Brazilian Energy Policy: Changing Course?

João Lizardo Rodrigues Hermes de Araújo[†]
Adilson de Oliveira[†]

1. Introduction

This paper compares the Brazilian Energy Policy in the last decade with that followed after the Second World War. We contend that the energy policies followed since the fifties showed certain continuity and allowed the energy sector to respond with remarkable efficiency to the challenges posed by the Brazilian economy for over a quarter of century, at least until the middle seventies. We assume that, from the eighties onwards, the energy policies till then adopted lost their effectiveness. As a consequence, several impasses appeared which led administrations during the nineties to adopt radical changes in the organisation of energy industries, which were aimed at creating conditions for a profound reorientation of energy policy. The results obtained by the new course have been far inferior to those reached in the previous phase. This paper purports to identify the main explanatory factors of this outcome.

The work is structured in two sections. The first section analyses the energy policy in the period from 1945 to 1990. In it we show that energy policy was centred on developing the supply infrastructure for oil products and electricity, aiming at fast growth of population access and geographical coverage of energy supply. This development was defined and implemented by state enterprises, which used state guarantees to leverage third party resources, supplemented by significant amounts of fiscal and quasi-fiscal resources as well as by fiscal renunciation.

The second section analyses the profound inflection in energy policy that took place in the nineties. Infrastructure development was left to market forces, and the space of state enterprises in formulating and implementing energy policy was drastically reduced. Fiscal and quasi-fiscal resources for the energy sector were eliminated, and the Treasure became a voracious demander of taxes from energy firms. These have been forced to find other sources of funds, which have to be private given the straits of public finance. Alongside with this, both the fossil fuel and the power sectors underwent a profound restructuring and ceased to be operated by monopolies. The government further signalled the will to promote the use of natural gas, until then a source playing a very minor role in the Brazilian energy balance. The outcomes were different in the hydrocarbons and the electricity industry, partly because of distinct treatments of Petrobrás and Eletrobrás by the new policies, and partly for specific factors of each industry.

The paper ends with an analysis of prospects for the energy industries as the result of policy change as existing in October 2003, and in consequence does not discuss the new model for the power sector in detail.

[†] Instituto de Economia da UFRJ

2. Oil and power, the national dream (1945-1990)[1]

2.1 Post-War years and the Second Vargas Government

The period 1920-1950 contained profound changes in the Brazilian economy. The crisis of the coffee-exporting economy accelerated the national division of labour and led to the setting up of an industrial sector in the Country. The incipient industrial techno-productive base remained dependent on imports of intermediate and capital goods. Even thus restricted, the rise of new industries had significantly transformed the structure of Brazilian energy consumption, especially after the Second World War. From 1944 to 1955 the consumption of coal, oil products and hydropower, grew at an average rate of 14% a.a. (Oliveira & Melo, 1985), provoking ever stronger pressures on the precarious energy supply apparatus of the country. The twin lags in "transport and energy" threatened industrial expansion, and overcoming these "stranglehold points" became the major preoccupation of the second Vargas administration.

The problem was that Brazilian industrial development had to make a direct transition from fuel wood to oil and electricity; and the construction of a modern energy system was hampered by the inability of private domestic capital to mobilise the amount of financial resources necessary to enterprises with long maturation lags and high risk as in the energy sector. Only international capital or the State could promote those investments.

Since 1930, there was awareness in the Country of the need to create mechanisms to centralise financial and technical resources that would allow large investments in the steel industry and in oil refining. Centralisation of power by Vargas had created a collection of public agencies (Department of Public Service Administration, Federal Council for Foreign Trade, National Oil Council, National Council for Waters and Energy) aimed at planning Brazilian industrial development.

The ongoing industrialisation process had generated an intense debate between nationalists and privatists since the thirties, which became heightened after the war. Economic nationalism had gained a new dimension and support in the society; the proposal of defence and national control of natural resources, as well as the view that industrialisation would only be feasible through state support with direct investments in transport, mining, energy and basic industries, increasingly grew in favour. The alliance between military and technical cadres in the thirties had created the bases for a policy both state-led and nationalistic (Martins, L., 1976, chapter V). The thesis of national control over natural resources was reinforced by the feeling that the Country was vulnerable in fuels and lubricants supply[2]. The intense debate over the possibilities for developing a national oil industry, and the conviction that the international oil cartel had no interest in promoting these investments, turned the campaign "O Petróleo é Nosso" ("The Oil is Ours") into a significant episode in the Brazilian history[3].

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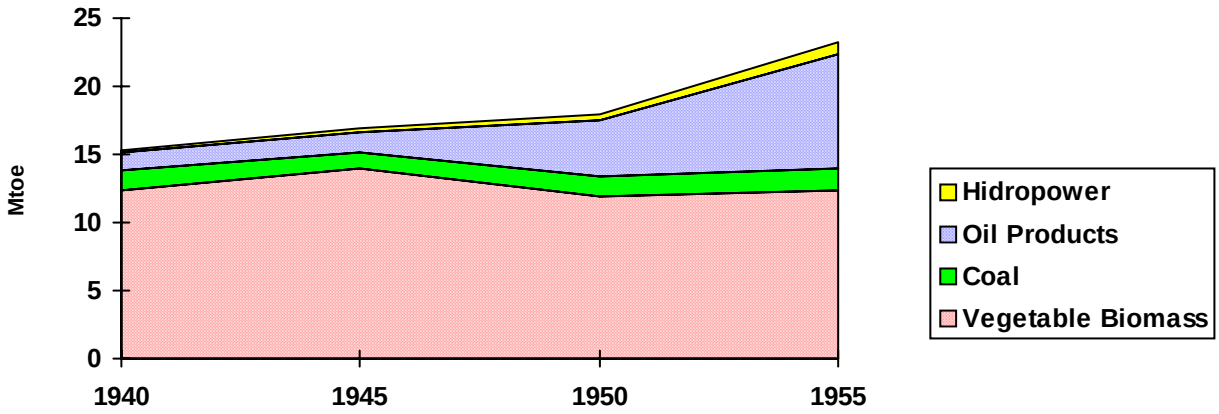
[1] This section is based on Melo, Araújo e Oliveira (1994).

[2] "General Horta Barbosa, then Director of Engineering of the Army and an important representative of military opinion on the issue, wrote secret memoranda addressed to the minister, describing the delicate situation of the armed forces in face of dependence on foreign supply of fuels" (Dias/Quaglino, 1993, page 81).

[3] The 1950 election of Getúlio Vargas apparently meant a nationalistic turn, in a scenario that favoured the purposes of the oil campaign. The Vargas victory displaced the politico-military conservative forces to the opposition, but did not ensure the support of left-leaning forces in the oil issue. The campaign had arrived at the Congress and would face strong resistance until the creation of Petrobrás in 1953.

After the war, the debate on how to organise the Brazilian oil industry was intense and passionate. At the time, oil multinational firms had at their disposal huge reserves in the Middle East and showed little inclination to invest in sedimentary basins with low potential for oil, in the light of the technological knowledge of the time. The state-led solution to build the national oil industry was forged in those years, under the premise that only the State could furnish an abundant supply of low-priced energy, which was essential for modernising the Country. The oil industry and electricity from hydropower would supply the consumption structure induced by the twin processes of urbanisation and industrialisation (Figure 1). Monopoly then emerged as a rational solution to optimise scarce resources, allowing economies of scale in an infant market.

Figure 1
Evolution of Apparent Energy Consumption



Source: data from Martin, J.-M. (1965), p. 348

The year 1954 marked a turning point in Brazilian political history. The Vargas suicide represented the defeat of a governmental project for autonomous national development. The failure of the visionary nationalistic project had nevertheless some of its utopian goals fully achieved by the creation of the energy enterprises Petrobrás and Eletrobrás.

Actually, the vigorous dynamism of the Brazilian economy placed growing demands for State action to overcome bottlenecks due to deficiencies in the Country's economic infrastructure. As far as the government was concerned, State intervention was limited to refitting the infrastructure for transport and energy.

Nevertheless, the usual, more or less consecrated interpretation of many historians is that the second Vargas Administration had a strategy for economic development based on an alternative model of Brazilian capitalism. Another interpretation places this administration in an ambiguous light, stressing the diverse and conflicting strategies that economic policy followed in the period. Skidmore (1975, 127/128), the first one to raise this aspect, stated "The Vargas Government tried to soften the effect of its 'orthodox' economic measures, simultaneously pursuing a strategy of economic nationalism. This task Vargas embraced with enthusiasm". This conflict remained along the whole period of his administration and ended with his suicide. "Authentic or not, the letter-testament was immediately accepted as such by the people. The indecision of Getúlio between a nationalistic and an orthodox policy had ended. His suicide letter was the most vigorous nationalistic call he had ever made" (Skidmore, T., 1975, 180). The Vargas nationalism never threatened the participation of foreign capital in the national economy: "We do not oppose, was it is

usually insinuated, the coming of foreign capitals to Brazil. On the contrary, we desire them to come." (Vargas, G. 1951, 303) He understood that the State should preserve sovereignty in sectors considered as strategic: "We oppose indeed the cession of our natural resources, of our reserves to control by foreign companies, generally at the service of cosmopolitan capital (…) what constitutes the foundation of our sovereignty, cannot be delivered to alien interests;" (Vargas, G., 1951, 303).

The main arguments favouring the view that the second Vargas Administration sought an autonomous national development were the projects to create Petrobrás and Eletrobrás. These two enterprises, and his symbolic death with a shot in the heart on August 24, 1954, have fixed in the national imagination the Vargas figure as a paladin of Brazilian development.

Along their trajectories, Petrobrás and Eletrobrás have organised the national energy market and show a positive historical net result for Brazilian society. The first created an important technical and managerial structure able to operate globally, and gave the Nation the technological capability to extract oil from deep offshore waters, allowing the discovery of vast reserves in a country considered with scarce oil potential. The second one structured two interconnected systems that allowed the rational development of Brazilian hydroelectric potential, and organised the upstream market so as to induce the emergence of a collection of large national engineering firms, which could compete internationally.

