BROOKINGS GLOBAL ECONOMY AND DEVELOPMENT

BRAZIL AS AN ECONOMIC SUPERPOWER?
UNDERSTANDING BRAZIL'S CHANGING ROLE
IN THE GLOBAL ECONOMY

BRAZIL AS AN INTERNATIONAL ENERGY PLAYER

DRAFT 1

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ABSTRACT

This paper puts forward an analysis of the current Brazilian energy matrix in terms of its key components—oil, natural gas, hydropower, and biofuels—as well as the policies and market regulations that sustain them. Once this broad picture is established, the paper discusses the sector's main trends and their international implications, both regionally and globally. The hypothesis is that Brazil has been moving from a strict, self-sufficient, fully state-controlled strategy toward a more efficient and energy security approach based on a combination of domestic, regional, and international factors. State control is still an important determinant, but not the central one.

I. INTRODUCTION

Brazil has been rapidly modifying its international strategy and insertion into world energy markets during the course of the last two decades. This outcome was partly planned and state oriented, but also the result of pressures exerted by market forces and civil society at large. This process is also a response to a multidimensional scenario that is imposing qualitative changes on the country's foreign policy and international outlook.

Several features have shaped these developments. In the first place, Brazil presently relies upon a relatively solid and stable macroeconomic context. In this manner, it enjoys a favorable balance of payments and, for the first time, its foreign reserves are larger than foreign debt. In addition, from 2006 onwards, Brazil became a liquid capital exporter. Following the global commodity boom, the country's agribusiness sector grew at extraordinary rates, while the internationalization process of a series of large and successful national firms contributed to creating the new "trans-Latins" category. Firms such as Gerdau, Vale, Petrobrás, Totvs, and Odebrecht gave the country unprecedented regional and international leverage. Contributing to this favorable picture, arguably, has been a degree of political consolidation of domestic institutions, while in the regional sphere, Brazil's presence has grown considerably. In this context, the country's relative prominence in the energy sector constitutes an additional positive factor among many others.

Yet this context only partially accounts for what Brazil is currently experiencing, because part of this phenomenon is rooted in policies adopted during the 1970s and 1980s. Energy is part of a favorable set of multidimensional features, as opposed to being an isolated phenomenon. Consequently, the Brazilian experience is markedly distinct from that of only-oil-exporting countries.

This paper's central hypothesis is that, since the 1990s, Brazil has been moving towards substituting an energy strategy based on the pursuit of self-sufficiency (basically through the maximization of state control) for one of greater energy security and efficiency founded on domestic, regional, and international factors. While state control is still important, it is no

longer the determining factor. Still, the presence of the Brazilian state in this domain is fundamental for both oil and gas strategies.

Thus, this analysis argues that the country's new energy cycle is associated with a new energy foreign policy. This policy is by no means unique; it has considerable differences related to the geographical scope, priorities, tactics, and alliances adopted in each of the different energy segments. It follows that not only do the oil, natural gas, biofuels, and hydropower domains have different market and political dynamics, but also that Brazil's strategies in these subsectors are partially constrained by such dynamics.

Following this introduction, this paper is structured in five sections. The first briefly outlines some structural characteristics of the international political economy of energy while positioning the Brazilian experience in this setting. Second, the recent evolution of the Brazilian energy matrix is qualified in absolute and relative terms. The third section assesses Brazil's energy matrix vis-à-vis developments since the 1970s oil shocks. The fourth section puts in perspective claims that Brazil is now an international energy player. The final section presents concluding remarks.

II. THE INTERNATIONAL POLITICAL ECONOMY OF ENERGY

Energy is one of the most politicized sectors of Brazil's economy. The sector's strategic importance for the country's economic development and national security, the highly oligopolistic nature of the market, the sector's tendency to form natural monopolies, and the historically strong presence of states in both domestic and international markets are some of the contributing factors. At the same time, the energy market is strongly conditioned by economic and technical restrictions as well as by the obvious constraints of resource availability. These restrictions limit, to a great extent, political options and available country strategies concerning this theme, both domestically and internationally.

There are at least five key factors informing the definition of an efficient and secure energy strategy: (1) the quantity and quality of reserves or natural energy resources; (2) technological

capacity, which corresponds to the entire energy chain, encompassing extraction, refining, hydroelectric power stations, transportation, etc;[1] (3) capital availability, as it is a capital-intensive sector and scale capacity is fundamental in this market; (4) the energy transportation infrastructure (mainly ducts and cables); and (5) access to consumer markets.

Countries with all five of these features simultaneously available are rare; this includes the so-called major energy powers and the big oil- and gas-exporting countries. Most other countries are forced to seek part or all of these resources in the international market. While self-sufficiency strategies are feasible, most of the time, they imply extremely high economic costs. Therefore, factors are highly influential in a country's international strategy. The relative standing of a country vis-à-vis each of these five factors is the basic variable for understanding and evaluating its options and strategies.

The following table synthesizes some of the conditioners and restrictions imposed by the factors described above.

Table 1: The Energy Market from the Political and Economic Points of View

	Production	**Transportation**	**Storage**	**Market**
Oil	Resource availability	Easy (oil pipelines, land and naval)	Viable	Global
Gas	Resource and technology availability	Difficult and of regional reach (basically gas pipelines)	Viable, but expensive	Basically regional
Electricity	Vast array of sources (gas, oil, hydro, nuclear, etc.	Difficult and of regional reach	Impossible	Essentially regional
Nuclear	Technology availability and political viability			
Bioenergy	Agribusiness economic viability (natural resources and technology)	Easy (oil pipelines, land and naval)	Viable	Global

Sources: Various, designed by author.

[1] Technology may render the exploration of a river's hydraulic potential economically viable, or the exploration of oil in deep waters, or even the exploration of natural oils to be used as fuel.

As seen above in the table, the key energy-related factors also shape the international dynamics of markets. Technical and economic restrictions in the electricity and gas sectors have rendered those international markets primarily regional, while those for biofuels and oil are global markets. Brazil's international strategy has been shaped by some of the aforementioned factors, including technological and economic conditions, combined with political and geopolitical variables related to the country's relations with African, Middle Eastern, and South American countries. In addition, these conditions play a role in Brazil's performance in the multilateral sphere, be it at the World Trade Organization, the UN, or environmental forums.

III. Recent evolution of the Brazilian Energy Matrix

The Brazilian energy matrix is the result of strategies pursued during the military period (1964–84) and of regulatory reforms and privatizations from the 1990s. The changes during the 1990s did not redirect established tendencies in the country's energy policy, though there were some exceptions, most notably the introduction of the use of gas. By and large, previous policies were further developed taking advantage of the maturation of earlier investments, as was the case for ethanol and oil. The reforms of the 1990s seem to be much more market oriented and economically efficient than previous options. Nevertheless, it is very likely that such developments would not have been made possible without preceding investments and policy options.

