

# INFRASTRUCTURE REPORT

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## THE BRAZILIAN ELECTRICITY SECTOR (1993-99)

The development of the rankings in the Brazilian electricity industry for five consecutive years – the RANKINGS 1996, 1997, 1998, 1999 and 2000 published in *Cadernos de Infra-Estrutura*<sup>1</sup> – compile a significant body of data and indicators for the economic, financial and technical-operating performance of the sector for the 1993-99 period, and also includes information on productivity, efficiency and profitability.

The numbers update our picture of the sector, and more particularly enable us to track its performance during the advances of the restructuring process, as we shall see below.

### OVERVIEW OF THE ELECTRICITY SECTOR

The Real Plan led to an upturn in economic activity with a strong and immediate impact on electricity consumption in Brazil.

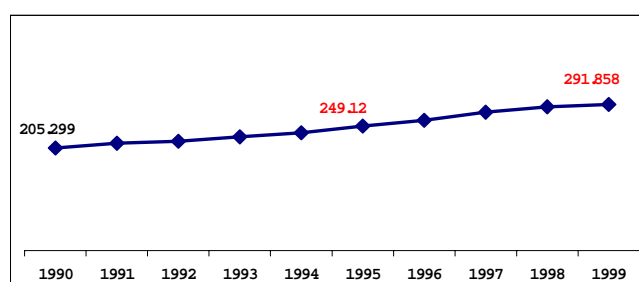
For the purposes of our analysis of the electricity market, the 90s are divided into two periods. In the first period, 1990-94, prior to the Real Plan, electricity consumption was growing faster (3.5% p.a.) than the economy (2.3% p.a.). This was in line with the historical trend in Brazil for the rate of growth of electricity consumption to outstrip economic growth rates.

In the 1995-99 period, following the introduction of the Real Plan and economic stabilization, the upsurge in consumption lasted through 1997, with growth in electricity consumption at 5.4% p.a. Higher income levels were reflected in higher household consumption (purchases of home electronics and appliances) and retailing (new shopping centers, hypermarkets).

After 1998, Brazil's economic policy was modified due to the international crises - the Asian crisis and the Russian moratorium - and this affected the rate of expansion of electricity consumption in Brazil. The rate of growth in electricity consumption fell from 6.2% in 1997, the high point for the 90s, to 4.1% in 1998. In the following year, 1999, the rate of growth of electricity consumption fell more steeply under the influence of a weaker economy, due particularly to the maxi-devaluation of the Brazilian real in January 1999. Nevertheless, by the end of 1999, electricity consumption was growing at 1.6% against 0.86% GDP growth.

Note that electricity consumption has grown over the last five years despite an accumulated increase in the average industry supply tariff of approximately 43% since the end of 1995. Higher tariff levels in the last two years have not impeded growth in consumption, including the business and residential consumers who pay the highest tariffs.

**Total Electricity Consumption  
(TWh)**



Unlike consumption, supply capacity has not kept up with demand and is well below market requirements. A look at growth rates over the last three decades brings this out very clearly. Whereas installed generating capacity expanded at an average of 11.8% p.a. in the 70s, it was down to 4.1% p.a. in

the 80s, and in the 90s it dropped to 2.9% p.a. Supply capacity and demand for electricity were out of step. In the 1995-99 period, installed generating capacity expanded at 3.4% p.a., but electricity consumption in this period rose much faster at 4.4% p.a.

In the 70s and 80s, the expansion of Brazil's electricity generation system was guaranteed by the combination of a specific electricity tax (IUEE), tariff levels that ensured the remuneration of investments, and international loans. However, as of the mid-80s, the specific tax was abolished, tariffs were held down and access to foreign funding was restricted. The result was a steady decline in the ability to invest of companies in the sector, which until then were practically all state-owned.

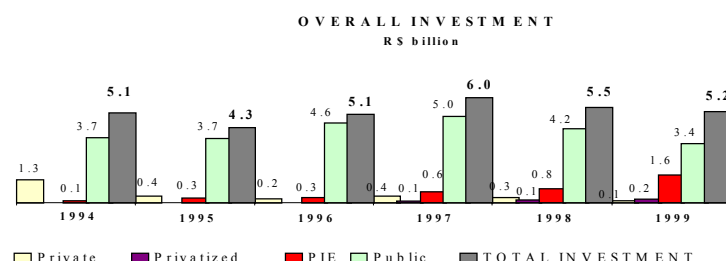
The public sector was no longer able to invest in the much-needed expansion of infrastructure and this led government to promote a far-reaching restructuring of the electricity sector. The industry was opened up to private capital, with concessions awarded for generation, transmission and distribution of electricity, practically all of which had been restricted to state-owned companies.