2.2 PETROBRÁS

2.2.1 Antecedents

The first document mentioning Brazilian oil dates from 1864, when the Englishman Thomas Denny Sargent obtained permission from the Imperial Government to exploit peat, petroleum and other minerals in the grounds of Camamu and Ilhéus in Bahia (Dias/Quaglino, 1993). However, the incipient stage of industrial development kept oil industry from developing in the Country. Consumption of oil products was restricted to kerosene until the early XXth century, and effective diversification and growth took place only after the First World War[4]. The war called the attention of politicians and military to the supply hazards of imported oil products (Oliveira, A., 1977,13). National private capitals showed some interest in the industry, but they had neither financial nor technological capability to face the demands of oil industry. Some private investors drilled anyhow some wells in partnership with the State, through the Geological and Mineralogical Service of Brazil; the wells were not deep, seldom reaching 500 metres, with null results. International capital showed some interest and the 1921 Message of President Epitácio Pessoa stated, "Concerning oil exploration, proposals and solicitations by foreign firms and capitalists have lately arrived" (Wilbert/Britto, 1974). Such "interest" did not materialize during the twenties in any venture of international capital to explore Brazilian oil. The apparent paradox is explained by the overproduction in the international oil market in that decade (Grenon, M., 1974, 108). The large oil firms that controlled world production had no interest in developing new producing areas, which would increase supply and reduce prices; thence the "interest" in the Brazilian sedimentary basin.

The 1929 crisis and the 1930 Revolution had a relevant impact on Brazilian industrialisation and therefore on the oil issue. The 1929 crisis had deteriorated the purchasing power of Brazilian exports; Tavares (1972) evaluated the reduction in 50%. In such conditions, redirecting imports became imperative to keep industrial stock in operation and to go ahead with industrialisation. Oil

[4] Only around the turn of the century gasoline acquired value with the diffusion of internal combustion motors, and fuel oil started to replace coal.

was already an important item of industrial imports and its consumption would increase in consequence of the industrialisation process (Table 1).

A new element in the Brazilian economic universe was the increase of the political power of Central Government. Contrasting with the earlier period, where that power was fragmented by policies of state governors, the Union's political importance translated into a growing participation of the State in the productive process.

Table 1
Import of Oil and Oil Products

	1934	1936	1938	1940
Thousand tonnes	846,3	990,3	1.179,2	1.256,5
Worth (M Cr$)	213,4	336,0	436,2	506,4
Average worth (Cr$/tonne)	256,6	339,3	344,5	403,0

Source: **Dez Anos de Atividade do Conselho Federal do Comércio Exterior** - Imprensa Nacional - Rio de Janeiro, 1944, page 76

In energy and mineral industries several initiatives were born, as well as an ample discussion on how to organise the sector. From the Service to Promote Mineral Production (SFPM) until the creation of the National Oil Council (CNP) in 1938, there was a lively and broad debate going from Brazilian geological prospects to the refining of imported oil. Once created, the CNP exerted a strict control over the whole oil industry (Martin, J.M., 1966, 226). This organism had the power to define the price of oil products, delimit concessions for exploration and stop refining from being done by foreign firms, thus hurting the interests of oil companies. Since then, national private capital has always played a marginal role in the Brazilian oil industry.

By 1949, the oil issue was perceived in the Country as a national issue. In that year, Standard Oil sent the Government a confidential document proposing participation in all phases of the industry, conditioned to changes in legislation. General Horta Barbosa, President of the National Oil Council, who defended a nationalistic position, rejected the proposal. Since the policy for the sector was still undefined, the fall of Vargas and the election of General Dutra as President of the Republic made it possible to intervene in CNP; partisans of the liberal tendency took over the Council. Legislation was changed, allowing that societies organised in the Country to exploit mineral resources, including oil (1946 Constitution). The insertion of this paragraph in the Constitution was qualified by the Former President of the Republic, Arthur Bernardes, as a Standard Oil-led manoeuvre to be able to operate in oil exploration, which was till then reserved for national firms (Oliveira, A., 1977, 24).

After the war, national private capital showed a more definite strategy of association with international capital, and lobbied to obtain participation of the international capital in the sector. The end of the Second World War had consolidated the absolute American hegemony. In face of the new world reality, national investors sought an alliance with the oil cartel to develop Brazilian oil industry.

The strategic character of the oil issue provoked the military to take positions. General Horta Barbosa, who led the nationalistic tendency, affirmed that the history of other oil countries, such as Venezuela, showed that only the international capital profits in countries where it exploits oil. General Juarez Távora, favourable to the participation of international capital in the sector, said that

Brazilian interests converged with American ones to defend the "civilised world" (Martins, L, 1976, 434).

The Dutra Administration sent the National Congress in 1948 a bill to regulate the activities of the oil industry: the "Oil Statute", which partly agreed with the theses of General Juarez Távora in permitting participation of international capital in the sector. The Oil Statute defined a concession regime for the initial duration of 30 years; in exploration and production foreign companies did not have to associate with domestic firms, but in transport and refining their participation was limited to 40%. Export of crude oil and oil products was also controlled, in order to ensure domestic supply; "… the Oil Statute was not a liberal manifesto. It tried to work a compromise and ended by displeasing both sides" (Dias/Quaglino, 1993, 95).

The debate over the industry's future gained the streets. Military, technicians, students and journalists who led the nationalistic tendency qualified the Oil Statute as "entreguista" ("surrenderistic"). The nationalists' motto was "O PETRÓLEO É NOSSO" (the oil is ours), a slogan coined by the student's movement and adopted by the people. Manifestations multiplied all over Brazil, while the Oil Statute remained in Congress. Foreign companies also boycotted the bill because they mistrusted CNP interference in regulating the sector, and mostly feared to lose control of the domestic market of refining and transport.

Such a participation of the people in a debate strictly concerning economic policy was a singular event in Brazilian history. The popular movement grew and spread all over Brazil. In 1949 the Centre of Studies and Defence of Oil and the National Economy (CEDPEN) was created, with broader goals than just the defence of domestic oil. In the 1950 elections CEDPEN members were elected in several states and the debate reached Congress. In the Military Club, likewise, the nationalistic ticket had been elected; this was headed General Newton Estillac Leal, future War Minister of Vargas, with General Horta Barbosa as his vice.

The presidential 1950 elections returned Vargas to power; it became necessary to find a solution for the oil issue and resolve the impasse. The "oil is ours" campaign remained in the streets, while police persecuted their members under the pretext that communists participated in the campaign. The Ministry of Justice tried (mid-1951) to suspend CEDPEN activities in Rio de Janeiro, dissolving a conference with gunshots; the persecution was repeated in the states, and in Minas Gerais Governor Juscelino Kubitscheck closed the local centre. Finally, in December 1951 Vargas took back the "Oil Statute" bill from the National Congress and substituted another one.

In the new bill, the Presidency's economic advisors had been very cautious over the monopoly issue, reflecting both the divide in society and the weight of conservatives. In the message accompanying the creation of the incorporated company "Petrobrás", Petróleo Brasileiro S.A., Vargas called the attention of congressmen to the Balance of Payments issue: "in 1939, oil imports represented 7% of our total foreign purchases; in 1946 they represented 7,6% and in 1950 11,5%. In the present year, this share will exceed 13%." The bill did not propose the monopoly, which was the issue mobilising popular movements, and just proposed state property of 51% of the company's stock.

CEDPEN reacted violently condemning the "bill's ambiguity", and Congressman Euzébio Rocha (PTB/SP), in January 1952, introduced a substitute bill that altered the company's ownership structure, establishing full ownership for the Union, States and Municipalities and destined 51% of the stock for the Union. This substitute bill, with the Presidency's economic advisors' bill, after lengthy debates and numerous amendments were negotiated by the Vargas government, who accepted the principle of state monopoly and excluded private refineries and distribution of oil products (controlled by foreign firms) from the bill. In the negotiation led by Minister Gustavo

Capanema, nationalist forces demanded that the capacity of foreign refineries could not be increased[5]. This agreement allowed going ahead with the bill; after disagreements in the Senate, where the weight of conservatives hampered the state-led solution, the bill was finally approved on September 21, 1953, and sanctioned by the President of the Republic on October 3, 1953.

The law n. 2004 instituted the monopoly of exploration, extraction, refining and transport of crude oil. Petrobrás would be the instrument to execute Union monopoly, and CNP would direct, monitor and control the national policy for oil and oil products. There were some attempts to revert the situation; but the violent political crisis, which ended with the Vargas suicide and the nationalist libel of the letter-testament, provoked a popular mobilisation that turned the Petrobrás project an irreversible reality. Congressmen close to President Café Filho proposed the National Congress the suppression of the company, but in view of popular support for the company the bill was filed away (Oliveira, A., 1977, 32).

2.2.2 40 Years of PETROBRÁS

By the law creating Petrobrás, it inherited the economic and technical patrimony created by CNP:

- The National Tanker Fleet (22 ships with 230.000 tonnes capacity);
- The Madre de Deus oil terminal in Bahia;
- The Mataripe Refinery in Bahia (5.000 bpd);
- The Cubatão Refinery under construction in the state of São Paulo (45.000 bpd).

This patrimony was insignificant in face of the Country's needs; in that moment, consumption was roughly 160.000 bpd, supplied through imports (Petrobrás, 1993). Observe that existing refineries plus those under construction could barely supply 30% of oil products to be consumed by the Country in 1955. The national tanker fleet could transport only 20% of products to be demanded in 1955. And domestic production corresponded to 2,5% of the consumption in 1953 (Penna Marinho, 1969,79).

Over the 1955/1965 period Petrobrás made a great prospecting effort and drilled 1.907 wells, of which 773 were exploration and 1.134 producing wells (Oliveira, A., 1977, 37). This work was successful: in 1955 Brazil produced 321.500 cubic metres (around 3% of consumption); by 1965 domestic production reached 5.46 million cubic metres (27,4%). In refining the effort was not lesser. Aiming for self-sufficiency in oil products, Petrobrás launched an ambitious project. It expanded the small Mataripe refinery (BA) from 5000 bpd to 42.000 bpd in 1959; it also built the Presidente Bernardes refinery (SP) (1955) with 45.000 bpd expanding it in 1961 to 110.000 bpd; and built the Duque de Caxias refinery (RJ) with 90.000 bpd in 1961. Sufficiency in oil products was reached in 1963; but in LPG Petrobrás supplied 57% of domestic consumption and only 3% of lubricant oils (Oliveira, A., 1977, 40/41).