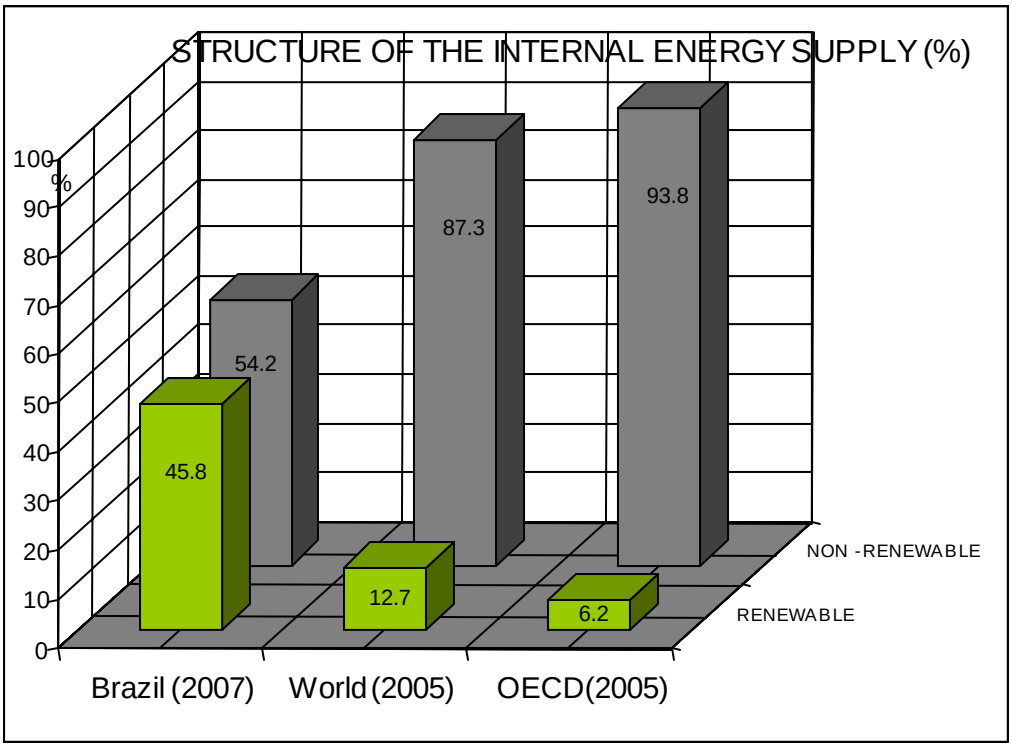
Even though these strategies were not significantly altered, important changes occurred in their international dimension. For example, the strategies' content was altered both in the multilateral spheres—the UN, the International Atomic Energy Agency, etc.—and in terms of the country's international role, as it went from being an oil importer to being an oil, capital, technology, and ethanol exporter.

As was the case in the previous phase, the external dimension of the new energy cycle maintained strong state participation in the oil, gas, and electricity sector. With biofuels,

conversely, there emerges an unusual participation of the private sector parallel to that of the state. A further important contrast to the previous period is that current strategies are greatly in tune with international tendencies to be more market and environmentally friendly.

In terms of the structure of energy supplies, the Brazilian energy matrix is different from that of most developed and developing countries matrixes in several respects. As shown in Graph 1 below, Brazil is positioned considerably above the world average in terms of the use of renewable energy resources, especially when compared to OECD countries.

Graph 1 – Domestic Energy Supply



Source: Ministry of Energy and Mining, Brazilian Energy Matrix Report 2007.

Brazil's relatively high use of renewable resources is primarily due to the intense use of biomass and hydroelectricity, which, combined, account for 45.8% of the Brazilian energy matrix in 2007. On the other hand, as can be seen from Table 2, the Brazilian matrix uses natural gas, coal, and uranium at significantly lower rates than the world average, although the use of natural gas has increased substantially in recent years (ranging from 0.4% to 9.3%

participation in the matrix) and will increase further given new discoveries off the Brazilian coast.

Table 2 – Internal Energy Supply (% and tep)

SPECIFICATION	BRAZIL		OECD		WORLD	
	1973	2007	1973	2005	1973	2005
OIL & DERIVATIVES	45.6	37.4	53	40.6	46.2	35.0
NATURAL GAS	0.4	9.3	18.8	21.8	16.0	20.7
COAL	3.1	6.0	22.4	20.4	24.4	25.3
URANIUM	0.0	1.4	1.3	11.0	0.9	6.3
HYDRAULIC & ELECTRICITY	6.1	14.9	2.1	2.0	1.8	2.2
BIOMASS	44.8	30.9	2.4	4.2	10.7	10.5
TOTAL (%)	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
TOTAL - millions of tep	**82**	**238**	**3.762**	**5.548**	**6.128**	**11.434**

Source: Ministry of Energy and Mining – Brazilian Energy Matrix Report 2007.

Over the course of the past 30 years, Brazil has followed a different path than most countries. It has invested heavily in hydroelectricity; while the world has maintained this energy source at around 2% of its matrix, Brazil went from a level of 6% in 1973 to around 15% in 2007. In addition, Brazil's use of biomass is also comparatively high. Although its use has decreased in relative terms, from 45% to 30%, it has maintained itself at drastically superior levels compared to the world average. Moreover, in spite of the maintenance of firewood and coal participation at surprisingly high levels of around 15%, the participation of biofuels is noticeable at an equal 15% rate. This last development can be seen as the direct result of a governmental program launched in the 1970s named Pro-Alcohol—a program which promoted sugarcane-based ethanol with the purpose of substituting large-scale oil derivatives consumption, and was originally developed to restrict dependence on foreign currencies and pursue energy self-sufficiency in the event of oil shocks.

In this context, it is worthwhile noting that 64% of energy consumption in Brazil is derived from the industrial and transportation sectors; in OECD countries, these two sectors correspond to 51% of energy use, and in the rest of the world to 47%, as shown in Table 3 below. These two energy-intensive sectors are also the main consumers of biomass energy sources, as will be further discussed.

Table 3 – Energy Matrix – Consumption (% and tep)

SPECIFICATION	BRAZIL		OECD		OTHERS	
	1973	2007	1973	2005	1973	2005
INDUSTRY	29.8	37.8	30.8	20.8	35.8	27.5
TRANSPORT	25	26.7	23.3	31.3	23.4	19.7
ENERGY SECTOR	3.3	9.7	8.3	7	6.9	7.9
OTHER SECTORS	38.7	19	30.4	31.5	29.7	37.6
NON-ENERGY USE	3.1	6.8	7.1	9.3	4.2	7.2
TOTAL (%)	100.0	100.0	100.0	100.0	100.0	100.0
TOTAL - millions of tep	76.3	215.1	3,097.40	4,144.20	1,478.30	4,215.50

Source: Ministry of Energy and Mining – Brazilian Energy Matrix Report 2007.

Furthermore, heavy industry is the main energy-consuming sector in Brazil; its participation in the matrix's final consumption went from around 30% in 1973 to 38% in 2007. Thus, on top of a participation rate well above the average for both OECD countries and the rest of the world, over the past 30 years this sector has increased its participation in Brazil's energy consumption, while its relative consumption was drastically reduced in the rest of the world.

In terms of the relative use of energy for transportation, figures have increased substantially in OECD countries, have fallen in the rest of the world, and have remained constant in Brazil. Assuming some energy efficiency gains in transportation equipment, the data indicate the importance mobility acquires as countries develop. In Brazil, transportation grew in proportion to the rise in transportation-energy efficiency; this development has been accompanied by a marked reduction in the share of other sectors (which includes home consumption) in the energy matrix. In other countries, efficiency gains seem to have been larger than the increase in overall energy use.

