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State or Market? Strategic Choices in Brazil's Energy Sector¹



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Brazil is endowed with a unique combination of natural resources, land, climate and people, together with a dynamic economy and democratic institutions. No less than 26 percent of its energy is derived from renewable sources; 83 percent of its electricity is generated by hydropower. It has 22 percent of the planet's potable water, and the largest potential for biomass. By 2013, it will be the fifth largest economy. In short, it has everything to be a success in anything it undertakes.

And yet one of the country's Achilles' heels is the energy sector, not for lack of natural resources, but rather due to their mismanagement, burdensome regulatory structure and taxation, and dysfunctional rather than integrated energy planning. Politics permeates the process. In Lula's government it is in turn infused with a statist-interventionist ideology that is dissuasive of foreign investment in energy infrastructure. Brazil is both a giant producer and consumer of energy, and is expanding on both counts at an exponential rate.

Blessed with the recent discovery of as yet unquantified, but probably gigantic hydrocarbons resources at the pre-salt level – preliminary estimates suggest up to 50 billion barrels BOE – Brazil faces the opportunity of becoming a major oil and gas exporter, assuming that the required financing can be found, and with it the technology mobilised to extract crude oil economically from a depth of 7,000 metres below the ocean's surface, at a distance of over 300 km from the coast. Both the financial and the technical challenges involved are immense, as is the task of training the manpower required, ensuring the domestic manufacture of machinery and equipment to meet demanding local content commitments, and building the 214 vessels, most of which have yet to be tendered, are needed as auxiliary and transport craft. These are daunting demands.

¹ The opinions expressed in this article are the author's own and do not necessarily reflect those of any institution with which he is affiliated

There are a few perverse risks involved as well. One is the danger of contracting the 'Dutch disease', even if the government has created a fund that will absorb, and disburse for social development purposes, excess liquidity from pre-salt revenues. Another is that, in a continent where energy diplomacy plays a pre-eminent role in international relations, Brazil may have to continue buying 30M m3/d natural gas from Bolivia, for political reasons, beyond the expiration date in 2019 of the current GSA, although Brazil itself would by then have a surfeit of gas. Yet another risk is that Brazil's economic growth continues to proceed at such a rate that, by the time pre-salt reserves are commercially exploited, as of 2016, domestic demand is such that there will be virtually no surplus left for export. At least, however, the country will then be self-sufficient in oil, as indeed it is now.

Petrobras announced on 15 January 2010 the volume of its proven domestic reserves of oil and gas: 14,865 billion barrels (by SPE measuring criteria), in 2009, a 1.5 percent reduction from the previous year (220 million BOE) resulting from the non-inclusion of Petrobras' reserves in Bolivia. According to the International Energy Agency (IEA) Brazil's oil production in 2010 will be the highest outside OPEC, increasing by 160,000 barrels per day, to 2.7 million barrels per day. The Agency reports that pre-salt output will rise significantly as the Tupi field will enter this year the first phase of commercial production, with 100,000 barrels per day through to December. The IEA sees the Brazilian Congress as lagging behind on the approval process for the pre-salt regulatory framework, and this institutional paradigm is essential to determine the speed at which reserves may be developed.

THE ENERGY MATRIX

The Brazilian energy matrix is dominated by hydropower (71 percent of the 105,900 MW of installed capacity), of which there is still an enormous untapped potential. The government has in recent years begun developing some very large hydropower complexes, mostly in Amazonia (two on the Madeira river (6,450 MW), and one at Belo Monte (11,220 MW) on the Xingu) but the effort has been plagued by the difficulty in procuring environmental licences from the federal Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), as well as its counterparts in the states. IBAMA takes a 'holier-than-thou' approach that often results, paradoxically, in the need to build and operate oil-fired interruptible-cycle thermo-electric plants, which are of course much more polluting than the hydro-electric ones. IBAMA is unable to cope with the rhythm of expansion of Brazil's power sector, and has now under review, for purposes of granting environmental licences, no less than 24 hydro-electric projects large and small, which in the aggregate amount to 33,440 MW, i.e. over twice the capacity of Itaipu (14,000 MW). This is a serious problem that the government has not been able to solve.

