, and price-earnings ratios, an EPS comparison will show debt to be clearly the better alternative. The use of debt relieves the current market of the direct threat of dilution due to more shares being traded.

When managers have superior information, and stock is issued to finance investment, stock price will fall, other things equal. If the firm issues safe (default-risk-free) debt to finance investment, the stock price will not fall. (KUKETAYEV, 2012)

Usually, there is asymmetric information between managers and shareholders. Managers cannot credibly convince shareholders that cash flow is too low to take advantage of all positive NPV projects. Consequently, managers may under invest when cash flow is low. Shareholders can use debt to restrict free cash flow, however, debt reduces investment in both good and bad states of the world. The Optimal debt is negative when there is a chance positive NPV projects will not be pursued, on the other hand, it is positive when there is free cash flow in excess of positive NPV projects. (CANNIZZARO, 2012)

Chapter 7:  
**Conclusion**

This paper aimed to give an overview of the evolution of investment in the Brazilian electricity sector and the most important issues related to debt as this may become a problem for the enactment of investments. The background of the industry was important to notice that investments could be either from the private or public sectors. However, in both cases, it is observed that revenue should provide the profitability and return for the capital invested in order to keep the investments in the sector sustainable. The tariff control used by the Government, observed several times in the past, discouraged private investment and worsened the financial situation of public companies, putting in check the sustainability of the growth in energy supply.

All sources of funding had an important role in the expansion of the sector: operational cash flow, debt, equity from the Treasury and sector charges. However, no source alone was enough to meet the funding required without causing undesirable results.

The gold clause, for example, attracted equity investments and increased the operational cash flow, however, it resulted in higher tariffs and even the decrease of electricity demand, which were not desired by the Government.

The equity investments from the Treasury and sector charges did attend, temporarily, the funding required by the electricity sector, and helped the Government achieve its objective of keeping low tariffs and not increasing the profits from private companies. However, the continuous increase of equity investments from the Treasury and sector charges was not sustainable.

Debt was also important. However, the high debt levels of some companies and the hard economic period, which kept companies from obtaining new loans in foreign markets, made it difficult to continue this source of funding.

Just as it happened in the 1950s, the current trend of having BNDES as the main source of funding for sector may not be sustainable in the long run or impact other industries, as on one hand investments tend to increase, while on the other hand the payback period of the loans increased significantly.

The capital market is also acting as an important alternative source for raising fund by the issue of bonds, receivables funds and equity. However, the low costs loans offered by BNDES restrict the development and a more relevant participation of loans from the private sector.

The definition of a fixed return for the investments did not work. Either the profitability was considered insufficient by investors, or the methodology, the historical costs, was considered inappropriate. Additionally, electricity tariffs were used by the Government as an instrument to control inflation, which resulted in investors not being able to obtain the effective return initially established.

Although the private sector had a relevant role for the electricity sector investment, the Government's participation proved to be vital for the supply expansion and in keeping low tariffs. The Government historically played an important role in the expansion the sector, providing funding through sector charges, the Treasury and BNDES, as well as granting tax incentives and making direct investments by the State's owned companies.

The current criticism of the private sector about the expansion of public investments, also existed after the Second World War in 1945, when most of the investments were done by public companies.

The small investors always had a small market share and have never been really relevant for the total investment in the sector. The increasing and high investments demand was not compatible with a more expressive role for small companies, since their cash flow and debt capacity was much lower.

The reforms that have occurred in the sector since the 1990s increased the market competition, and gradually created the perception of a less risky environment for new investments.

The role of the private sector is growing gradually, providing funding for the new investments as equity from local and foreign companies, and/or as debt, loans and bonds from private banks and the capital market. However, the private sector participation in generation segment is still limited, especially for the big projects, due to the profitability expected for these new investments, long pay back periods, big

environmental challenges and the short history of the current regulation and successful projects, which offsets the entry of more aggressive investors.

Public investments in the sector became relevant again after 2003, since much of the sector operational cash flow is concentrated in the public companies, which together still have a relevant market share of the generation segment. However, the companies' borrowing and investment capacity may decrease significantly after 2015, as a reduction of energy prices is expected as a result of the end of the concessions of many assets at the distribution, transmission, and generation segments.

The decision criteria for the new investments are now different from those observed in the past, when the Government was the largest single investor. State and regional policy guidance used to influence decisions for specific plants, as well as claims for regional development. In the past the environmental issue, profitability and return of the investment, was not relevant as it is today.

The current period struggle between projects makes companies to be as efficient as possible, looking for the lowest cost to ensure higher returns. The financial strategy of the projects holder is very important as it allows them to offer more aggressive bidding in the auctions to those who have a lower funding cost.

The funding became one of the most important issues for the success of a project. High debt levels may make it difficult for a company to raise new loans for its investment plan, or lead to very high interest rate, decreasing the shareholders return and the project attractiveness.

The electricity sector companies usually meet many of the factors (sales stability, asset structure with many receivables suitable as security for loans, low operating leverage and reasonable growth rate) for a capital structure with a relatively high debt level. However, the aggressive investment plan some public companies are enacted are leading to a higher debt ratio which makes it important to them follow their borrowing capacity.

Finally, it is noticed that many criticisms observed today about the active role of government and the relevant participation of sector charges at energy prices also existed in the past.

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