As shown in Table 4 below, Brazil presents a relatively low pattern of oil and gas consumption for transportation. This is the result of the fact that energy originating from biomass is destined to substitute oil derivatives in the transportation sector, amounting to around 15% of total demand. Only recently has biomass begun to be used for energy generation. However, one should note the extremely low use of electricity for transportation, which is well below the world average and contrasts with the weight of hydroelectricity in the country's general energy matrix.

Table 4 – Energy Matrix of Transportation – Total (% and tep)

SPECIFICATION	BRAZIL		OECD		WORLD	
	1973	2007	1973	2005	1973	2005
OIL DERIVATIVES	98.9	80.9	95.9	96.7	90.9	92.1
NATURAL GAS	0.0	3.9	2.4	1.7	0.2	5.7
COAL	0.0	0.0	1.0	0.0	7.5	0.5
ELECTRICITY	0.3	0.2	0.7	0.8	1.5	1.5
BIOMASS	0.9	15	0.0	0.9	0.0	0.2
TOTAL (%)	100.0	100.0	100.0	100.0	100.0	100.0
TOTAL - millions of tep	19.1	57.4	720.6	1,298.80	346	833.2

Source: Ministry of Energy and Mining – Brazilian Energy Matrix Report 2007.

The program for ethanol use as fuel has regained greater force in recent years. At least three factors have contributed to this: the vertiginous increase in the international price of oil; the development of biofuel motors (and later on, flexfuel, which allows users to adjust the proportion of gasoline and ethanol every time they fill up their tanks); and finally, the development of technology that allows sugar-based alcohol factories to be more productive by using waste originated from their production to generate thermoelectric energy. This waste is then used at smaller factories connected to the traditional ones. Additionally, it can be sold on the wholesale market. In more recent projects of sugar-alcohol factories, the sale of electricity corresponds to around 35% of the projected profit.

The intense substitution of oil derivatives for industrial use experienced in Brazil, which brought figures down to 15% (more in accordance with international averages) is primarily explained by the fourfold increase in the use of energy deriving from biomass, which presently sits at 40%, compared to a 7.4% world average (see Table 5 below). By contrast, the increase in the industrial use of electricity is very small. While OECD countries have started from the international pattern of around 18% of industrial electricity usage in the 1970s, doubling the relative use of electricity in its industry by 2005, the rest of the world experienced a 50% increase, while Brazil saw a relative rise of around 15%. The industrial use of gas energy sources was significant in Brazil, particularly during the 1990s, accompanied by a relative increase in the use of coal.

Table 5 – Energy Matrix Industry (% and tep)

SPECIFICATION	BRAZIL		OECD		OTHERS	
	1973	2007	1973	2005	1973	2005
OIL DERIVATIVES	61.2	15.7	32.6	16.7	23.9	14.7
NATURAL GAS	0.1	9.5	26.6	29.6	20.1	14.7
COAL	10.9	14.3	18.8	12.4	32.6	34.2
ELECTRICITY	17.4	20.4	17.7	33.7	19.7	29.1
BIOMASS	10.3	40.1	4.4	7.6	3.7	7.4
TOTAL (%)	100.0	100.0	100.0	100.0	100.0	100.0
TOTAL - millions of tep	14.6	81.3	954.6	860.5	538.1	1,158.8

Source: Ministry of Energy and Mining – Brazilian Energy Matrix Report 2007.

As Table 6 indicates, Brazil has an energy matrix that does not depend much on international resources, with the exception of coal, which is almost completely imported, and natural gas, of which one-third of the supply is imported. In the case of oil, the greatest part of the country's internal supply comes from local production; with its import volume (light oil) similar to its export volume (heavy oil). The fundamental difference between heavy and light oils lies in their quality. Recent years have pointed to some changes in this picture, particularly concerning growth projections for gas, oil, ethanol, and biofuel production. In all these four cases, there are projects with international effects. In the case of gas, changes are related to reducing dependence on Bolivian gas, and in the remaining cases, the projection is of an increase in exports.

Table 6 – Consolidated Energy Balance - thousand tep (2007)

	Oil	Natural Gas	Coal	Coal Metal	Uranium	Hidropower	Wood	Sugarcane	Others	TOTAL
Production	90,670	18,025	2,268	119	0	32,197	28,635	40,051	7,626	219,589
Imports	20,971	9,093	0	10,821	0	0	0	0	0	40,885
Stock Variation	-270	0	20	11	3,263	0	0	0	-20	3,003
Total Offer	111,371	27,118	2,288	10,951	3,263	32,197	28,635	40,051	7,626	263,478
Exports	-21,813	0	0	0	0	0	0	0	0	-21,813
Rejected	0	-1,783	0	0	0	0	0	0	0	-1,783
Reinjection	0	-3,096	0	0	0	0	0	0	0	-3,096
Gross Domestic Offer	89,558	22,239	2,288	10,951	3,263	32,197	28,635	40,051	7,626	236,786

Source: Ministry of Energy and Mining – Brazilian Energy Matrix Report 2007.

In sum, Brazil has a rather atypical energy matrix in comparison with both OECD countries and the world average. Key features of this matrix are not only the intensive use of biomass for transportation and industry but also the robust utilization of hydroelectricity for domestic consumption. Over the past 30 years, some significant changes in the matrix can be observed both in terms of energy-producing sources and their final use. At the same time,

the country's dependence on imported inputs has fallen drastically, and in recent years Brazil has increasingly become a net energy exporter.

This process has not only distanced Brazil from the average profile of OECD countries and from the energy matrices of other countries; it has also distinguished Brazil's matrix significantly from that of other South American countries, as will be detailed below. This reality reflects the legacy of policies that sought self-sufficiency and a reduction of foreign dependence.

IV. The Present Energy Matrix's Profile and the 1970s Oil Shocks

In the light of the 1970s energy crisis, Brazil sought to pursue an autonomous strategy to secure its economic growth, which relied upon very distinct characteristics in relation to the global average. The country made heavy use of biomass for transportation and industry and counted on hydroelectricity for domestic and economic use (which excludes transportation and industry).

Two national objectives were behind both aspects of this strategy: sustaining economic growth based on strong industrialization, and reducing dependence on imported sources of energy. These efforts were carried out through state policies, not only in the hydroelectric realm but also in that of oil and biomass, with the latter particularly concerned with the use of ethanol fuel.

This concerted effort had a strategic character, which surpassed economic and financial motivations. The initiative was a nonliberal adjustment to the shock produced by the international energy market. It was not merely the case of adjusting the national economy to the international price shock; it was also an effort to render the development and security strategy sustainable within an increasingly hostile international environment where energy was vital. So crucial was the country's strategy of development and industrialization to national security that it justified a thorough political, financial, institutional, and technological mobilization.

These lines of action had a strong international component, mobilizing diplomatic efforts, state-owned companies (Petrobrás, Eletrobrás, and Nuclebrás[2]), as well as the Brazilian private sector. The financial effort of such initiatives was, for the most part, made by the state, which deepened its pattern of foreign fund-raising in order to make its audacious projects viable.[3] These international strategies had a strong regional dimension (particularly in the River Plate region), an Atlantic and Middle Eastern dimension (especially on the Western and Northern African coasts), and a multilateral dimension (principally in the UN and the Non-Aligned Movement).