The global financial crisis, resulting in a strong economic deceleration in Brazil in late 2008 and early 2009, had one positive effect: it reconciled supply of and demand for electric power. According to the National Operator of the Electric System (ONS),

the average demand in 2008 and 2009 has remained virtually stationary, at 51,897 MW, while supply has grown by 3,174 MW. While there are huge hydropower projects planned or under construction, until 2013 generation will grow increasingly in the form of thermo-electric power plants. By that year, the average offer of electric power will be 68,712 MW, with demand averaging 64,664 MW, i.e. leaving a positive margin of 4,048 MW. However, there is lingering uncertainty about 19 new thermo-electric plants due to come on stream between 2010 and 2011. Most of those in the Northeast are oil-fired, with diesel-powered plants produce about 3,900 MW. Over 60 percent of Brazil's hydro-electric potential is located in the Amazon region, which raises environmental licensing problems and resistance from local indigenous populations. Thermo-electric plants account for 23.6 percent of Brazil's current electricity generation, with hydro-electric plants accounting for 71 percent. 93 other plants, amounting to 11,500 MW generating capacity, are under construction, and about 58.8 percent of the electric power to be generated by these plants (3,900 MW) will come from fossil-fuel fired thermo-electric plants.

It is clear that the national power grid is vulnerable to man-made or natural accidents and that this is principally due to lack of investment in the system. Indeed, federal investments in infrastructure are pitiful: By August 2009 Eletrobras had invested only 38 percent of its budget for infrastructure. The Ministry of Mines and Energy this year lost R\$6 billion (US\$3.53 billion) of its resources earmarked for investment. The cost of transmission rose 500 percent over the last ten years. R\$10.5 billion were invested

(US\$6.17 billion) to expand the grid by 26,000 km, according to the Brazilian Electricity Regulatory Agency (ANEEL).

Even before pre-salt reservoirs begin to be commercially exploited, Brazil will have a surfeit of natural gas. By September 2009, the country had accumulated a surplus averaging 38M m3/d that will rise by another 10M m3/d in mid-2010, with the entry into operation of the Mexilhao field in the Santos basin. Once pre-salt fields come on stream, the surplus may rise to 80M m3/d. Antonio Menezes, head of the gas and electric power division of Shell Brazil, ascribes the glut of natural gas to the current model of the electric power sector, which discourages investments in gas and energy. Thermo-electric plants are only activated on an emergency basis, in periods of drought, and almost all electric power is still derived from hydropower. Menezes observes that after 2020, when pre-salt will be exploited at full tilt, Brazil's gas reserves will amount to at least 1.8 trillion m3, part of which could be exported.

Current demand for gas in Brazil averages 40M m3/d, more than half of which is imported from Bolivia under an agreement signed in 1999 which will remain in force over the next ten years. The question that then arises is what will Brazil's posture be in regard to Bolivia, even admitting that, for political rather than economic reasons, natural gas will continue to be imported from the country beyond the expiration of the contract in 2019. Nobody seems to know in either country. At the end of 2009, Brazil gave two "Christmas gifts" to Bolivia. One, a contractual consequence of the 1999 agreement provides for quarterly price readjustments, which means that since January 2010 Brazil pays about seven percent

more for Bolivia's gas. Two, under the Act of Brasilia since between presidents Lula and Evo Morales in 2007 and additional provisions agreed on 18 December 2009 between Petrobras and Bolivian state firm YPFB, the former will compensate the latter for the use of "rich liquid components" (of high caloric value) contained in Bolivia's natural gas retroactively to 2007 and up to 2019. This will yield Bolivia extra revenue of about US\$100 million per annum, or US\$1.2 billion aggregate. Petrobras resisted as much as it could, but in the end abided by Lula's political decision to aid Bolivia.

Nuclear energy is expanding: in addition to the existing two thermo-nuclear plants (at Angra dos Reis, near Rio de Janeiro), the government has started to build a third one at the same location, and plans to build six other ones, with an aggregate capacity of 6,000 MW, by 2020. It is noteworthy that Brazil has the world's sixth largest uranium reserves and has developed its own uranium-enrichment technology for peaceful purposes, under IAEA supervision.

As to alternative sources of energy, one of the most dynamic components of the matrix is that of biomass, of which Brazil has the largest reserves on the planet. In 1975, as a corollary to the first OPEC oil crisis, the Pro-Alcohol programme for the production of ethanol was created, and Brazil has been at the forefront of biofuels technology and use as an automotive fuel. Prospects for continued expansion of the sector, domestically and for export, are impressive. However, ethanol is losing its competitive edge over petrol, in terms of price, mostly in Brazil. Given the recent rise in sugar prices worldwide, an increasing proportion of sugar-cane production is devoted to sales of the commodity than to ethanol processing. Accordingly, the government has decided to reduce the proportion of ethanol added to petrol, as of 1 February 2010, from 25 to 20 percent. Meanwhile, other alternative sources such as solar energy and wind-power are peripheral to the energy matrix.