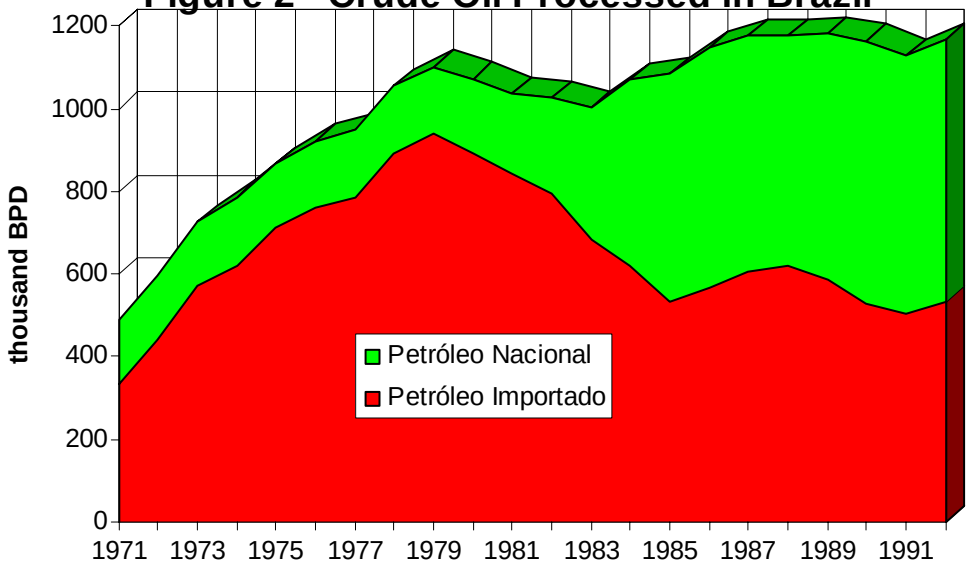
As to transport, new ships were bought in 1955, 1957 and 1959. However, this activity only became significant in December 1963, when Petrobrás was granted the monopoly of crude imports. This measure enabled obtaining a better purchasing price for imported oil, reducing expenses in foreign currency and permitting later intergovernmental trade agreements as well as exchange of Brazilian goods for oil. Since 1961 Petrobrás had been authorised by CNP to distribute oil products to final consumers. To encompass all these activities was extremely important for the firm, since "in

[5] Private firms had a processing capacity of 36.300 bpd: Refineries Capuava (20.000 bpd), Manguinhos (10.000 bpd), Ipiranga (5.000 bpd), Matarazzo (900 bpd) and Rio Grandense (400 bpd). A refinery was under construction in Manaus, with expected capacity 5.000 bpd.

truth, the oil industry has no real meaning, no matter where in the globe, but when it takes on the condition of an integral [integrated] industry" (Penna Marinho, I., 1969, 466). Even though it had to share domestic distribution with the firms of the oil cartel, this decision allowed Petrobrás to fully integrate its activities and also minimise an aberrant situation, "distribution, with demand growth rising, was an operation practically without risk" (Penna Marinho, I., 1969, 381). The Brazilian State kept the riskier phases in the productive chain: exploration, production, refining and transport; the international cartel controlled upstream and downstream operations, that is: the supply of crude oil and its final valuation in the domestic market.

The 1973 oil price shock faced Petrobrás with the challenge of increasing domestic oil and natural gas production to reduce the impacts of oil imports on the trade balance. Reorienting investments toward exploration led to the 1974 discovery of oil in the Campos Basin, on the coast of Rio de Janeiro State, the largest oil province in the Country. The development of oil production in the continental platform was a gigantic effort by Petrobrás, and which consolidated the company in the world scene. With the new discoveries and developments, especially in the Campos Basin, national production arrived in 1992 at 734 thousand of oil equivalent/day[6], operating 375 fields in onshore and offshore basins (Petrobrás, 1993, 30/31). Offshore basins answered then for 70% of domestic production. National dependence of imported oil was thus drastically reduced in 40%, with prospects of reaching self-sufficiency (Figure 2).

Figure 2 - Crude Oil Processed in Brazil



Source: Petrobrás/DEPIN, 1993

It is important to note that over these 40 years of activity Petrobrás became an enterprise with size and technological level comparable with oil multinational firms. Petrobrás and the monopoly were particularly relevant during the oil crisis, permitting the restructuring of the Brazilian fuels market and thus cushioning the Brazilian economy from impacts of fluctuations and uncertainties in the international oil market. The Brazilian oil industry is now mature. The national market for oil products is no longer negligible, with more than 2% of the world market; more important, our market should go on growing while that of developed countries stagnates. The strategy followed has permitted Brazil, with a handful of other countries, to control all three links of the oil productive chain: reserves, techno-managerial structure and market.

[6] With 630 thousand barrels of oil and 19,1 million cubic metres of natural gas per day.

The oil sector strongly influences the economy, both for its high levels of chaining in the productive chain and for its impacts on the Balance of Payments and Public Accounts. The investment policy and oil product prices were powerful tools used by the Brazilian government to propel national development.

2.3 ELETROBRÁS

2.3.1 Antecedents

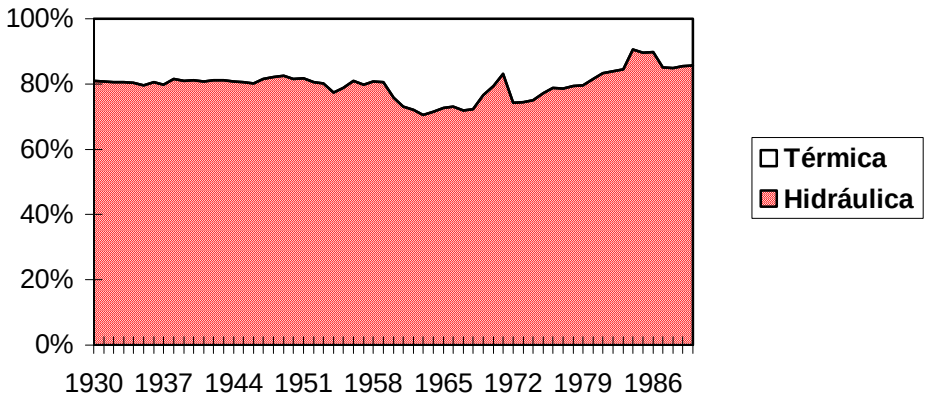
In contrast with the oil sector, in which the State intervened from its effective inception, electricity was initially developed by private capitals. Until the thirties, two groups dominated the growing electricity market. One was the American-Canadian group Light, which dominated power supply in the Southeast. The second one was the American Foreign Power Company (AMFORP), responsible for supplying electricity to smaller towns in the states of São Paulo and Rio de Janeiro, besides other centres such as Porto Alegre, Pelotas, Curitiba, Salvador, Natal and Vitória. Besides these large groups, many public and private enterprises supplied power in a small scale to poorer regions. The international capital controlled till the seventies distribution in the two largest Brazilian towns (São Paulo and Rio de Janeiro), and thus in the Country's industrial hub. As to production, even in 1950 more than 81% of installed capacity was in the present Southeast region and was owned by the international private capital (Araújo, Hildete, 1979, 27).

During the Vargas administration the State broke into power generation side by side with large foreign companies, which supplied the Country's wealthiest region. Since the end of the XIXth century Brazil utilised hydropower, which answered for the greatest part of power generation in the Country (Figure 3). The significant hydropower potential close to the main consuming region led the first Vargas administration to edit legislation (the Code of Waters) [7] in 1934 and create a regulatory agency (National Council for Waters and Power) in 1939 to direct the exploitation of these resources. The coexistence of the State and of foreign companies jointly acting in the sector imprinted a dual character to the electricity supply industry, both in technical-financial and in political aspects. In the historical evolution process of the Brazilian power sector a division of labour was established, which legated to the Federal Government the generation and transmission activities, more demanding in investments and with longer maturation lags, and modified sector ownership structure (Figure 4). Distribution, initially under charge of foreign companies, was progressively transferred to state governments.

After the war, the evolution of the electricity supply industry resulted from the superposition, upon the foreign companies installed in the Country, of a nascent public sector that no longer was constituted of small municipal utilities, but rather of large state and federal enterprises formed to develop big hydropower projects. The perspective of collapse haunted the power sector when Vargas took his constitutional term in 1951. The prognosis was that around 1959/1960 the Country would face a grave electricity supply crisis with imprevisible consequences, if the big hydropower projects and interconnections between concession areas were not carried out. On returning to power, the Vargas administration had in this question a priority issue.

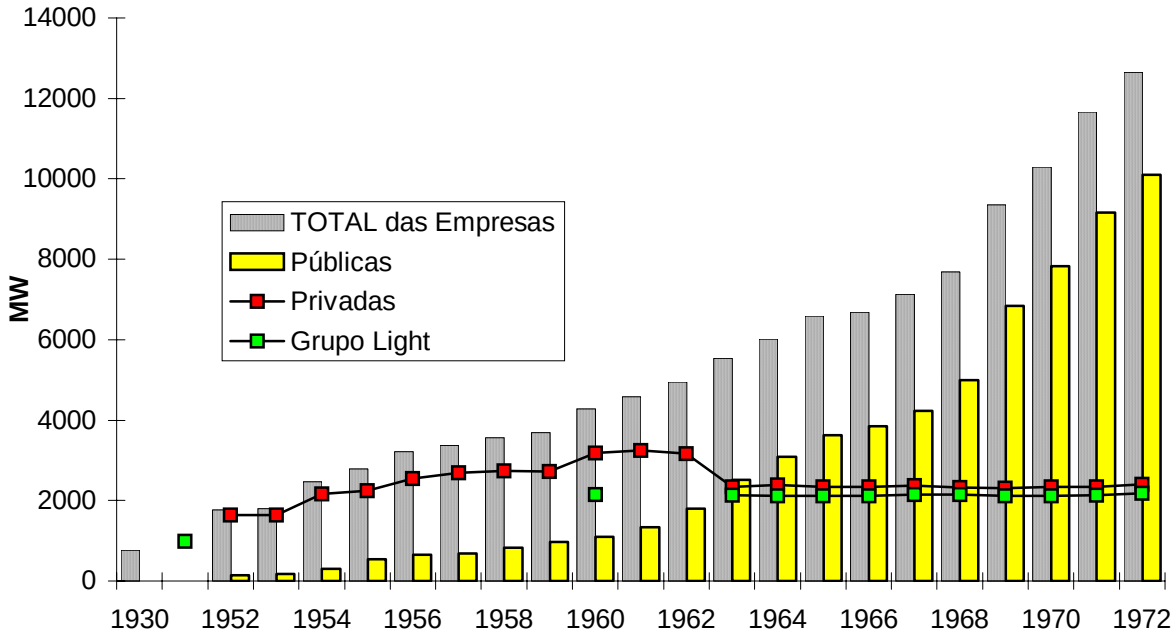
[7] Until the nineties the Code of Waters was the basis for all regulation in the sector. It defined tariffs by the cost of service, remunerating investment at a "fair" rate on the historic worth of assets (accountable cost). It stipulated public ownership of hydro resources and restricted their economic exploitation to Brazilian citizens, under concession by the federal government.