While these strategies presented internal and external limitations, they did not, however, end up rendering unviable the implementation of the original programs, such as the Pro-Alcohol Program, the construction of the Itaipu hydroelectric power station, and other extensive hydroelectric power stations. Nevertheless, as a consequence of these limitations, the programs experienced constant setbacks, reformulations, and adjustments. In addition, collateral damage took place in terms of (among others) the financial cost involved; the delay in the maturation of returns; and the political, social, and environmental costs of implementation.

The Regional Question

Among the various themes which are part of South America's regional integration agenda, few demonstrate so much potential for economic gains and economic rationality as energy. The great availability and variety of energy resources, the relative proximity between producer sources and consumer markets, complementary seasons, and the existence of state-owned and private companies with business and technological capacity in this domain—all these make energy integration a rather attractive alternative for countries in the region. It is

[2] Although, in the case of the decision to build the nuclear plants of Angra I and II, it is very unlikely that it had actual energy-related objectives or that the objective was to simply master the nuclear technological cycle and enable the country to operate with atomic energy.

[3] Curiously enough, the country's greatest external vulnerability ended up occurring in the financial domain, as it came to be known as the external debt crisis of the 1980s.

estimated that with energy integration, the region would save from US$4 to US$5 billion dollars per year,[4] on top of expressive gains in energy security.

In the South American region, there are both energy-exporting and energy-importing countries. Venezuela possesses the largest oil and gas reserves in the region, occupying the tenth position in the world scale of production of these hydrocarbons. Bolivia has the region's second-largest natural gas reserves and exports mainly to Brazil trough the Gasbol pipeline, which is the region's main private investment in energy infrastructure. Argentina has the region's third-largest natural gas reserves and fourth-largest oil reserves. Brazil holds the region's third-largest oil reserves. Brazil imports electricity from Venezuela to cover consumption in the country's extreme North and jointly owns two electric power conversion stations with Argentina and Uruguay. Chile is highly dependent on the import of energy inputs. Colombia is self-sufficient in oil and exports the remainder of its production. Peru has initiated the exploration of the Camisea complex, which will provide natural gas for internal consumption as well as for partial use by its neighbors. Ecuador is an important oil exporter, and Uruguay does not have oil or gas reserves, importing such inputs for internal consumption. Paraguay holds neither oil nor gas reserves, but it exports hydroelectric energy to Brazil and Argentina. Finally, it is important to note that no oil pipelines connect any country in the region; neither Brazil nor any other South American country possesses the means for transporting oil to any other regional partner.

In light of this scenario, the relatively low degree of energy integration between countries in the region is surprising. In spite of the potential for economic gains from regional energy integration, there has been only a limited adoption of integration initiatives. Existing policies are basically focused on punctual connections between some countries, as opposed to structured long-term programs concerned with the formation of a regional market and the optimization of available energy inputs.

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[4] Rolf Linkohr, "La política energética latinoamericana: Entre el Estado y el mercado," *Nueva Sociedad*, 204, Geopolítica de la energía, Buenos Aires, July-August 2006.

Brazil, as the key country in South America in terms of making regional energy integration a reality, contributes considerably to the present state of affairs. But although the autonomy-seeking attitude of the country's energy strategy persists, pro-integration impulses and interests have been advancing. The 1990s regulatory reforms, which occurred both in Brazil and in the region at large, have contributed to improving the environment for market solutions with a regional scope. Yet these developments have not been enough to produce a significant shift toward regionalism. Moreover, economic and political crises, especially in Argentina and Bolivia in the early 2000s, have led to setbacks.

Until the early 1990s, the energy interchanges among South American countries occurred with strong participation by state-owned firms. The region's states took up the roles of entrepreneur, operator, and regulator for these projects; at times, the private sector would play a secondary role. But these projects were not the result of a joint-optimization strategy of available resources in the region. At most, they were the result of bilateral and punctual actions. It is worthwhile noting that these initiatives refer essentially to regional electricity and natural gas markets, which demand the construction of a physical infrastructure between countries in order for energy to be transported.

The consequences of this extremely low level of regional integration are reflected in the enormous asymmetry among the energy matrixes of countries in the region. Given that energy markets do not communicate with one another, price formation and options available to consumers and firms are strictly conditioned to national supplies and conditions. The latter are, in general, strongly conditioned to state-owned firms operating in the sector.

Table 7 – The Latin American Energy Matrix

Years		Natural Gas	Oil	Hydropower	Nuclear	Coal	Other Biomass
2003	**Argentina**	46%	34%	13%	3%	1%	1%
2003	**Bolivia**	33%	53%	13%			1%
2006*	**Brazil**	9.6%	37.9%	14.8%	1.6%	6%	30,1% **
2003	**Chile**	23%	42%	22%		10%	1%
2002	**Colombia**	17%	44%	29%		10%	
2003	**Ecuador**		81%	19%			
2004	**Mexico**	29%	58%	4%	1%		2%
2002	**Peru**	2.5%	60%	31.7%		5.5%	0.3%
2003	**Paraguay**		12%	88%			
2002	**Uruguay**	1%	47%	52%			
2004	**Venezuela**	40%	39%	22%			

Source: several country reports, several years base, except for Brazil.
* Source for Brazil: Ministry of Energy and Mining (2007.)
** Sugar cane products 14,6%, wood 12,4, others 3%.

The above table synthesizes the energy matrix of selected Latin American countries. In spite of the fact that they are all heavily dependent on oil, which oscillates from 34% to 60% of most their matrixes (with the exception of Paraguay, with only 12%), the case of Ecuador is distinctive, for oil consumption corresponds to 81% of its energy matrix. If one turns to natural gas, Argentina, Bolivia, and Venezuela find themselves in the range of 30% to 46%, and Chile along with Colombia with a range of 15% to 25%. The remaining countries, including Brazil, have 0% to 10% natural gas participation in their energy matrixes. All the other energy sources are secondary, including coal, nuclear energy, and renewable sources. As has been noted above, the Brazilian case is unique for its matrix depends considerably on nonrenewable sources; in this sense, the use of alcohol fuel originating from sugarcane is highlighted.[5]

The region presents a picture of reasonable energy interconnections; however, this does not mean integration between markets. In other words, exchanges of energy inputs between

[5] Although there is not yet any integration program based on renewable sources, manifestations in this direction have been growing. President Luiz Inácio Lula da Silva's special adviser on international affairs is one of the public defenders of this idea.

countries are predominantly bilateral and punctual without involving any convergence between their markets.

Concerning electricity, electric integration initiatives in South America have amounted to an attempt at creating a common electricity market in the Andean Community, as well as to the creation of four power stations and some electric interconnections in the Southern Cone. Thus, in comparison to the oil and gas sectors, the electricity sector is possibly the most advanced in terms of interconnectivity throughout South America. Additionally, this sector claims a reasonably installed infrastructure. Infrastructure bottlenecks do exist, yet they are of lesser prominence than in other segments of the energy market.

Prior to the 1990s, there was only one international gas pipeline in South America. It connected Bolivia to Argentina and began operating in 1988. The construction of gas pipelines is a direct reflection of the economic reforms implemented in the region's countries during the late 1990s. Since then, this domain has come to be characterized by the participation of private firms as they have constructed and operationalized gas pipelines. At present, there are gas pipelines connecting the following countries: Argentina and Chile (since 1995), Argentina and Uruguay (since 1998), Bolivia and Argentina (since 1996), and Brazil and Bolivia (operations started in 1999).