THE INSTITUTIONAL STRUCTURE

Brazil has a complex institutional framework for managing its energy sector, but it works most of the time in an un-coordinated fashion. It is also ponderous and unwieldy. At the political level, the President of the Republic takes the most important policy decisions, assisted by the Chief of the Civil Cabinet of the Presidency and by the Minister of Mines and Energy. There is an advisory body to the President, the National Council on Energy Policy (CNPE), whose duties include definition of the areas to be auctioned for exploration and production (E&P). There are also two normative-regulatory agencies, respectively for the electric power sector (ANEEL) and for petroleum, gas, biomass and alternative sources of energy (ANP). Finally, there is a federal Enterprise for Energy Research (EPE), which undertakes planning for the electric power sector, in which there is also a federal holding company, Eletrobras, which has regional and sectorial affiliates, and there is a National Operator of the System (NOS, an agency that manages the power grid).

In the petroleum and gas sector, there is of course Petrobras, with an array of subsidiaries both domestic and foreign. These include BR Distribuidora (fuels distribution), Transpetro (transport), and Petrobras Bioenergia (bio-fuels). The Board of Petrobras is heavily political, and is currently chaired by the Chief of the Civil Cabinet of the Presidency – Ms. Dilma Rousseff, Lula's candidate to succeed him as President in the elections of 3 October 2010.

As regards pre-salt, the Lula government decided in 2009 to propose to Congress – where the legislation is pending – an entirely new structure, as follows: (a) a production-sharing system (rather than the concessions system in force for conventional E&P); (b) a new public enterprise, 100 percent state-owned, provisionally called Petro-Sal, whose function it will be to manage all pre-salt resources; (c) a Social Fund, to administer the revenues derived from pre-salt, other than those earmarked for federal, state and local royalties; (d) capitalisation of Petrobras, which will be sole operator of pre-salt projects and will have at least 30 percent participation in those allocated to other enterprises. The Chamber of Deputies approved on 9 December the basic text of the bill establishing the production-sharing system, which was hotly debated for two weeks, and now proceeds to the Senate. In the Chamber of Deputies, the government had to yield on several counts to states and municipalities on the tricky issue of allocation of royalties.

There are several major bottlenecks for the development of Brazil's pre-salt resources, even assuming that all the other conditions are met: that the regulatory framework is in

place, the colossal financing and complex technology can be found, the huge fleet of the auxiliary vessels is built on schedule, and a crash programme implemented to train the required manpower at different levels. The other principal remaining obstacle relates to procurement, given the government's policy – soon to be embodied into law – for the promotion of local content, if need be at the expense of price, beyond the current minimum of 65 percent. The problem will be to develop a Brazilian suppliers' chain for those E&P systems and equipments, for example special offshore drilling platforms and other sophisticated machinery and electronics, rendered scarce by heated world demand, and which will have to be produced domestically, for the first time, to serve Petrobras' needs.

Just before Christmas 2009, the company's president, Jose Sergio Gabrielli, described the problem, and the company's reliance on the government's Programme for Mobilisation of the National Petroleum and Natural Gas Industry (PROMINP) to identify the many bottlenecks and overcome them. For instance, there is currently no production in Brazil of certain corrosion-resistant steels, nor certain gas-powered turbines, rivet compressors, certain types of valves, cranes, etc. Entirely new metallurgical, chemical and other systems will have to be devised. Gabrielli said that Petrobras is establishing the necessary infrastructure, and co-operating with a number of foreign firms on setting up in Rio de Janeiro research and tool-manufacturing facilities. The company also has available funds to finance technological innovation for domestic suppliers, but the challenges remain daunting.