Figure 3: Installed Capacity Shares, by Source



Source: till 1986, Memória da Eletricidade (1988); from 1987 to 1990, SIEE/OLADE (1993)

Figure 4: Ownership Evolution of Power Firms in Brazil



Source: till 1962, Memória da Eletricidade (1988); from 1963 to 1972, Araújo, H. (1979 e 1986)

Until then the State had a dispersed presence in the power sector, fruit of pioneering initiatives of a few states: Rio Grande do Sul, Paraná and Minas Gerais. Most states had regulatory agencies similar to DAEE (Department of Waters and Electric Energy), and it was through these that the public powers first intervened in electricity generation and transmission[8]. An initiative by a

[8]See about this subject "Panorama do Setor de Energia Elétrica no Brasil", Centro da Memória da Eletricidade do Brasil - Memória da Eletricidade, Coordinated by Renato Dias, Rio de Janeiro, 1988.

state government with a great impact was that of Minas Gerais State, which proposed to install over a ten year period a supplementary 561 MW in generating capacity and to build 4052 Km of transmission lines.

The sector fragmentation led the Minas Gerais Government (Juscelino Kubitscheck Administration) to create in 1952 a holding company to manage the sector. CEMIG (Centrais Elétricas de Minas Gerais SA) was constituted as a mixed economy incorporated company, in which the State had majority stock in association with private capital. The hydropower projects of this pioneering phase of CEMIG were financed by the World Bank and Eximbank[9] and had the merit of creating technical capability in the Country for the large hydropower projects to come. By its turn, the State of São Paulo had obtained from the Union a certain amount of concessions on the river Pardo, an affluent of Rio Grande, and on the Paranapanema River. Two mixed economy societies were founded to exploit these concessions: USELPA (Usinas Elétricas de Paranapanema SA) and CHERP (Companhia Hidrelétrica do Rio Pardo) [10]. In 1951 the São Paulo government also created the company Centrais Elétricas de Urubupungá S.A. to exploit the hydropower potential of parts of the Paraná river in the state boundary with Mato Grosso[11].

The evolution of electricity supply was thus discontinuous; each project was faced as an isolated unit, not integrated in a system of interlinked projects. This diversity of projects and companies accented the institutional and organisational discontinuity of the power sector; at the same time, it was difficult to overcome. The electricity supply companies credited the delays in system expansion to financing hurdles in the international market, as well as to the inflationary process and exchange rate policy that corroded electricity tariffs and made those investments less and less interesting to the concession owners (Soares Pereira, J., 1975, 16). In the face of this situation, the second Vargas Administration sent the National Congress the National Electrification Plan and the bill creating Eletrobrás (Messages 134/135). This was to be a public company, responsible for managing all the state endeavours in the sector[12].

The National Electrification Plan proposed the duplication of installed capacity, interconnection of the regional systems, and unification of electricity supply standards in ten years[13]. These activities would be financed by the Federal Electrification Fund, formed by the revenue from the unique tax on electric energy (IUEE), the main part of which was to be linked to

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[9]"But a few works were started financed by suppliers' credit. Gianetti [Américo René Gianetti, industrialist and Secretary of Agriculture in the Milton Campos Administration], for instance, bought 50.000 KW in General Electric machines for Salto Grande with five years suppliers', and we obtained funds from Westinghouse to Itutinga, which later was converted into a project financed by the World Bank". Lucas Lopes, Memórias do Desenvolvimento, Rio de Janeiro, Centro da Memória da Eletricidade no Brasil - Memória da Eletricidade, 1991, page 135.

[10] The São Paulo power sector was mainly supplied after the war by two foreign subsidiaries: the CPFL system (AMFORP Group) and São Paulo LIGHT, acquired by the Federal Government in 1965 e 1979 respectively. As São Paulo State had the largest growth rates of the Brazilian economy, conflicts with foreign investors were most acute and public intervention was most necessary there.

[11] That Project aimed at the construction of Jupiá e Ilha Solteira power plants, which were only concluded in 1970. The hydropower complex of Ilha Solteira-Jupiá is one of the world's largest in installed capacity.

[12] One should note that the idea of creating the Ministry for Mines and Energy was conceived in the second Vargas Administration, in parallel with the conception of Eletrobrás. Its effective creation only occurred in 1960, under the Kubitscheck Administration.

[13] This Plan was strongly opposed, and Lucas Lopes criticised it thus: "The plan contained a listing of projects, some realistic, others unrealistic, others entirely outdated ... It was a plan that made no sense as basis for a development programme". Lucas Lopes. Op.cit., pages 154/155.

the Plan[14]. Eletrobrás was to be the holding company of the system, managing the set of regional enterprises, both subsidiaries and associates. The former would act in the regions with less economic muscle and their capital would be controlled by Eletrobrás; the latter would be owned by State Governments and would operate in regions with greater industrial concentration, as was the case of São Paulo, Minas Gerais e Rio Grande do Sul. The Plan would also promote the heavy electric equipment industry; if no private investors showed interest in this industry, Eletrobrás itself would implant firms to produce those equipments in partnership with private capital.

The set of measures proposed by the Vargas Administration did not contemplate Union monopoly in producing and distribution electric power. However, once submitted to the National Congress in 1954, both the Eletrobrás and the National Electrification Plan bills suffered fierce opposition. This came not only from electricity companies owned by international investors, but also from state-owned public and mixed economy electric utilities. These latter feared excessive control and centralisation by the federal government. The Eletrobrás bill remained dormant in the National Congress and the National Electrification Plan was filed away. There was disagreement on the institutional format for the sector; all felt the urgency for money resources to develop the plentiful national hydropower potential. Thus the financial support provided by the Federal Electrification Fund and the Unique Tax on Electric Energy was approved. The fund was managed by BNDE (National Bank for Economic Development), another creation of the second Vargas Administration, which thus helped to consolidate the bases of the modern Brazilian State[15].

The financial leverage that the Federal Electrification Fund (formed by resources from IUEE) offered the power sector was extremely powerful in the fifties. These funds answered for 60% of sector investment in the period. Installed capacity jumped from 2.806 MW in 1954 to 4.800 MW in 1960 (Lessa, C., 1982, 36). This programme's success smoothed the resistances of the principal states producing electric power, and in 1961 the National Congress finally approved the creation of Eletrobrás, albeit in a less ambitious version than the original bill[16].

Centrais Elétricas Brasileiras S.A. (ELETROBRÁS), an incorporated company with its initial capital of 3 billion cruzeiros, integrally underwritten by the Union, started managing the resources from the Federal Electrification Fund from its creation. Eletrobrás did not have the monopoly of production and distribution of electricity, but only the role of sector coordinator. In this way, the presence the private capital in the electricity industry was not altered; however, the State intended to

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[14] The Bill creating the Federal Electrification Fund was sent to the National Congress through the Presidential Message n º 219, of 25 May 1953. Its resources were to come from the collection of the Unique Tax on Electric Energy. This tax had been created by the 1946 Constitution (Art. 15). Both the Fund and IUEE were published only after the Vargas suicide, by the Law n º 2.308 of 31 August 1954. President Kubitscheck regulated the applications of the Fund in 1956 and placed it under control of BNDE.

[15] The Café Filho and Nereu Ramos administrations, as well as Kubitscheck's, practically ignored bill nº 4.280, which created ELETROBRÁS, but this kept slowly making its way in the Congress. In 1956 it was approved by the Federal Chamber of Deputies sent to the Senate where it remained for a few years. Lucas Lopes, one of the closest collaborators of President Kubitscheck, thus described the problem: "... BNDE was not against ELETROBRÁS, but it had no interest in pressing Congress into approving it, as long as conditions were not really adequate. We were very much afraid that the Federal Electrification Fund would be given over to an organisation ill prepared to manage it, and that it could be pulverised through political pressure among projects for the Minas Triangle, for Bahia, Pernambuco or Maranhão". Op. cit., page 188.

[16] In April 1961 President Jânio Quadros sanctioned Law nº 3.890-A, which authorised the creation of Centrais Elétricas Brasileiras SA (ELETROBRÁS). Nationalists had partially gained the battle, even if the legal text contained no mention of a state industry of electric equipment. However, only in May 1962 the Statute of Eletrobrás was published in the Official Diary of the Union, and in June 1962 President João Goulart signed Decree nº 1.178 that regulated the constitution of the company.

lead the expansion process. Private enterprises would still participate through their existing facilities, which were basically in distribution. It is important to note that, since these enterprises were concentrated in the Rio/São Paulo axis, they answered for half the Country's power distribution (Araújo, H., 1979, 114).

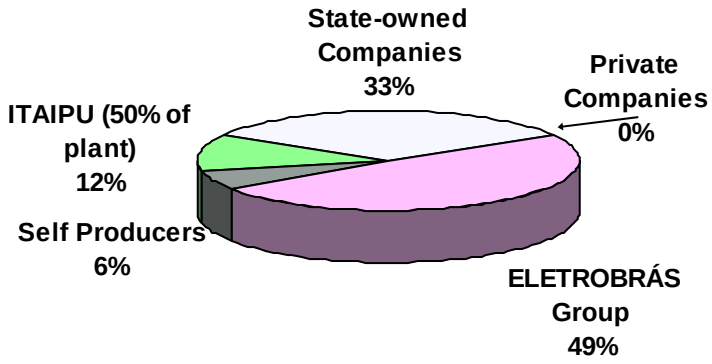
2.3.2 THE ELETROBRÁS PERIOD

Eletrobrás acted as holding for the power sector from its creation. Besides controlling directly the federal enterprises, it participated in state enterprises as minority partner. The formation of Eletrobrás quickly altered the ownership structure of the sector. Public participation expanded, private share stagnated and the weight of self-production gradually fell to about 6% of installed capacity in the nineties (Figure 5).

Thus, Eletrobrás controlled the stock of the federal generating companies CHESF and FURNAS (around 20% of installed capacity at the time). These were signposts in the sector evolution. CHESF had been created in the forties by the first Vargas Administration, and construction of the Paulo Afonso plant was started under the Dutra Administration to supply the Northeast. FURNAS was set up in 1957, and the following year construction was started for the Furnas power plant, which was the first plant conceived by a state government firm (CEMIG) to supply the South-eastern macro-region[17]. As a holding, Eletrobrás gave financial support and thus acquired stock shares in state-owned electric firms. These controlled then other 20% of installed capacity, attaining 33% in the nineties (Figure 5). These reforms permitted the Brazilian power sector to enjoy a long period of sustained growth with significant efficiency gains.

Figure 5

INSTALLED CAPACITY BY TYPE OF COMPANY (1993)



During those years, the expansion of Eletrobrás was favoured by the excellent financial conditions for the development of the power sector: availability of foreign capital, support from

[17] Furnas was a CEMIG Project to generate 1.200 MW. Implementing this project was an extremely important feat for Brazilian engineering. It was a hundred metre high dam that represented a technological advance, since it would supply the states of Minas Gerais, Rio de Janeiro e São Paulo, requiring the interconnection of these markets, an innovative concept at the time. Paulo Afonso power plant started being constructed in 1946, and was the largest hydropower plant of its time.

multilateral funding organisms and a briskly growing consumer market. That development led to a massive supply of electric services to the Brazilian population, so that in 1993 around 90% of all residences, urban as well as rural, had access to electricity[18].