In addition, there are projects in the works that plan to connect different countries in the region. Some of these follow the bilateral pattern, such as the Bolivia-Chile, Bolivia-Paraguay, Peru-Bolivia, and Peru-Brazil gas pipelines. There are other projects still being studied that plan to connect more than two countries; namely, the Mercosur Gas Pipeline, the Austral Gas Pipeline, the Mercosur Energy Ring, and the polemic Great Gas Pipeline of the South connecting Venezuela-Brazil-Argentina.[6]

Nevertheless, in spite of the thickening in South American gas infrastructure, the nationalism of domestic regulatory marks still predominates, with a few exceptions, such as Chile. In

[6] According to the previous minister of energy, Silas Rondeau, this project is in its research phase. Interview in *Abinee Magazine*, December 2006, http://www.abinee.org.br/informac/revista/39c.pdf.

effect, energy nationalism is intrinsically associated with strong state-owned energy companies, whose weight is considerable in both the political and economic spheres. These state-owned firms have not always focused on building efficient matrixes but have often pursued other goals. At times, these firms have been primarily sources of revenue for their countries; at others, they have focused on helping to manage the balance of payments. State-owned firms are also used to finance special political programs in the form of domestic policies or as foreign policy instruments.

Brazil's Energy Strategy and South America

Recent conditions in the international energy market, as well as domestic factors in Brazil, have been rapidly altering the country's international competitiveness in the energy sector. The growth of Petrobrás' technological and managerial capacity, the continuous rise in oil and gas production and refining, and the leap forward taken by the national biofuel industry—all constitute the base for this potentially new pattern in Brazil's international insertion.

Brazil is still the 17th country in the world in terms of proven oil reserves (12.2 billion barrels), and its reserves have grown more than 40% in the past 10 years in a context where world reserves have grown only 14% and most countries have seen their reserves shrink, apart from a few exceptions such as Kazakhstan and Angola. Brazil's total registered reserves—although not yet proven—amount to 18.2 billion, according to the National Agency of Oil, Gas, and Biofuels (ANP).

The same is the case for oil refining and production. With respect to production, Brazil is the 16th country in the world, with 1.8 million barrels/day, a greater than 100% increase over 10 years in the face of an 11% rise in global production capacity. ANP projections for 2020 point to a production capacity of 2.96 million barrels/day; in other words, a 65% increase. The country is the 12th in the world in terms of refining capacity (1.9 million barrels/day) and first in Latin America.

Proven gas reserves in Brazil are of 350 billion m^3 (while total reserves equal 588 billion m^3); however, these have been increasing at a rapid pace over the past years, especially with the

recent discoveries of the Tupi and Jupiter fields. In terms of gas production, the country ranks 35th in the world with 12.7 billion m^3, having grown 95% in the past 10 years compared to the world production increasing only 22%.

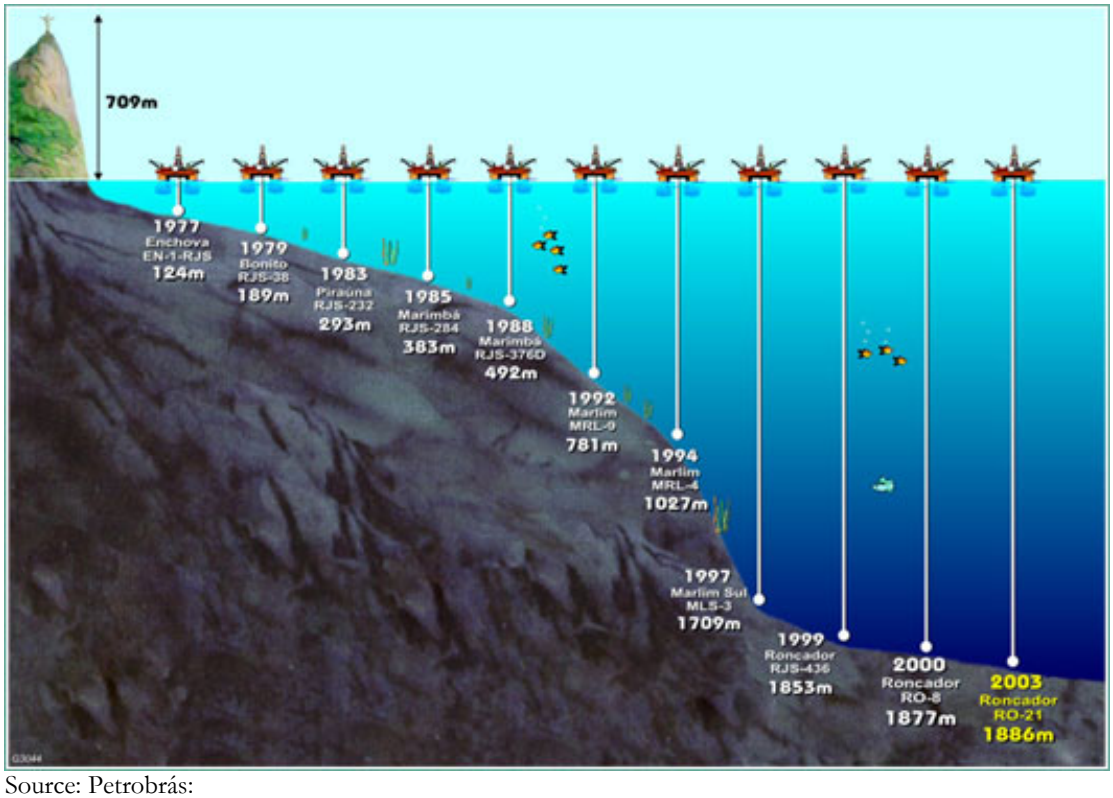
Brazil's biofuels production also took a leap forward over the past five years after experiencing a contraction in the latter half of the 1990s, increasing 70% since 2001 to around 17 million m^3. Brazil's installed capacity for biodiesel production is of 638,000 m^3, although only 10% of its capacity was used in 2006.

Regarding technically usable hydroelectric capacity, the country has the third-largest potential in the world, behind only Russia and China (data from World Energy Council, 2004). The National Agency of Electric Energy (ANAEL) estimates that the potential growth probability of this capacity is 225% relative to presently installed capacity. Some projections suggest that these numbers are likely to increase substantially over the following years.

The increase in Petrobrás' oil and gas findings in Brazil and its international enterprises are basically associated with exploration technology in the country's ultradeep waters. Over 92% of Brazilian oil reserves are found at sea, of which 82% are offshore. The same holds true for the gas sector, where 78% of reserves are located at sea.

The graph below illustrates Petrobrás' technological advancement in oil prospecting and production. The most recent findings—Tupi and Jupiter—are located in the pre-salt layers, which have between 5,000 and 7,000 meters in depth. The first oil well in the pre-salt layers took over a year to be drilled and cost US$240 million. At present, Petrobrás is drilling a similar oil well in 60 days, at a cost of US$60 million.

Graph 2 – Petrobrás Deep Water Exploration Technology Capacity (until 2003)



Source: Petrobrás:
(http://www2.petrobras.com.br/Petrobras/portugues/plataforma/pla_aguas_profundas.htm).