SPECIFIC ISSUES

The dysfunctional state of Brazil's current energy system is attested to by the question of refining. In 1995 Petrobras lost the monopolistic position it had enjoyed in regard to the oil and gas sector since the creation of the company in 1953 by president Vargas. Petrobras thrived after the Petroleum Law of 1997, proposed by president Cardoso, which created ANP and the system of annual tenders (Rounds) of concessions for E&P, in which foreign oil companies became active participants – mostly in partnership with Petrobras. There are nevertheless certain segments in which Petrobras to this day enjoys a virtual monopoly, by its ownership of most pipelines and gas pipelines, as well as refineries. Paradoxically, until very recently, when a conversion programme was put into effect, most of Brazil's refineries were incapable of processing Brazilian crude oil, which tends to be low-grade, heavy and acid. They were designed to process imported, of which for 45 years Petrobras produced very little anyway. Conversion of these refineries, while necessary, is very costly. For political reasons, Petrobras is partnering with Venezuela's PDVSA to build a refinery at Suape, state of Pernambuco, which will process both imported Venezuelan and Brazilian ultra-heavy crude, at a cost of US\$23 billion, including vast overruns.

This episode raises the basic issue of whether Petrobras, the world's fifth largest international oil company in terms of market value, operating in 25 countries, and with over 36 percent foreign shareholders, is primarily a branch of the Brazilian state or an integrated, competitive international energy company. Under the Lula government,

political interference in Petrobras' strategic corporate policy decisions has become routine, for example when the company started E&P operations in Cuba and Iran, or when it had to yield to Evo Morales' expropriation of two Petrobras refineries in Bolivia. The chairperson of the Board of Petrobras is the Chief of the Civil Cabinet of the Presidency, and two cabinet ministers sit on the Board. Small wonder, then, that there should be such interference. The company's staff has a core staff of excellent technical level, but departmental directors are selected primarily on a political basis.

REGIONAL ENERGY INTEGRATION

Where Europe has the Energy Charter Treaty to foster economic integration, South America does not have anything similar, except for pious exhortations from regional integration institutions, and mechanisms, of which there are many. And yet the region has the potential for such energy integration, given the complementary nature of South America's national energy mixes. Argentina used to export natural gas to Chile and to Uruguay but, having adopted policies dissuasive to foreign investment in the energy sector, now imports gas from Bolivia, and even intermittently, from Brazil (as well as electric power). Bolivia lives off natural gas, selling it to Argentina and Brazil, although the latter no longer needs it. Brazil on occasion buys oil from Venezuela, exports electricity to Argentina and Uruguay, and generally engages in intermittent trading in energy with its neighbours. There is not, however, a strategy for energy integration. Brazil intends to build six hydropower plants in Peru, yielding 6,000 MW, which, when this capacity comes on stream, should be exported

to western Brazil, but the length of the transmission lines (1,600 km) would probably make this a very onerous proposition. Brazil itself has a problem with Paraguay, which co-owns on an equal basis the Itaipu hydropower plant but sells to Brazil 95 percent of its 50 percent share of the 14,000 MW the plant generates. Again, for diplomatic reasons, the Brazilian government, under Lula, has yielded to several Paraguayan demands, including a sizeable (7 percent) rise in the price of the electricity it purchases, which is being passed on to consumers.

Petrobras is active throughout South America, and also has operations in the Caribbean, the gulf of Mexico, West Africa and Central Asia, and Eletrobras was recently given the legal authority to extend its operations abroad (hence the Peruvian projects). The National Bank for Economic and Social Development (BNDES) finances Brazilian public and private enterprises engaged in overseas operations, several of them in the energy sector. In addition, there are substantial development aid projects sponsored by the Brazilian Co-operation Agency (ABC), part of the Foreign Ministry.

New important actors have recently appeared on the scene – China and India – both with insatiable appetites for energy resources. An Indian company is involved in Brazilian E&P; China has lent Petrobras US\$10 billion, and is building a gas pipeline in eastern Brazil. There are also technological exchanges between Petrobras and its Chinese counterparts. As pre-salt develops, one can expect China, which is also active in other South American countries, will take a more proactive stance regarding E&P in Brazil.

CONCLUSIONS

What are the prospects for the future? It all depends on who should be elected president of Brazil next October, and taking office on 1 January 2011. If it should be Dilma Rousseff, Lula's anointed heiress-apparent, we could expect more of same – i.e. a populist administration, favouring state interventionism in practically every sector of the economy, and most assuredly in the strategic energy sector. Should the elected president be Jose Serra, currently governor of the state of Sao Paulo, one could expect a performance-orientated administration, austere managed, with less international protagonism than Lula's, and – probably – less sympathy for Brazil's populist spendthrift neighbours. Since the electoral campaign does not officially start until April 2010, there is always the possibility that another candidate may surface. But, at this stage, that is unlikely. ■