The concentration of financial resources and the centralisation of decision-making in the holding Eletrobrás made it feasible to create large interconnected markets in the South-Southeast and in the North-Northeast, with economies of scale and scope that reduced the cost of electricity supply to domestic consumers[19]. The availability of cheap electricity induced the localisation of electro-intensive industrial complexes in the Country, promoting industrial development. On the other side, the continental dimensions of Brazil and the hydropower option required the construction of long transmission lines. By 1970 there were only 32 thousand kilometres of transmission lines; in 1993 these arrived at 150 thousand kilometres. The energy generated by Itaipu arrives at the Southeast through 1.612 km in direct current and extra-high tension, a remarkable feat at world level. (Oliveira, A., 1994, 16/17)

The evolution of the Brazilian power sector in the years following the creation of Eletrobrás was extraordinary (Figure 6). Besides the institutional changes, there were profound transformations in sector structure. Since the purchase in 1963 of the AMFORP Group firms (constituting the Auxiliary Company of Brazilian Electric Utilities – Companhia Auxiliar de Empresas Elétricas Brasileiras – CAEEB), after a noisy takeover process[20], and with the relative stagnation of the LIGHT Group firms which supplied the main economic hub of the Country (Rio/São Paulo), the electricity supply industry had its expansion entirely commanded by the State.

After 1979, when LIGHT was bought out, and until 1994, the Brazilian power system had the following structure. Eletrobrás coordinated funding, operations and planning for expansion of the system, which comprised four regional enterprises and around sixty state or local utilities. In its functions, Eletrobrás utilised auxiliary collegiate organisms in which the main companies had representatives. The principal organisms were the Group for Coordinating and Planning of Systems (GCPS), the Group for Coordinating Interconnected Operation (GCOI), and the Committee for Environmental Coordination of the Electricity Sector (COMASE).

Besides coordinating, Eletrobrás acted as holding of four large regional generators (FURNAS, ELETRONORTE, CHESF, ELETROSUL). These answered for more than half commercial generation, which corresponded to 52,3 GW of nameplate installed generating capacity. Besides these generators, it also controlled LIGHT in Rio, ESCELSA in Espírito Santo, NUCLEN (since 1989), 50% of ITAIPU (or more than 12% of installed capacity), and was minority partner in state utilities. Locally, there were also municipal and private utilities, acting in distribution and small-scale generation. Utilities were responsible for the project, construction and operation of their facilities. Eletrobrás had general coordination for the planning, financing and operation of the

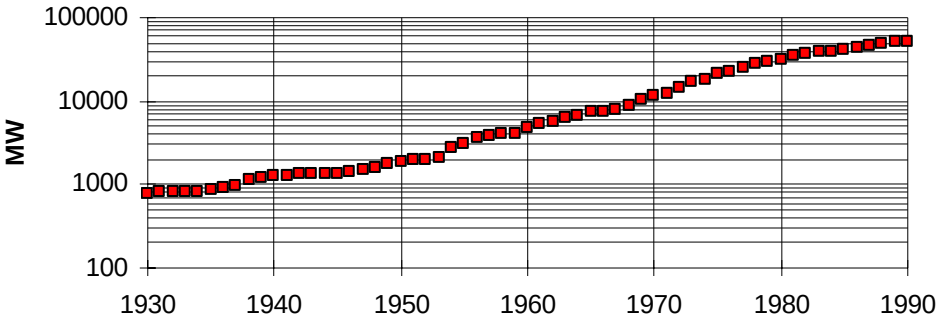
[18] 34 millions of residences were connected to the system at the time, other 3,8 millions still had no access to electricity services (Oliveira, A. 1994, 20).

[19] This centralisation trajectory was not specific to the Brazilian power sector. Indeed, it was stimulated by technical advisors (Americans and Canadians, and later by the World Bank itself, who identified a similar trajectory in Northern countries). M. Prowse, Investment in People seen as Key to Third World growth; and "Economists' faith in 'new consensus' raises old concerns" in Financial Times, 8 July 1991, p.2.

[20] Relations between public and private electric utilities were very tense, after the Leonel Brizola Administration in the State of Rio Grande do Sul had taken over the Companhia de Energia Elétrica Riograndense, subsidiary of the AMFORP Group, for the symbolic price of one cruzeiro. The purchase was finally approved by the National Congresso n 6 October 1964 (under the military administration and with Washington acting as go-between) for 135 million dollars, in the form of a loan to be paid in 45 years by ELETROBRÁS with interest rates at 6,5% per year.

system, while DNAEE (National Department of Waters and Electric Energy) was responsible for regulating the supply of electricity in adequate levels of price and quality[21].

Figure 6: Evolution of Installed Capacity in Brazil's Power Sector



Sources: Memória da Eletricidade (1988) till 1986, SIEE-OLADE (1993) for 1987 to 1990

Expansion of installed capacity fell mostly on the companies of the Eletrobrás System; however, four state companies also answered for a significant share of system expansion: CEMIG and CESP in the Southeast, COPEL and CEEE in the South. For their size and the more industrialised profile of their market, these companies had interests that partially distinguished them from other state utilities.

3. Exhaustion and route changes

In the fifties, the debate on how to conduct the process of economic development was favourable to the tendency arguing for an active role for the State. Most development theorists, whether European, North American or Latin American, advocated some kind of intervention by the public sector, to enable or accelerate the process of economic development[22]. The State was strongly involved in infrastructure, particularly in the energy sector; in Brazil, this debate was especially acute in the second Vargas Administration, culminating with the creation of Petrobrás and Eletrobrás. However, from the seventies on this view began to suffer sustained attacks, ending with the reform of infrastructure industries in a pro-market environment, where the role of the State is seen as a regulator and purveyor of basic rights, with no direct interference in productive activities. This posture is known as "Washington Consensus" and its ideological components are well known. However, we should stress that the reforms of infrastructure industries had objective causes, which one should strive to understand. It is also important to note that reform trajectories varied between countries, reflecting local conditions and historic constraints.

During many years, the model of energy policy centred on Petrobrás and Eletrobrás worked very well. Thanks to sizable economies of scale and of integration, and to easy access to domestic

[21] DNAEE (National Department of Waters and Electric Energy) was a regulating agency, which absorbed the former National Council of Waters and Electric Energy and the National Department of Waters and Energy. Besides answering for the determination of tariffs and controlling utility accounts, it was also responsible for all aspects of water resources.

[22] See Diana Hunt, Economic Theories of Development, New York, Harvester Wheatsheaf, 1989, pages 52 and ff.

and international funding, they had no difficulty in financing the expansion of infrastructure. In the mid-seventies electric tariffs and fuel prices were equalised throughout the national territory. The model seemed triumphant. The situation began to change at that moment, after the first oil shock. Under pressure to reduce oil imports, the government subsidised domestic energy production: energy policy focused on substitution of domestic sources for imported fuels. This meant intensifying development of hydropower projects and oil exploration, especially offshore, stimulating the use of steam coal and of biomass – particularly alcohol from sugar cane – and launching a nuclear programme[23]; much later, natural gas was added to the list.

Added to this, the oil shocks unchained an inflationary spiral in the Brazilian economy, where over indexing made it difficult to follow a consistent anti-inflationary policy; governments thus started using public tariffs and fuel prices as tools to fight inflation, keeping prices to follow cost increases. The combination of these policies reduced the profitability of energy firms and hampered the funding of new projects, deteriorating company performance; as a result many alternative programmes ran into troubles, particularly steam coal and the nuclear programme[24]. After the second oil shock, the interest rate hike and the financial crisis of the State, there was no way to keep the same course as before.

By the late eighties, macroeconomic policies underwent a radical change. Import substitution policy was abandoned, and protection schemes to Brazilian producers were progressively removed. Privatisations and market liberalisation were also started at the same time. Thus, after fifty years of an import substitution policy, and thirty years of State-led infrastructure building, the financial crisis of the eighties placed the whole scheme in check. Under pressure of multilateral funding organisms, and without means to finance expansion, Brazil started to make reforms with privatisation and introducing competition. Nevertheless, this was an unequal process, indicating an imperfect understanding of what was at stake, and of what would be necessary for a reform to solve the strangleholds that had made it inevitable.

Electricity

The stranglehold was particularly grave for the power sector. During the seventies and eighties, utilisation of public tariffs as a tool to contain inflation seriously deteriorated sector finances. In this context, the 1974 tariff equalisation worked as a trap for the sector: utilities with lower costs ceased to forward resources from the Equalisation Fund to Eletrobrás, and the sector debt grew at an explosive rate. Under these conditions, the sector was no longer able to finance its investments, which fell in consequence (Figures 7 and 8). The change of attitude of international funding organisms was the final straw, making reform inevitable.

In truth, despite its achievements the model followed in the "Eletrobrás Age" had important limitations. First of all, it was yoked to the State's ability to finance itself. When this went into crisis, the sector could not go on. This characteristic also led to governmental interference and to conflicts that worsened the sector crisis. More subtly, the success of the model around large hydropower plants created a rigidity of behaviour that made it difficult to adapt to new circumstances. Finally, excessive centralisation led to costly and environmentally ruinous decisions, as the Balbina plant. In other words, there was an objective case for reform.

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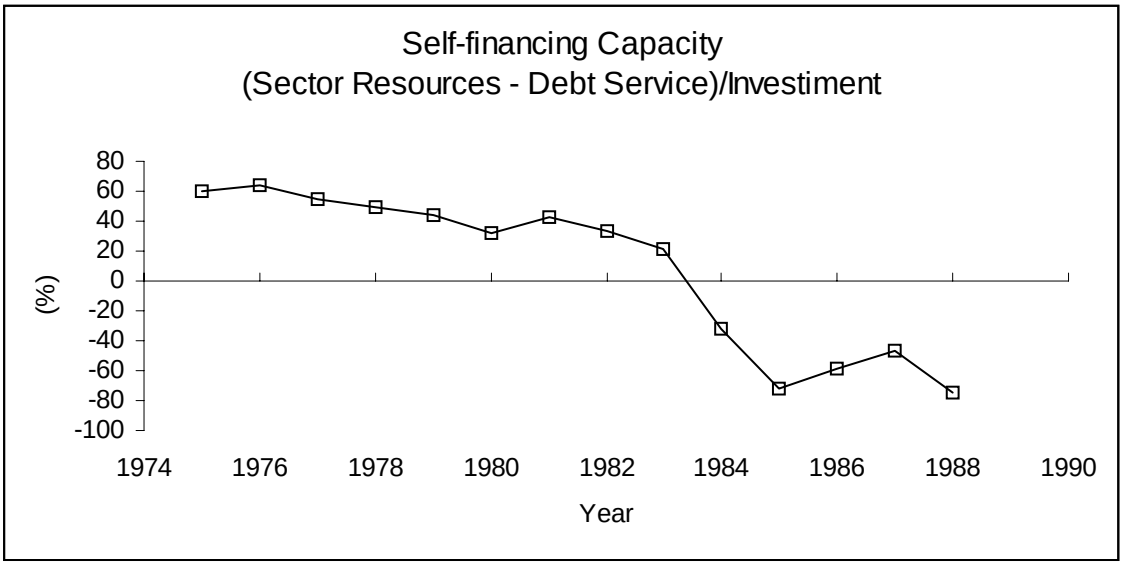
[23] JL de Araújo & A. Ghirardi, (1987) Substitution of Petroleum Products in Brazil: Urgent Issues; A. de Oliveira, (1991) Reassessing the Brazilian alcohol programme

[24] de Araújo, J. L. , de Oliveira, A., Piccinini, M., Navegantes, L. (1993), Rational energy use in Brazil: policies, programmes, results.