Brazil makes use of oil, gas, and their imported derivatives in its energy matrix, also exporting both oil and its derivatives. In 2006, the country attained a surplus in its oil and derivatives commercial balance for the first time in its history; a fact that was announced as the achievement of energy self-sufficiency. Nonetheless, the actual case is that while Brazil produces an oil volume similar to what it needs for its internal consumption, its production (mainly of heavy oil) has a quality which is not entirely compatible with the country's refineries, as they are made to refine light oil. Brazil exports part of the heavy oil it produces and completes the refinery mix with imported light oil and its derivatives. Following this line of thought, in 2006 the country had a surplus in the sector of 10,000 m^3/day.

The table below shows the gradual reduction in Brazilian dependence on oil imports.

Table 8 – Oil Imports in millions of barrels (selected years)

		1997	2001	2006
North America		**0**	**2,076**	**3,445**
South America		**81,917**	**35,039**	**3,943**
	Argentina	46,518	20,634	664
	Venezuela	34,481	10,828	0
Middle East		**64,779**	**27,666**	**32,669**
	Saudi Arabia	38,123	24,921	22,906
	Iraq	0	1,441	9,764
Africa		**55,353**	**85,658**	**90,890**
	Angola	1,918	5,988	6,890
	Argelia	21,401	29,349	21,830
	Nigeria	31,091	45,215	52,575
Total Imports		**202,049**	**152,481**	**131,942**

Source: ANP, 2007 Annual Report.

It is interesting to note that Brazilian oil imports from other South American countries have been radically reduced, after having expanded in the 1990s, with its principal regional partners being Argentina and Venezuela. The latter had its sales to Brazil reduced to zero in 2006. A significant reduction also took place in relation to purchases from the Middle East. However, Brazil's trade operations with Africa, especially Nigeria and Algeria, have increased significantly.

During the 1990s, Brazilian energy purchases from South American countries were part of a regional policy of political engagement with its neighbors, which also served to counterbalance commercial agreements in other domains. Curiously enough, this trade was drastically reduced in recent years, even during the term of the Luiz Inácio Lula da Silva government, in which rhetoric and statements favoring greater energy integration were very much present.

Yet South America will acquire a more prominent role in the international trade of Brazilian oil and its derivatives. In this case, South America constitutes the main exporting region for Brazil, accounting for 35% of the country's total imports. Attention should be drawn to Argentina, as it is the origin of 25% of Brazil's imports. Moreover, the region is also the

main trade partner for Brazilian oil derivative exports, representing 32% of the country's total exports.

Turning to natural gas, given that Brazil does not possess any significant internal production or any regasification plant, the central point for its integration with its South American neighbors is the construction of gas pipelines that are able to transport gas from producer to consumer markets. To this end, long-term agreements are fundamental. The integration problem here is not related to a lack of gas reserves (available in Bolivia, Venezuela, Argentina, and Peru), but to the low level of political and regulatory convergence between Brazil and the other countries in the region.

As has been observed above, the 1990s saw the construction of gas pipelines in South America, among them Gasbol, the pipeline that transports natural gas from Bolivia to the most industrialized states of Brazil. Gasbol was built as the result of a 1996 bilateral agreement and started operating in 1999. At this point, Brazil began to import growing quantities of gas, from 400 million m^3/year in 1999 to 9.3 billion m^3 in 2006.

The first agreements that established the Brazilian use of Bolivian gas date to 1930, and there were many attempts of this kind over the course of the following decades. Brazil's decision to implement the construction of a gas pipeline, of celebrating a gas supply agreement with Bolivia, and of Petrobrás' massive investments in this country were considered a benchmark in bilateral relations, as well as of Brazil's new regional posture. The process of rendering these developments viable demanded internal and external political engagement from the government of President Fernando Henrique Cardoso (1995–2002), as it required intense action by Brazilian diplomats and faced a lot of resistance from Petrobrás' technical sectors.

The political crisis that followed Evo Morales' election in Bolivia and the nationalization of gas and oil reserves and production in Bolivia did not interrupt gas imports. Still, they generated important effects over costs and Brazilian strategies to this product. This process affected Brazil's average imported gas prices. From an average level of US$80/1,000 m^3, the

value went up to US$98 in 2003 and 2004, US$116 in 2005, and US$159 in 2006. This amounted to a 37% increase between 2005 and 2006.[7]

As was observed above, this product was basically destined for industrial use—particularly in Brazil's southeastern region—as well as for fuel use, predominantly in fleets of buses and taxis. Residual gas was allocated to thermoelectric power stations for use after the 2001 electricity blackout. In addition to the impact of price increases—only partially transmitted to consumers—the political impact was considerable. In the eyes of some Brazilian diplomats, Petrobrás, industry, and public opinion, the episode fanned historical fears of regional energy integration in the face of fragile long-term agreements with unstable neighbors. As a result, Petrobrás announced several years of investment in gas prospecting as a means of reducing dependence on Bolivian gas. The firm also launched studies for the construction of a regasification plant to make possible imports of liquid natural gas from other countries. Furthermore, there are also negotiations and studies in progress for the import of gas from the Camisea region of southern Peru, where production should start soon.

As far as hydroelectricity is concerned, the present situation and future projections have a strong geopolitical element. Itaipu—a binational state-owned firm controlled by the Brazilian and Paraguayan governments—is central to bilateral relations between the two countries. This is partly explained by the history of this investment and by the format adopted in the deal. Itaipu's energy production is divided equally, and one country is conditioned to selling to the other the surplus from its own production. The first-generation utility started operating in 1984, and since then Brazil has imported electricity from Paraguay.

The hydraulic use of the Paraná River (Seven Falls plus Foz do Iguaçu) is an old and controversial theme. However, it was brought back to the fore during the energy crisis of the 1960s and 1970s. At the time, two alternatives involving neighboring countries were considered in order to reduce dependence on oil imports; that is, Bolivian gas and a hydroelectric power station with Paraguay. The Bolivian option was then considered to be

[7] Source: ANP Annual Report 2007.

too risky in terms of supply stability, so the Paraguayan option was pursued, generating a new geopolitical entanglement with Argentina. The Argentines pursued the project as a means of exerting significant influence over Paraguay and controlling the mouth of the Paraná River, located only a few kilometers away from the border between Paraguay and Argentina. The controversy was settled in 1979 with the Tripartite Agreement.

According to the format of the deal, which is presently an issue in the Paraguayan elections,[8] the project was entirely defined, structured, financed, and executed by Brazil.[9] Itaipu was planned to be the largest hydroelectric power station in the world, in terms of water volume, through a US$14 billion project (value of the time). It again brought to light century-old border questions—among them the Paraguay War of 1865–70. Only in 1966 did the countries sign an agreement defining a cooperative pattern to settle their border and hydraulic disputes.

The Itapu project would flood a large part of the land under litigation, and the nonflooded part became a binational ecological park to be administered by Itaipu. In 1973, the Itaipu Treaty was signed, and in 1974, an international mixed-capital firm was created to manage operations and exploration. The power station started operating in 1984, but it only reached its integral capacity in 2007 with the installation of the last of the 20 planned turbines. Moreover, the station almost doubled Brazil's capacity to produce electricity, going from 16,700 megawatts of installed power capacity to almost 30,000 megawatts. In 1997, Itaipu represented more than 25% of the national electric production.