Until 1995, there was very little private capital in the electricity generation and distribution segments. Private companies accounted for 2.7% of installed generation capacity and 2.4% of electricity distribution. It was only after July 1995, with the ESCELSA distributor privatization, that this picture began to change. This period saw the beginning of the first structural reforms in the functioning and financing of the sector.

The transition from state-owned to mixed state-private operation – in a sector of the magnitude and characteristics of the Brazilian electricity sector – obviously led to delays in investment decisions by new players, who awaited a stable<sup>2</sup> regulatory situation to assess investment opportunities. During this initial phase, most investments in the electricity sector were still made with government money, despite the decline in the last three-year period (1997-99).

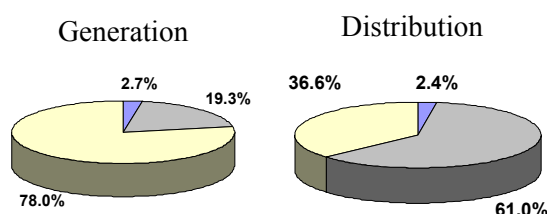
Privatization of distributors started in 1995 and began to provide some incentive for independent power producers (IPPs) to respond to Aneel's invitations to tender for generation projects. In addition, higher supply tariffs were the key factor in attracting generation investments, including non-utility generation and independent energy generation. In the 1995-99 period, average supply tariffs increased 51%.

On this basis, the share of private capital in total investment in the electricity sector jumped from 6% (R\$ 0.7 billion, 1995) to 35% (R\$ 1.9 billion, 1999).



Sources: ANEEL (Investments by Concession Holders) and BNDES (own data - PIE).

Currently, the share of private capital in the generation segment is 22% of Brazil's installed capacity, whereas in the distribution segment it has a 63% share of energy consumption.



## SECTOR INDICATORS

After seven years of restructuring the operating model for the electricity sector<sup>3</sup>, enough data has been accumulated to evaluate the sector's performance using several indicators. Using this data, we took a

representative sample of companies accounting for around 92% of the Brazilian electricity market. The sample consists of publicly listed companies and members of the Eletrobrás group.

The indicators selected were segmented as follows:

*(i) Economic-Financial*

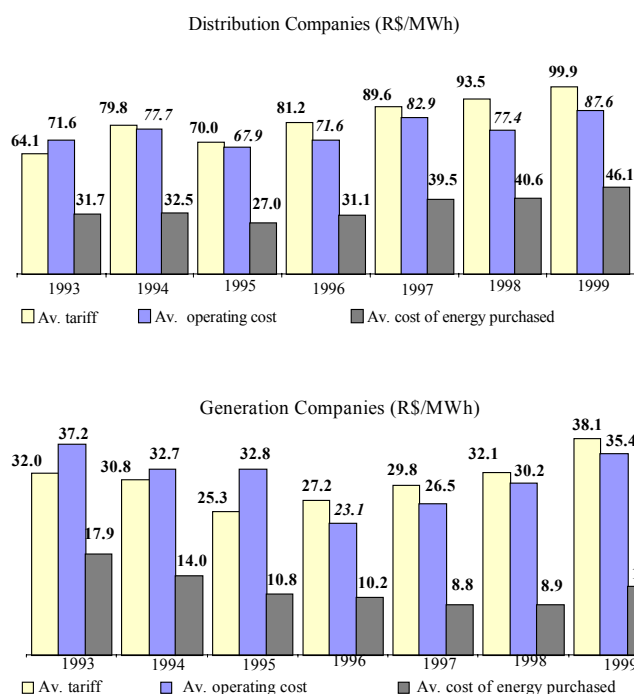
- . Operating Result
- . Return from Economic Activity
- . Net Profit

*(ii) Technical-Operating*

- . Energy losses
- . Duration of Energy Interruption per Consumer - DEC
- . Frequency of Energy Interruption per Consumer - FEC
- . Productivity

### Economic-Financial Indicators

Operating Results for the sample companies over the period 1993-99 are shown in the charts below.