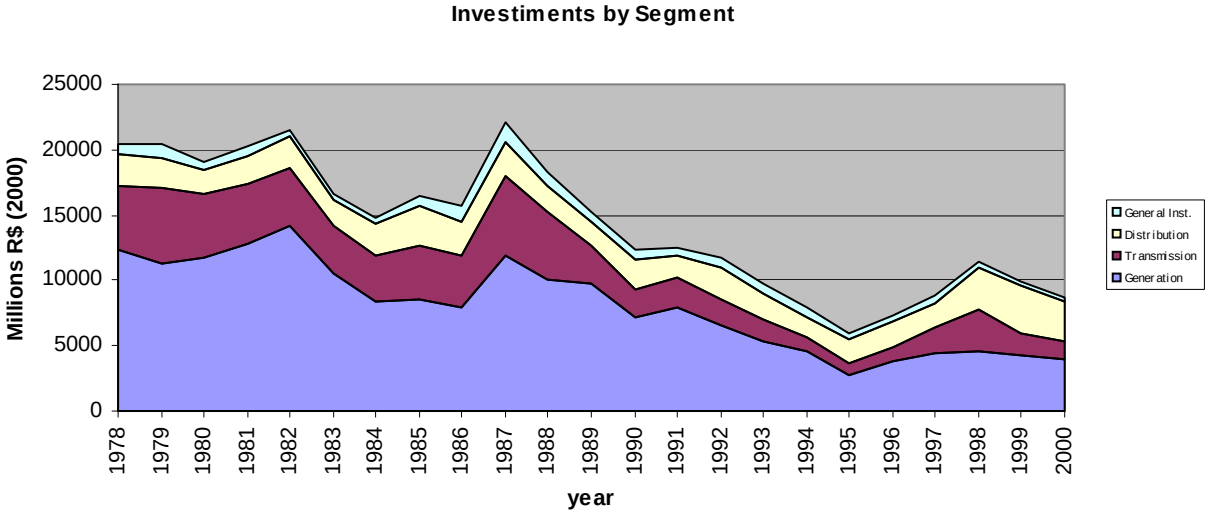
Figure 7 - Evolution of the self-financing capacity of the power sector



Source: Eletrobrás, Fontes e Usos de Recursos

Between 1987 and 1989 a task force (REVISE) worked on proposals for sector reforms that would preserve the broad features of the existing model. However, institutional hurdles (in particular lack of agreement between federal and state governments) aborted this initiative. In 1993, Law 8631 ended tariff equalisation and annulled intra-sector debts; the National Treasure absorbed the 23 billion-dollar debt to clean the sector slate. In the same year, a decree stimulated the formation of public-private consortia, and another one created the National System of Electric Transmission (SINTREL) to induce free access. Since adhesion was voluntary, this had the same destiny of similar schemes in other countries – it never worked. Reform went ahead in 1995, with laws to regulate the concession regime and stimulate private capital. In the following year a law created ANEEL as regulating agency for the sector (it only began functioning in December 1997, when 10 utilities had been privatised for a total sum of 10 billion dollars) and a consortium, led by Coopers & Lybrand, was hired to design the new working model for the power sector. After approval of its report, several organisms were created for managing the system, such as ONS (for physical operation of the system), MAE (to manage the bulk market) and CCPE (indicative planner for generation, determinative for transmission). MAE should have started its activities in 1999; but it ran into working problems, which finally led to its substitution (an alternative scheme for the sector is under study by the Congress).

Figure 8 – Evolution of Electricity Investments



Source: Pinhel (2000), updated by Pinhel

Meanwhile, privatisations were being carried out since 1995, even without rules for the sector. The sale of **distribution** utilities proved to be easier, although it has left a a passive of ad-hoc contracts for the regulator, who is now trying to correct some of the more damning clauses. In one way or the other, most of distribution market was auctioned away and less than 30% of the market remains in the hand of state enterprises. The composition of companies now active in distribution is in Table 2, ordered by market size.

In contrast, **generation** was much harder to privatise. Table 3 shows the composition of companies active in generation, ordered by installed capacity; almost 60% of this remains under state companies. Actually, the weight of state-owned companies is even greter in energy generation, since most installed capacity of private companies refers to thermal plants, which have been less dispatched. Likewise, the intended deverticalisation was far from complete.

On the other side, the new market model ran into troubles. Conceived as an English-like pool it had however some significant differences from the original model. First, prices in the "spot market" were to be defined by an optimisation programme using a forecasting model and cost data, with centralised dispatch. Second, to profit from economies of coordination in the hydropower system a "Mechanism of Energy Reassignment" was implemented to assign generation revenues between hydropower plants according to their warranted energy. To stimulate thermal plants, these could stipulate a minimum level of their capacity to be dispatched in any circumstance. Finally, to reduce exposure to volatility, distribution and generation utilities should have at least 85% of their dealings covered by medium term contracts. These contracts were initially defined by ANEEL, and would be gradually liberated. But things did not go according to plan.

Table 2

Distribution Market Shares

Companies	Systems (%)		
	National	S/SE/Centre-West	N/NE
EDF - Electricité de France	13,04	16,80	-
Cemig (*Estatal*)	12,56	16,18	
AES International Holding Ltd. (USA)	8,85	11,41	-
ELETROBRAS (*Estatal*)	8,55	-	38,19
EDP - Eletricidad de Portugal	5,86	7,37	0,63
COPEL (*Estatal*)	5,52	7,11	
521 Participações S/A (Fundos Investimentos BB)	5,50	5,37	5,96
VBC Energia (Votorantin, Bradesco, C. Correia)	5,25	4,47	-
Votorantim (Antonio Ermírio de Moraes e Sócios) and others	4,81	7,98	-
ENERPAULO - Energia Paulista Ltda.	4,04	5,21	-
ENDESA ESPAÑA	3,63	2,41	7,83
ENRON	3,62	4,67	-
Bradesplan, Fundação Bradesco, Cidade de Deus and Elo Participações	3,30	3,04	-
Ivan M. Botelho (Gipar S/A, Itacatu S/A, Multisetor Com. Ind. Part. Ltda., Energisa S/A)	3,28	2,63	6,40
DRAFT 1 Participações S/A	3,18	6,93	-
CAMARGO CORRÊA S/A (Dirce Navarro de Camargo Penteado)	3,02	3,90	-
DENERGE S/A (Jorge Queiroz de Moraes Jr)	2,53	1,89	-
IBERDROLA (Espanha)	2,50	-	11,17

Table 3

Generation Market Shares

Companies	Systems (%)		
	National	S/SE/Centre-West	N/NE
Eletrobrás	39,23	15,59	93,16
CESP-Paraná	7,74	11,15	
Cemig	6,40	9,22	
Tractebel	6,16	8,87	-
Bradesplan, Fundação Bradesco, Cidade de Deus and Elo Participações	5,58	10,55	-
VBC Energia (Votorantim, Bradesco, C. Correia)	5,28	7,59	-
AES International Holding Ltd. (USA)	5,01	7,21	-
Copel	4,84	6,97	
Votorantin (Antonio Ermírio de Moraes e Sócios) and others	3,85	5,6	-
Camargo Corrêa S/A (Dirce Navarro de Camargo Penteado)	3,04	4,37	-
DUKE Energy	2,99	4,3	-
Endesa España	0,98	1,42	-
Endesa Chile (Endesa España)	0,91	1,31	-
EDF – Electricité de France	0,88	1,26	-

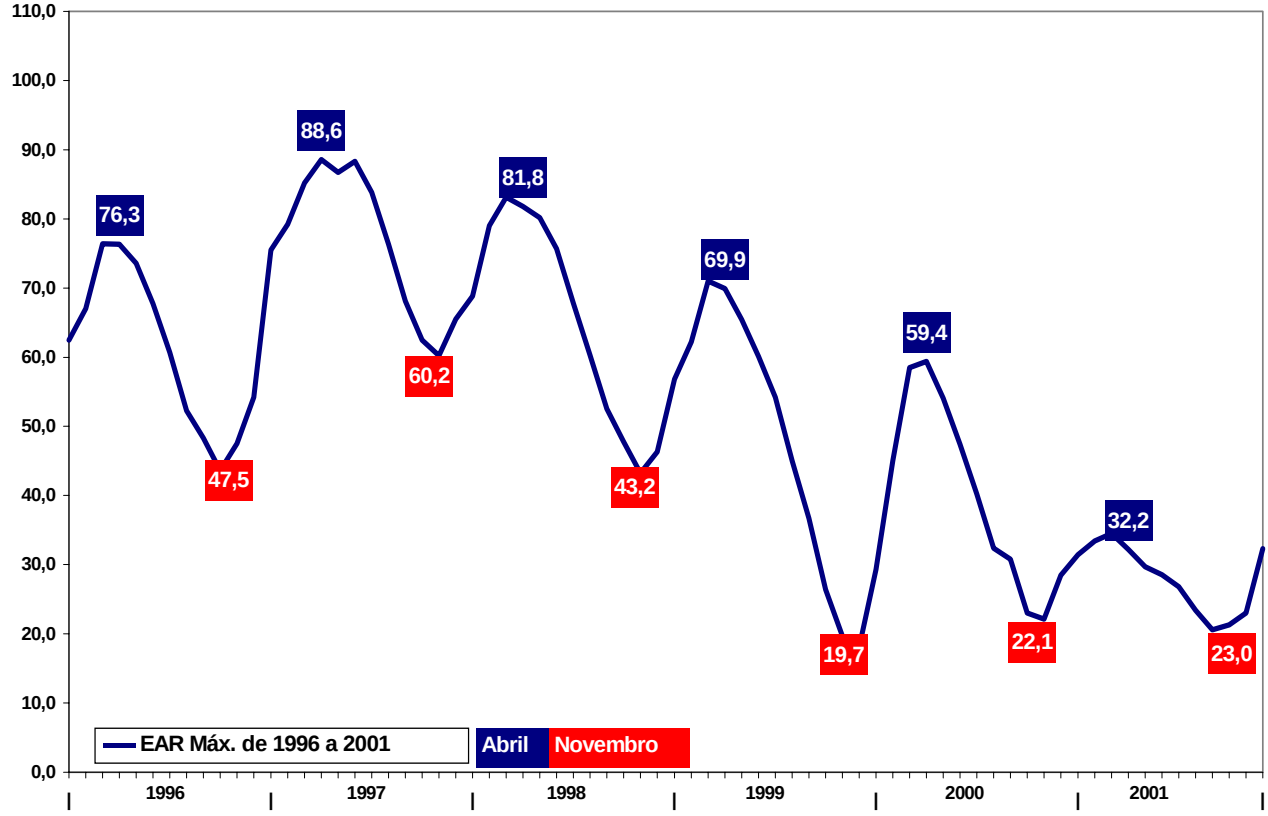
A first problem was the difficulty to arrive at an acceptable set of rules for the working of the Bulk Electricity Market (MAE). Since this was conceived as an agreement among agents, the divergences between generators and distributors led to postponement of the solution of moot points,