Since then, there have been other large hydroelectric power station projects in Brazil, such as Tucurui and Balbina. Nevertheless, they did not have any significant regional or international connotation. It was only recently that public tenders for the hydroelectric use of the Madeira River, located close to the border with Bolivia, provoked some noise, once the course of the river enters the neighboring country.

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[8] In this year's Paraguayan presidential elections, the theme "renegotiation of the Itaipu agreement" has been central. The candidate ahead in the polls has been using this theme intensively in his campaign.

[9] This work was partly funded by domestic funds and partly funded by international ones. In both cases, Brazil took responsibilities. The international funding will be in place until 2023.

In this manner, Brazil's international trade in electricity is still highly concentrated in Paraguay, as a result of Itaipu. However, after 2000, a series of ad hoc concessions for electricity imports and exports were authorized by ANEEL. This has been done on a limited scale with some neighboring countries, amounting to US$80 million and 900,000 kWh (ANEEL 2006).

Yet there are signs that Eletrobrás—the state-owned electricity firm partially privatized in the 1990s through the sale of a substantial part of its distributing and transmitter stations—is cementing the space to expand its international presence. The Brazilian Senate recently approved a Provisory Measure (No. 396) that authorizes both Eletrobrás and the concessionaries under its control to participate in projects and tenders outside Brazil.

Finally, private-sector actions in the biofuels sector are widely influenced by state actors. Although Petrobrás has recently entered this sector, it remains principally controlled by the private sector. Annual sugarcane and ethanol production has not been linear through the course of the past 10 years; it suffered a significant decrease from 1997 until 2001, recuperating growth again in 2001, and arriving at a 17 million m^3 production in 2007—but the productivity gain has been constant.

Yet the energy balance of the sugarcane ethanol remains remarkably favorable. The relationship between produced and consumed energy throughout the process reveals this differential. In the case of ethanol, this relation is of 9.3, while for beetroot and wheat it is 2 and for corn it stays at 1.4.[10] The Brazilian biodiesel program was approved in 2004 through Law No. 11,097, which establishes targets and deadlines for the introduction of this new fuel in the national energy matrix. Since 2005, the federal government has authorized the addition of 2% biodiesel to all diesel consumed. From 2008 onward, this 2% mix will be compulsory, enabling the market to expand.

[10] This unit represents the amount of energy contained in ethanol per unit of fossil fuel input.

On March 20, 2008, an agreement was signed establishing the pursuit of technical viability studies for the construction of an alcohol pipeline connecting Campo Grande, the capital of Mato Grosso do Sul State, to the Paranaguá port, located on the Paraná State and primarily focused on exports. The Brazilian target for ethanol exports is to surpass the present 500,000 m^3 and reach 4.7 million m^3 by 2012.

After a lot of resistance, Petrobrás decided to enter the biofuels domain. Thus, the target of expanding the company's participation in the ethanol market is part of its 2007–11 Business Plan. In order to secure the supply increase, partnerships are being studied in over 40 alcohol production projects. Petrobrás exported 80 million liters of alcohol in 2006 and is planning to multiply its sales abroad. To this end, the company will invest more than US$1.6 billion in ethanol production, storage, transportation, and distribution. In addition, the state-owned firm is implementing its first industrial biofuel production units, which will generate 171 million liters of alcohol per year and should be inaugurated in 2008. Petrobrás is also studying other projects in various regions of the country in partnership with different types of investors, ranging from big economic groups to rural worker cooperatives.

Ethanol exports have amounted to an average of US$1.6 billion since 2005, with the principal buyers being the United States (almost 25% of total exports), Japan, and Holland. Contrary to what happens in the gas and electric sectors and to what partially takes place in the oil sector, biofuels do not relate to South American countries.

V. VECTORS OF INTERNATIONAL PROJECTION

As it has been noted above, Brazil's international performance in the energy realm is fundamentally centered on Petrobrás. This includes oil, gas, their derivatives, and petrochemical sectors as well as the biodiesel and ethanol sector, although on a smaller scale. The electricity sector is the only one which follows international dynamics alien to Petrobrás, as it is under the influence of another state-owned firm, Eletrobrás.

Yet it would not be incorrect to say that Petrobrás is an arm of the Brazilian federal government, or even of the country's executive power. The company's lines of action, decision-making process, and strategies have reasonable autonomy in relation to not only the federal government but also ANP.

The 1988 federal Constitution consolidated the Brazilian state monopolies over oil and gas exploration and production, as well as refinery, import, export, and transportation activities. Nonetheless, in 1995, a constitutional amendment liberalized the country's oil and natural gas regime, allowing the participation of national and international capital in the different spheres of this industry. In 1997, the Oil Law was enacted, creating ANP and regulating private participation in the oil and gas industry, thus putting an end to Petrobrás' 40-year monopoly. This law also allowed Petrobrás to take part in joint ventures and to create subsidiaries without congressional approval.[11]

The new Oil Law consented that the government should reduce its participation in the state-owned firm to 50% plus one additional share. Until the year 2000, the government possessed 84% of all preferential shares as well as 53% of Petrobrás' total capital. In August 2000, the federal government sold 180 million blocks of 100 shares for US$4 billion. Of the total sum, 40% was sold in Brazil and 60% abroad through ADRs (American Depository Receipts) on the New York Stock Exchange. In this manner, Petrobrás' financial and management reports started to be analyzed and regulated by the Brazilian Securities and Exchange Commission (Comissão de Valores Imobiliários, CVM) as well as by its American counterpart, which supervises open capital firms. Petrobrás' ADRs figure among the principal types of paper traded on the international market.[12] At present, the federal government holds only 33% of Petrobrás' capital; however, it keeps most of the preferential shares (56%).

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[11] Ibid.

[12] Georges Landau and Juliana Lohmann, "Relations between Oil-Producing Countries and Oil Companies in the 20th Century: The Case of Petrobrás in Brazil," paper presented at an International Conference organized by IRICE, CNRS, Paris, September 18–19, 2006.

Even after the end of the monopoly in 1997, and the entrance of some private players in the sector, the giant Brazilian state-owned firm continues to have a dominant presence in the national market. In spite of the liberalization of private-sector participation in different energy domains, Petrobrás still leads in all sectors, controlling 95% of crude oil production in the country. Downstream, this leadership is also observed as Petrobrás was allowed to keep existing refineries, and private companies intending to invest in new refineries need ANP's approval. In the transportation sector, Petrobrás is charged with the maintenance of the existing gas pipelines; nevertheless, it does so through its subsidiary Transpetro, which controls gas pipelines, maritime terminals, and oil pipelines. Private companies are allowed to build new gas pipelines, as well as use Petrobrás' existing pipelines, albeit through the payment of tariffs.

Furthermore, apart from Petrobrás, Brazil's international action in this field is centered on a few private firms from the petrochemical sector, most notably Braskem. Grupo Ipiranga is the other important company doing business in the sector, both in petrochemicals and distribution. It was recently bought out by Petrobrás. Although Petrobrás is listed on the São Paulo and New York stock exchanges, the firm keeps an influential management and technical apparatus in relation to the Brazilian Congress, ministerial organs, and national public opinion. The company's recent efficiency gains and profits have made its influence even greater.