The principal factors affecting the operating results of concession holders were:

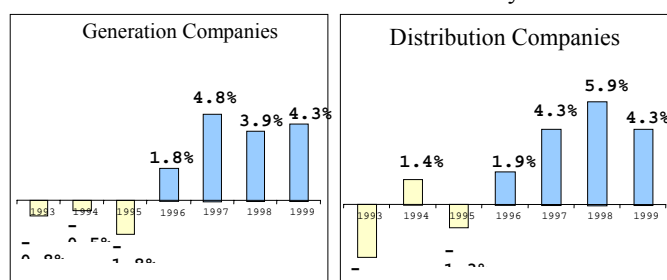
*1996-97:* tariffs recovered and high growth in the market contributed to operating results becoming positive.

*1998:* recently privatized companies adopted a cost-reduction program focused on two components: (i) Cost of purchase of energy: reduction of losses and (ii) Staff costs: Staff downsizing program - Voluntary severance /Outsourcing.

*1999:* the maxi-devaluation had negative impact on the cost of energy purchased by concession holders acquiring energy from Itaipu (tariff is set in U.S. dollar terms).

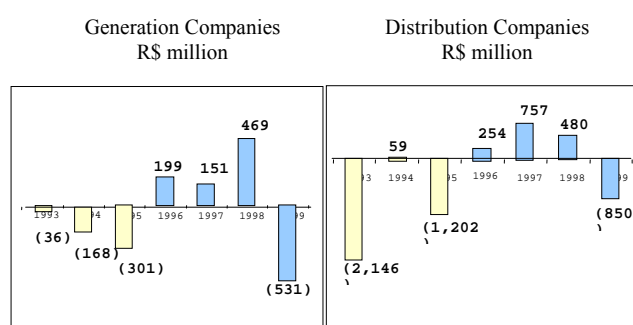
Return on assets, both for generators and distributors, tended to increase in the 1993-98 period as a consequence of the factors we analyzed under "Operating Result". However, Return on Economic Activity dipped in 1999 due to the January maxi-devaluation, which raised the cost of energy purchased from Itaipu.

### Return on Economic Activity



In addition to the points highlighted above, in relation to operating result, we also emphasize that the January 1999 devaluation caused a negative effect on concession holders' financial results, particularly privatized companies with foreign currency liabilities arising from the major role of foreign investors in the privatization process.

### Net Profit



### Technical- Operating Indicators

| <b>TECHNICAL-OPERATING INDICATORS (DISTRIBUTORS)</b> | <b>1995</b> | <b>1999</b> | <b>Δ (%)</b> |
|--|-------------|-------------|--------------|
| <b>Efficiency Indicator</b>                          |             |             |              |
| Energy Losses (%)                                    | 13.6%       | 12.4%       | -9           |
| <b>Quality Indicator (supply interruptions)</b>      |             |             |              |
| DEC (Number of hours)                                | 27.41       | 18.36       | -33          |
| FEC (frequency)                                      | 27.68       | 17.64       | -36          |
| <b>Productivity Indicator</b>                        |             |             |              |
| MWh sold per employee                                | 1,572       | 3,705       | 136          |
| Consumers per employee                               | 283         | 607         | 114          |

The substantial reduction in investment in this sector in the past, due to postponement or suspension of work on expansion and maintenance of transmission and distribution (technical losses), and meter installation (sales losses), resulted in deteriorating service efficiency standards. However, higher investments with privatization meant that average energy losses in the sector began decreasing as of 1996.

In relation to the quality of services provided by concession holders to end consumers, note that the beginning of privatization brought a gradual recovery in standards as measured by the indicators DEC and FEC<sup>4</sup>. The investments made on privatization in transmission and distribution impacted positively by reducing interruptions caused by overloading, transformers overheating, etc.

Productivity indicators also improved. Higher demand and organizational restructuring of companies led to more efficiency in terms of "MWh sold per employee" and "Consumers served per employee".