in particularly concerning accounting and settlement of transactions. Therefore, while it began operating in 1999, it was only in 2003 that MAE transactions finally got up to date, after direct interventions by the regulator and by a special government committee created in 2001 to manage the supply crisis (Chamber for Crisis Management).

Additionally, prices resulting from optimisation models were perceived by practically all as unrealistic, requiring continuous modifications in equations to better approximate reality. There were also problems with the rules to pass on MAE prices to final consumers, as well as with initial contracts.

All those problems were rendered more acute by insufficient investment, which led to overuse of reservoirs (Figure 9) and ended in the 2001 supply crisis when rains were less than hoped for. Ironically, the measures taken to deal with the crisis were so successful in reducing consumption (besides reducing economic activity) that they created new problems for utilities – which asked and got price raises to compensate their losses with the fall in consumption (!).

Figure 9 –Recent Evolution of Reservoir Levels in Southeast/Centre-West



Source: ONS

It has already been said, inclusive by one of the present authors, that the reform made many mistakes, in particular in its rhythm – by privileging divestment over the setting up of clear rules and an adequate regulatory agency. Without repeating the arguments and the analysis of those mistakes done elsewhere (De Araújo, 2001), we should note that the power sector places special problems to competition. In the Brazilian case the large weight of hydropower is an additional complicating factor, albeit not insoluble as Norway shows. Observe that a small modification of the Mechanism for Energy Reassignment (MRE) to do assignment by basin would allow a more active participation of plants as in that country. The biggest hurdle is in how to stimulate thermal plants in a competitive context, in view of the high risks they must face in a hydropower-dominated system.

On the other hand, total elimination of investment risk would imply excessive proliferation or administrative centralisation of an extremely heterogeneous collection of agents, with high conflict potential. The parallel that comes to mind is not the "Eletrobrás System" of the seventies, but rather the period immediately following the publication of the "Code of Waters": a piece of legislation consistent and advanced for the time had to face a heavy legacy of ad hoc concessions, leading to two decades of conflicts.

The reforms got one point right: ONS control over the transmission grid and determinative planning of its expansion. This separates ownership of transmission assets, with remuneration determined by auctions, from grid control and expansion. One should however note that grid expansion planning cannot be dissociated from the model chosen for the working of the electricity industry: the capacity slack for an industry in a competitive environment must be significantly greater than in a coordinated and centralised context (Joskow e Schmalensee, 1983) (Joskow, 2000) (Newbery, 2000).

Oil and gas

Differently from the power sector, the hydrocarbon sector in the end benefited from the oil shocks. The Petrobrás effort was rewarded with the discovery of giant offshore fields in the Campos basin, permitting a quick expansion of production. From around 10 million cubic metres and 15% of consumption in 1970, domestic oil production attained in 1990 36,6 Mm^3 and 53,7% of the consumption; in 2001 it was 75,2 Mm^3 and 79,2% of total consumption. Part of the quick increase in production was the result of techniques of accelerated extraction from wells; these let Petrobrás build up a healthy cash flow, which allowed it to sustain the rhythm of investment despite constraints and diverse obligations of the company related to the model, such as price containment, the "Oil Account" and the "Alcohol Account"[25]. However, accelerated production had the cost of burning natural gas for lack of pipelines (later on, the gas was reinjected into wells), and the gas production did not arrive at the consumer market.

In the early nineties, government pressure to increase the supply of gas led to signing an agreement between Petrobrás and Yacimientos Fiscales Petrolíferos Bolivianos to build a 3 thousand kilometre gas pipeline between both countries, with capacity of 30 Mm^3/day, at the cost of 2 billion dollars. The initial supply would be 8 Mm^3/day, increasing progressively (Table 4). This contract was the result of almost twenty years of negotiations, and was imposed on Petrobrás, who was reluctant to take on this engagement.

Table 4 - Contract of Petrobrás with YFPB (Mm^3/day)

Year	Volume purchased (Take-or-pay)	Volume transported (Ship-or-pay)
2001	8,6	10,3
2002	14,3	14,4
2003	18,5	24,6
2004	24,1	30,1

[25] These were accounts that reflected cross-subsidies to consumer prices.

With the end of monopoly in 1995 and the creation of the National Oil Agency (ANP), the upstream and downstream markets were opened to entrants26. Nevertheless, contrary to what happened in Argentina, Petrobrás was kept whole and state-owned. It was directed to develop overseas operations, while ANP would provide fair rules for entrants. The reform also established that prices for crude and for oil products would be set by the market and would no longer be centrally administered. Since then ANP has conducted five rounds for licensing, and several companies are conducting explorations in the national territory.

Petrobrás adapted to remain competitive in the new context. The company has proven reserves to increase its crude production to 2 Mbbl/day until 2005 (Table 5). Natural Gas reserves arrived in 2001 at 222 billion m3 and Petrobrás plans to supply 39,5 Mm3/day in 2005, most of it associated to oil wells (65%). From this, 20,1 Mm3/day would go to the Southeast (75% associated gas). With the recent discovery of a giant gas field in the Santos basin with 419 billion m3, Brazilian gas reserves have tripled and are now 641 billion m3.

Given the existence of other favourable structures, a strong acceleration of domestic production of natural gas is to be expected, which could attain by 2020 a volume between 100 and 150 Mm3/day, according to rather conservative estimates. Of this total, Petrobrás could produce between 40 and 60%.

Table 5 – Reserves of Oil and Natural Gas

Year	Oil (Million barrels)	Natural Gas (Billion $m^{3)}$
1970	140,2	28,9
1980	216,9	56,2
1990	717,5	172,0
2000	1345,8	221,0 (640 in 2003)

In view of these prospects and the pressures from natural gas imports, Petrobrás' strategy was redefined to compensate growth reduction of its domestic oil market along the following lines:

i) Expanding overseas upstream and downstream operations, particularly in South America, Eastern Africa and the Caribbean;

ii) Expanding downstream operations in the domestic natural gas market;

iii) Entering the power market as a large thermal generator, becoming an energy company (which is allowed by Law 10438).

To achieve the first goal, Petrobrás is looking for strategic alliances, giving partners a position in the Brazilian market. The exchange of assets with Resold is a good instance of this policy27. Other deals are being negotiated. This strategy reduces Petrobrás' market power in the domestic market for oil products, although for the middle term it should remain dominant.

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[26] As an example of this policy, Brazil imports 320 thousand b/d n oil products, and an additional 300 thousand b/d should be imported in five years time if the capacity of existing refineries is not upgraded or new refineries are inaugurated in the meanwhile. The second alternative is clearly more economical, but Petrobrás has been directed not to do it without a private partner.

[27] Repsol gained shares of the Canoas refinery (Rio Grande do Sul) and of an offshore field; Petrobrás got a refinery and a distribution company in Argentina.

The situation in the natural gas market is distinct; this is a nascent industry and has opportunities for entrants. A vigorous competition may develop upstream. In transport, Petrobrás owns the existing gas pipelines but should give access to competitors having large fields in Bolivia. Although Petrobrás participates in several gas utilities (Table 6), they are in markets of little importance. The large Southeastern markets, with potential for fast growth, are operated by monopolies in the hands of competitors. The entry of Petrobrás in the electricity market enables it to go around that hurdle and to vertically integrate its natural gas operations.

Table 6

Petrobrás Participation in Gas Utilities				
Utility	**Region**	**State Government**	**Petrobrás**	**Private Investors**
Algás	AL	51,0%	24,5%	Enron
Bahiagás	BA	51,0%	24,5%	Enron
Brasiliano	SP			Snam/Italgas
BR Distribuidora	ES		100,0%	
CEG	RJ			Gas Natural/Iberdrola
CEG Rio	RJ		16,3%	Gas Natural/Iberdrola
Cegás	CE	51,0%	24,5%	
Cigás *	AM	100,0%		
Comgás	SP			BG/Shell
Compagás	PR		24,5%	Enron
Copergás	PE	51,0%	24,5%	Enron
Emsergás	SE	51,0%	24,5%	Enron
Gasmig	MG	8,0%		Cemig
MS Gás *	MS	51,0%	49,0%	
Natural *	SP			Gas Natural
PB Gás	PB	51,0%	24,5%	Enron
Potigás	RN	51,0%	24,5%	A. Gutierrez
Romgás *	RO	51,0%	24,5%	CS
SC Gás	SC	51,0%	23,0%	Enron
Sulgás	RS	51,0%	49,0%	

4. Perspectives

The change of government has brought signs of a possible inflection in energy policy, as show the change in criteria for choosing contractors for Petrobrás and the recent governmental initiatives to reform the power sector and regulate regulatory agencies. Although it is still early to analyse these initiatives in depth, we can raise a few relevant points.

Oil and natural gas

The oil sector has a high influence over the economy, whether for its strong degree of chaining in the productive chain, or for its effects on the Balance of Payments and the Public Accounts. The investment policy and fuel prices were powerful tools used by the Brazilian Government to stimulate national development.

The reforms of the nineties have broken the monopoly, but preserved Petrobrás intact. This latter is now in the process of strategy re-evaluation in a competitive environment, where it nevertheless keeps great market power. The challenge, for the Ministry of Energy as for ANP, is to maintain industry dynamism and to stimulate competition, restraining monopolistic behaviour by

Petrobrás but also restraining opportunistic behaviour by its competitors. It is a difficult course to steer between Scylla and Charibdes.