The firm's revenue in 2007 was US$100 billion, with profits of US$12 billion. Additionally, Petrobrás keeps 70 drilling rigs (43 of which are at sea), 12,395 oil- and gas-producing wells, 109 production platforms, 15 refineries, 23,000 kilometers of pipeline, and a fleet of 153 ships (54 of which belong to the company); it also has 3 fertilizer factories and almost 6,000 retail units.

Petrobrás, already active in 26 countries, is principally focused on exploration and production. However, the company has been advancing its performance in gas and energy in general, as well as the refining stages and trade. After going through financial restrictions in the 1990s, Petrobrás recuperated its investment capacity, and from 2003 onwards it decided to speed up its internationalization process. Today, around 8.5% of Petrobrás' proven

reserves are located abroad, especially in Argentina, Nigeria, Peru, and Venezuela. It holds a similar standard production capacity internationally, although its principal bases are in South America, most notably in Argentina. The company's liquid receipts abroad in 2006 were worth US$6.5 billion.

Petrobrás has audacious international plans for the following years, in various fields of action. Its 2008–12 investment plans foresee investments of US$112 billion—around US$22.5 billion per year—out of which 13% should be invested abroad. The company's target is to arrive in 2020 as one of the five main integrated energy companies in the world. Its 2012 target is to export around 770,000 barrels of oil per day through a combination of its international production with its surplus in Brazil.

Petrobrás' presence in South America is growing and is a central part of its strategic planning for the next 10 years; while activities in Argentina, Uruguay, and Bolivia have a place of prominence in such plans, there have been intense discussions over Venezuela. In the latter case, projects also imply some PDVSA (Venezuela's state-owned oil firm) participation in Brazil, whether through gas pipelines or investments in refineries.

On December 13, 2007, PDVSA and Petrobrás signed an agreement to create a joint company for the construction and operation of the Abreu e Lima Refinery, which will be located in Pernambuco. The company's participation shares should be divided with 60% for Petrobrás and 40% for PDVSA, with staff from both state-owned firms operating the enterprise. By means of the same agreement, PDVSA has granted Petrobrás, which has already been participating in projects in the Orinoco Basin, the right to take part in improved oil production in Venezuela.

Of Petrobrás' international investments, exploration and production is the segment that will receive the greatest sum, totaling US$15 billion in investments, of which US$10.5 billion (70%) will prioritize projects in Latin America, West Africa, and the Mexican Gulf. Nevertheless, if oil prices are kept at the current level, this picture could be altered in eight to ten years, the estimated time frame for the new oil and gas findings at the Tupi and Jupiter fields to become productive. These new reserves were announced at the end of 2007, and

are located under the pre-salt layer —that is, at more than 5km depth; 2 km of water, with the remaining 3 km being soil—with an estimate of 5 to 9 billion barrels of light oil. Such findings could represent a 50% increase in Brazilian proven reserves, elevating the country's position in the sector's world ranking considerably. While the technical viability of the exploration of these new reserves does not seem to be a problem, its economic viability is questionable as exploration costs are significantly high.

An additional factor that could alter this scenario in an even more decisive fashion is the discovery of the Carioca field. In this case, estimates are still extra-official, but they point to reserves on the order of 33 billion barrels, as can be seen from Table 9 below.

Table 9 - Oil Findings

INDEXES	TUPI	JUPITER	CARIOCA
Status	Official statement from Petrobrás	Official statement from Petrobrás	Unofficial statement
Start Exploration Date	2012	2013/2014	--
Potential Recoverable Volume	5 to 8 billion barrels (Boe)		33 billion barrels (Boe)
Oil Quality	Light oil of high aggregate value and Natural Gas	Natural and Condensed Gas	

Petrobrás defines itself as an integrated energy company that acts on six fronts: (1) exploration and production; (2) refinery, trade, and logistics; (3) distribution; (4) gas and other energy; (5) petrochemical; and (6) biofuels. While the exploration and production area has less of a geographical dimension, the refinery, trade, and logistic front focuses on the South Atlantic region, and the gas and other energy and petrochemical fronts are primarily tuned to South America. In the case of biofuels, activities center on the global market.

The clear definition of different geographical areas of action, according to a specific energy market segment, feeds the hypothesis that Petrobrás does not directly and automatically reproduce the federal government's priorities and policies. In many cases, their relation is symbiotic and of mutual support; however, it can be clearly divergent in others. If within the federal government there is no consensus or unique line of action on the international sphere, it is unlikely that this could occur with Petrobrás.

As has been seen above, the electricity sector's international articulation has a clear South American focus, particularly in the Southern Cone. Its project seems to be far less structured and advances at a slower pace than the oil sector. Eletrobrás is taking initial steps towards internationalization, but the very peculiarities of the electricity segment restrict the options of both the company and the state. Additionally, this is a less capitalized firm with less of a technological differential than Petrobrás.

Even if the electric segment does possess a wide array of interconnections and a binational power station, it does not make use of this condition in order to attain a regional projection. An additional distinction from the oil sector is that the electricity sector is not seen as an element that can articulate industrial policy and stimulate other production chains; thus, it mobilizes fewer interest groups and political segments.

As far as biofuels are concerned, the situation is even more dispersive in terms of strategic coordination. It was only recently that the sugar-alcohol sector managed to articulate its strategies with public policies in a broad fashion that encompassed the international sphere. Up until this point, the sector's traditional political influence was directed to price politics and had an oscillating relationship with energy policies which was always conditioned to the relative prices of sugar and alcohol.

The sector only started to act more broadly and in a reasonably coordinated fashion in the international sphere when it was able to associate production chain interests with those of the machinery and automobile industries, as well as to the country's energy needs and environmental rules. Without these conditions, a "left-wing developmentalist" government

such as that of President Lula could not have incorporated biofuels' international agenda in such an integral manner.

As has been previously observed and in great convergence with Petrobrás' strategy in this sector, the biofuels market and international policies are global (a regional agenda on the theme is practically nonexistent) and affect the subsidy and other issues related to multilateral trade and environmental forums such as the World Trade Organization and the Kyoto Protocol.

VI. CONCLUSION

Brazil's new energy cycle emerged in the 1990s, conditioned by marked changes in the international scenario as well as by domestic factors. Moreover, it is clear that this new cycle will reformulate the country's international performance and presence, as far as energy is concerned. Even if references to self-sufficiency and a reduction of vulnerabilities are still present, the new energy strategy has forcefully incorporated market standards and efficiency parameters. Certainly, this strategy has achieved the ends of preserving a strong state presence in the sector and, first and foremost, preserving the central role of the main state-owned energy firm, Petrobrás.

At the same time, efficiency gains and technological advancements, both in the biofuels domain (production, motor technologies, distribution logistics, etc) and in oil prospecting and production in deep waters (feeding promising projections for the national oil and gas sector) have contributed to Brazil's new international role in the energy sector. On a smaller scale, bets on the country's hydroelectric potential have also ended up favoring this process.

In conclusion, in all these four Brazilian energy segments, the present context would not have been possible if it had not been for direct state intervention, whether through its firms or strong subsidies and regulations. These policies have had enormous costs for the country and contributed to deepening the economic crisis of the 1980s and 1990s, particularly in its financial dimension. Nevertheless, since that period, some of the positive effects of such a

line of action have contributed to redefining Brazil's energy strategy under extremely favorable conditions.