### CONCLUSION

Privatization in the electricity sector began with the sale of concession in distribution. This was done partly to reduce the perceived risk of financial breach of contract by these companies, but also because – in

the initial phase of privatization – purchasing generation companies would have been an unacceptable risk for private investors, as much of the regulatory framework was not ready.

Currently, most distribution companies (around 63%) are now owned by the private sector, except for two major distribution concession areas - COPEL and CEMIG.

Privatization of generation companies, begun in 1998, moved slowly in the absence of regulation for the use of water resources under the responsibility of the recently created National Water Agency (ANA).

Investments in new plants, although crucial, is not keeping up with growth in demand. Hydroelectric dams planned for the 90s have either failed to materialize or are behind schedule.

In fact, the new business model for the electricity sector, while seeking to encourage more new investment by widening the range of alternative sources of funds for private capital, introduced a certain degree of uncertainty in the implementation of works scheduled under the Ten-Year Plan, since private investors will only put up the funds for projects that have definite parameters for profitability and risk.

Ultimately, although clear progress has been made in solving major institutional issues, for the decision to invest to take place in the time and in the amounts required to match market demand, investors must assimilate a number of crucial points, in particular the functioning of free market mechanisms (wholesale energy market). Furthermore, investors have to assimilate the effects of the January 1999 devaluation. Another target of constant criticisms from investors is the price of energy – the Normative Value (VN) set by the regulatory agency ANEEL – which investors do not believe that it reflects the real marginal cost of energy in Brazil.

Note that in the hydroelectric projects that ANEEL has managed to successfully sell via a tender offer process, investors cited non-utility generation as their principal motivation, due to the greater sense of protection from market risk.

Not only is investment in new generation capacity growing slower than growth in demand, but the projects underway are major hydroelectric dams such as Itá, Machadinho, and Lajeado. These projects have long-term construction schedules and will therefore have no immediate impact on the problem of supplying sufficient energy to meet demand.

Thermal electric plants could more rapidly meet the needs of growing demand, however, there are a number of obstacles: the mismatch between price increases (in relation to intervals and structure) for gas (priced in dollar terms) and the industrial supply tariff (depends on Normative Value regulation); the currency risk associated with foreign loans; the complex procedure involved in incorporating a Specific Purpose Company (SPE) and developing Project Finance; the shortage of turbine supplies; a tax regime that is incompatible with de-verticalization of the supply chain in the sector; the delays caused by requirements regarding environmental licenses; difficulties involved in signing long-term sale of energy agreements (PPA<sup>5</sup>) in a new environment of consumer freedom; and uncertainties in relation to future electricity prices.

In the distribution segment - with the recovery in tariff values, expanding demand and diluted costs over the last few years - there has been extra cash flow generation that was used to expand or modernize the distribution system. These new investments generated substantial improvements in technical-operating indicators, especially in relation to efficiency (lower energy losses) and quality of consumer service (reduction of frequency and duration of energy supply interruptions), even before ANEEL set quality targets for licensed distributors.

In any event, the implementation of the Emergency Plan will mean the construction of 10 thermal electric plants providing 1,700 MW, plus a further 1,600 MW from hydroelectric plants in 2001. Together with signs of higher water levels in dams, this should ensure sufficient extra energy to meet the immediate growth in demand. These extra supplies will buy some time to deal with the obstacles which, in the view of the agents involved, are holding back the investments needed to restore equilibrium between supply and demand in line with the targets set by the Ten-year Plan for Expansion of the Electricity Sector.

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1 *Cadernos de Infra-Estrutura* [Infrastructure Reviews] is published by the Infrastructure Projects Division - AI/GESET 1.

2 It was the end of 1998 before ANEEL (the Brazilian Electricity Regulatory Agency) announced tariff rules for the basic and distribution networks - the crucial variables in determining sale prices for independent producers.

<sup>3</sup> In 1993, Law No. 8,631 and Decree No. 774 introduced tariff disequalization and new rules for energy sales between concession holders; it also ended guaranteed remuneration and enabled intra-sector debts to be settled through the squaring of accounts.

<sup>4</sup> DEC - Duration of Interruption of Energy per Consumer- measures average time without energy supply per consumer per year.

FEC - Frequency of Interruption of Energy per Consumer - measures average number of interruptions in energy supply per consumer per year.

5 PPA: Power Purchase Agreement.