In the range of activities of the oil industry, natural gas plays a role apart for its network industry character and potential importance in restructuring the electricity sector. In Brazil, it has a very immature network – this is significant only in the towns of Rio de Janeiro and São Paulo, where for decades its dynamism has been exceedingly low. The 1988 Constitution gave the monopoly of its distribution to the Units of the Federation, which is understandable given the immaturity of the network but created an anomalous situation in more than one sense: On one side, the capacitation of regulatory state agencies is generally below that of federal agencies. This makes it harder and more conflictive to regulate gas services after their privatisation, mainly because most contracts were signed before a regulator or general rules had been created. On the other, attempts to stimulate competition in gas supply face the barrier of monopoly at the state level. Anyway, one must take into account that potential competition in this sector will be limited in the near future, and will require close monitoring by regulatory agencies.

Expansion prospects for the natural gas network are linked to the demand of large consumers, represented today basically by gas-fired power plants, and to a lesser degree by energy-intensive industries; one must also note the dynamism of the market for natural gas vehicles, which in Rio de Janeiro is now bigger than the residential market. A consequence of network immaturity is the need for fast expansion; by its turn, this tends to demand long-term contracts as warranty to manage risks. The basic task of regulators will then be to protect small consumers while stimulating efficiency and expansion in a context of long-term contracts. It might be possible to achieve competition in a longer horizon; but in the next few years this seems hard to achieve. On the other hand, the prospect of introducing competition may be a powerful help for the regulator to carry out his basic task.

Electricity

Recognising the troubles with electricity reform, the present administration has proposed a change of course; the proposal published three months ago[28] is being discussed with several stakeholder groups. Thus, it does not seem proper to analyse in depth a proposal in flux. We would like, however, to express a general concern:

From a reading of the text, one can extract a logic of administrative centralisation of decision-making, tempered by mechanisms seemingly decentralised. We have thus the impression that there will be no competition in the power sector in the middle term. At the same time, the text seems aware of the risks of centralised administration. The long-term purpose is not clear: does one intend to proceed towards market mechanisms, or return to a centralised model? In this latter case, shall we see a repetition of the conflicts of the 1940-1978 period? In any case, should not the final goal be made clear? As it is, it appears to be an instrument to make a clumsily reformed industry work, making the best of a bad situation. We recognise that this attitude is understandable, especially in view of the uncertainties around electricity reforms in other countries; but this gives it a palliative character easily discernable by investors. Such a palliative character does not appear consistent with a development project, which aims at the long term by its own nature.

[28] This was written in October 2003. As this goes to press the proposal is under discussion by the Congress, which does not alter substantially our comments.

Regulation

Practically all the relevant issues of infrastructure industries relate to the quality of regulation. This is thus a central theme, and carries two heavy burdens: a legacy of liabilities and lack of experience.

The first burden is the legacy of ad-hoc contracts, done in the absence of rules and with clearly damaging clauses for the economy and for society. Good examples of those clauses are the inflation indicators used in contracts (IGP-M and IGP-DI), with a questionable composition and a tenuous link with sector costs or with inflation measured by the GDP deflator (Guimarães, 2003). The list of damaging clauses of the several contracts is an extensive one, and a few actually impose anticompetitive conditions under supposedly procompetitive clause headings.

The second one reflects several factors: our lack of tradition in regulation, the little experience – also at international level – of regulation in the new competitive contexts, and the state of flux of reforms. Our inexperience went as far as, on creating several regulatory agencies, to add typical governmental duties (as power to grant concessions or sector planning) to specifically regulatory tasks, while other agencies, notably in transports, were given too few powers to adequately exercise the function of regulator. Graver still, the institutional issue is far from being solved. State-level agencies can be counted on fingers, and those with capacitation to face their problems are even less. In the absence of adequate general directives, this situation has all the ingredients to lead to a proliferation of conflicts, which could lead to sector paralysis and render useless the efforts made to solve sector problems.

I would like to be able to say that the present project to regulate the regulatory agencies under discussion by the government is an unambiguous step in the right direction. It has correct things, such as better definition of the regulatory agencies mission. Nevertheless, it contains a polemical item that could jeopardise its positive aspects. To transform agencies in organs of the Executive branch, subordinated to ministries under performance contracts, seems a risky bet in view of the context in which they must act. The proposed structure works best, historically, with state enterprises functioning as monopolies. Its insertion in a very diverse context, with strong participation of private investors and market mechanisms, is not very consistent since the agency has to act as a credible arbiter. The project also appears to misunderstand the real need for general rules and directives, which are much more important for agency control, transparency and effectiveness than performance contracts and subordination to ministries.

At this point, the United Kingdom experience has something to teach us. After an optimistic beginning and exploratory essays, British agencies have worked since 1999 to design general directives, so as to establish consistent and transparent standards of behaviour. Moreover, the supervision of the National Audit Office as external controller has kept the course of agencies within adequate standards. In Brazil, the Union Accounts Court (TCU) is the appropriate external controller, and has performed an active role besides keeping constantly in touch with its counterparts through INTOSAI (International Organisation of Supreme Audit Institutions). From my contacts with its technical staff, I am convinced TCU activities represent the best hope for developing competence in regulatory agencies at all levels.

5. References

MELO, H. P.; ARAÚJO, J. L.; OLIVEIRA, A. (1994), "O Sonho Nacional 1954-1994: Petróleo e Eletricidade no Segundo Governo Vargas", in **Vargas e a Crise dos Anos 50** (A. Castro Gomes org.), CPDOC/FGV/Relume Dumará, Rio de Janeiro

ARAÚJO, H. P. de M. (1979), "O Setor de Energia Elétrica e A Evolução Recente do Capitalismo no Brasil", Rio de Janeiro, COPPE/UFRJ, M.Sc. Thesis.

CENTRO DA MEMÓRIA DA ELETRICIDADE NO BRASIL (1991), "Lucas Lopes - Memórias do Desenvolvimento", Rio de Janeiro, Memória da Eletricidade/Programa de História Oral do CPDOC/FGV.

CENTRO DA MEMÓRIA DA ELETRICIDADE NO BRASIL (1988) , "Panorama do Setor de Energia Elétrica no Brasil" , Rio de Janeiro, Memória da Eletricidade.

CONSELHO FEDERAL DE COMÉRCIO EXTERIOR - "Dez Anos de Atividades do Conselho Federal de Comércio Exterior", Rio de Janeiro, Imprensa Nacional, 1944.

DE ARAÚJO, J.L. & A. GHIRARDI, (1987) Substitution of Petroleum Products in Brazil: Urgent Issues, Energy Policy

DE ARAÚJO, J.L., DE OLIVEIRA, A., PICCININI, M., NAVEGANTES, L. (1993), Rational energy use in Brazil: policies, programmes, results , COPED REPORT.

DE ARAÚJO, J.L.R.H., (2001), *Investment in the Brazilian ESI: What went wrong? What should be done?* , Workshop on Competition and Regulation: The Energy Sector in Brazil and UK/EU, Oxford, St. Anne's College, 4-5 June.

DIAS, J. L. de M. e QUAGLINO, M. A. (1993), "A Questão do Petróleo no Brasil - Uma História da Petrobrás", Rio de Janeiro, CPDOC/SERINST, FGV/PETROBRÁS, 1993.

GUIMARÃES, E. A. (2003), "O Viés do IGP e seus efeitos", Valor Econômico, 30 June

HUNT, D. (1989) - "Economic Theories of Development - An Analysis of Competing Paradigms ", New York, Harvester Wheatsheaf.

LESSA, C. (1982), "15 Anos de Política Econômica", São Paulo, Editora Brasiliense, - 3ª Edição

LESSA, C. e FIORI, J. L. (1983), "Relendo a Política Econômica: As Falácias do Nacionalismo Popular do Segundo Vargas", Rio de Janeiro, IEI/UFRJ, TD n.º 30, 1983.

JOSKOW, P. (2000), Electricity sector restructuring and competitions: Lessons learned, mimeo, August.

JOSKOW, P.; SCHMALENSEE, R. (1983), **Markets for Power: The economics of electricity deregulation**, MIT Press, Cambridge (Massachusetts)

MARTIN, J. M. (1966), "Industrialisation et Développement Énergétique du Brésil", Paris, Institut d'Hautes Études d'Amérique Latine.

MARTINS, L. (1976), "Pouvoir et Developpment Économique: Formation et Évolution des Structures Politiques au Brésil", Paris, Anthropos.

NEWBERY, D. (2000), **Privatization, restructuring and regulation of network industries**, MIT Press, Cambridge (Massachusetts)

OLIVEIRA, A. (1977), "Internationalisation du Capital et Developpement Economique: L'Industrie Petroliere au Brésil", Grenoble (França), Université des Sciences Sociales de Grenoble/Faculté de Sciences Economiques, D.Sc. Thesis.

OLIVEIRA, A. e LINHARES PIRES, J.C. (1994), "Setor Elétrico Brasileiro: Diagnóstico e Perspectivas", Rio de Janeiro, IEI/UFRJ, Research Report. (mimeo)

OLIVEIRA, A. e MACKERRON, G. (1992), “Is the World Bank approach to structural reform supported by experience of electricity privatisation in the UK?” Energy Policy, February.

OLIVEIRA, A. e MELO, H. P. “Industrialização e Desenvolvimento Energético 1945/1955”, Anais do XV Encontro Nacional de Economia ANPEC/

PENNA MARINHO, I. (1969), “Petróleo, Soberania e Desenvolvimento”, Rio de Janeiro, Block.

PETROBRÁS (1993), Sistema Petrobrás - Diagnóstico e Perspectiva, Rio de Janeiro.

PINHEL, A. C. da C. (2000). Simulação de uma usina térmica a gás no novo contexto do setor elétrico - Análise Risco X Retorno. M.Sc. Thesis, Rio de Janeiro: UFRJ; COPPE, December.

PROWSE, M. (1991), “Investment in People seen as Key to Third World” e “Economists’ faith in New Consensus raises old concerns” in Financial Times, 8 July.

SKIDMORE, T. (1975), “De Getúlio a Castelo”, Rio de Janeiro, Paz e Terra.

SOARES PEREIRA, J. (1975), “Petróleo, Energia Elétrica, Siderurgia: A Luta pela Emancipação”, Rio de Janeiro, Paz e Terra.

TAVARES, M. C. (1972), “Da Substituição de Importações ao Capitalismo Financeiro”, Rio de Janeiro, Zahar.

VARGAS, G. (1951) “A Campanha Presidencial”, Rio de Janeiro, José Olympio.