Energy in Brazil

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Brazil is better placed than most countries to deal with the twin challenges which will dominate the global energy system in the coming decades: reducing emissions of energy-related greenhouse gases, and finding other sources of energy to replace the finite oil resources which are being depleted. Brazil already has in place the key elements which other countries need. Some 45 per cent of the energy it consumes is from renewable sources: hydroelectricity, charcoal and commercial firewood, and sugar cane products. Hydroelectricity supplies 85 per cent of electricity in Brazil. Biomass in various forms supplies 30 per cent of the commercial energy consumed.

Brazil's more difficult challenge is to halt and reverse deforestation, (particularly of the Amazon basin) which accounts for 50-60 per cent of Brazilian greenhouse gas emissions.

Overall, the Brazilian economy in 2007 used 30 per cent more energy to produce US$1,000 of GDP than the US, but 60 per cent less than in China, 70 per cent less than in Russia, and about half that in India. Because of the country's high renewables use, CO_2 comparisons are even more favourable to Brazil, with emissions per unit of GDP about half the world average and just over a third of China's. However, Brazil's emissions are increasing.

Brazil can only maintain and improve its advantaged position if it can overcome constraints on the further exploitation of its renewable resources. New hydropower schemes and land conversion for biofuels face environmental objections from within Brazil, from groups anxious to protect unique ecosystems and indigenous communities. Because of this, Brazilian energy policy is shifting to bring into play new resources such as wind and solar, and is committed to an expanded nuclear programme as well as incentives for energy efficient appliances and energy management. In the longer term, climate change itself will affect Brazil's renewables options through its effect on rainfall, water supply, and land use.

Development also needs investment. The micro-economics need to work for projects. The economy is strong and the banking and public finances have proved relatively robust. Brazil has achieved a mixed, state-led market-oriented economy of private and public sector investment. It exhibits a unique combination of state investment and development funds, state controlled companies (with private investors) which dominate their sectors, competing private sector Brazilian companies, and foreign companies attracted by Brazil's market size and resource potential. Brazil is the fifth largest country in the world, with a surface area twice that of Europe (and 40 per cent of its population), spread over 40 degrees of latitude. As well as diverse agricultural, forest and mineral resources, and an internationally competitive manufacturing industry with a strong engineering component, Brazil now has expanding reserves of offshore oil and gas.

Power

The power sector is at the heart of Brazil's 21st century energy challenge. Technically, hydroelectricity could support the growth of energy demand. Though the economics of power generation deteriorated after the Brazilian devaluation of 2001 when real prices were capped, low-cost capital is available from a variety of government funds. Brazil has an electricity market, with 70 per cent of distribution and 15 per cent of generation under private control, including major foreign utility companies.

Inventories of hydropower reserves are 112 GW, with a further 32 GW estimated probable, compared to installed capacity of 73 GW. To maintain water reserves for use in dry years, capacity utilisation is normally around 55 per cent, but has risen because of years of low rainfall which have therefore weakened the security of hydroelectric supply and forced rationing in some years.

Brazil is now looking to diversify its sources of power generation. Brazilian energy minister Edson Lobão has called for a reduction in hydropower production, to be made up by expansion of wind power; the construction of four new nuclear power plants (reversing a trend of difficult nuclear projects in the 1980s and 1990s) and new gas and oil plants to provide security against deteriorating and uncertain rainfall. The government has proposed legislation requiring new fossil-fired plants to plant trees to offset their emissions.

The building of new large hydroelectric schemes in Brazil is also inhibited by social and ecological constraints as shown by controversy over the US$17 bn Belo Monte Project in the Amazon. Brazil therefore looks to neighbouring countries to supplement its hydropower. It already buys almost all Paraguay's share

of power from their joint venture at Itaipu. A superhigh voltage connection brings in power from Guri in Venezuela. Eletrobrás is studying the possibility of building five new plants in the Peruvian Amazon and one in Guyana.

Biomass

Over 50 per cent of Brazilian biomass production is consumed in industry (mainly charcoal) and about 12 per cent in transportation (ethanol produced from sugar cane). Brazil now consumes more ethanol than gasoline and almost all new cars sold are "flex-fuel", capable of using 85 per cent ethanol in blend with gasoline. However, half of Brazil's transport fuels are diesel, to which ethanol does not contribute. Biodiesel production, from soyabeans, is mandated to supply 5 per cent of the diesel market by 2013, two and a half times its current level of production.

Sugar cane is produced mainly in the north east and the south, on arable land with high rainfall and temperatures. About half of all cane production is used for ethanol. About a third of Brazil's available arable land is not systematically cropped so that there is scope for expanding ethanol production for export as well as for the home market. Brazil is a low-cost ethanol producer, and faces protective tariffs in the US and Europe. The Amazon basin is not suitable for cane production and the problem of Amazon deforestation/reforestation is not directly connected with ethanol, though it may be affected if sugar production displaces ranching or other crops, such as soy, which are then diverted to encroach on forest land.

Increasing production of soya bean for biodiesel is itself a potential threat to forests. Soya beans are the main source of biodiesel, which is key for expanding the use of renewables in the diesel market.

Petroleum

Oil products account for around 40 per cent of Brazil's energy consumption, and half of oil consumption is in the transport sector. Oil production in Brazil exceeded consumption in 2008 and is set to grow from recently completed projects. 2006-9 Discoveries of large reserves of light oil and condensates in the Tupi and Guará reservoirs in the sub-salt strata offshore have transformed the future of the Brazilian oil industry: The reserves are large and high-cost (at a depth of 4.5 miles) and will be developed in stages, so that Brazil will be a net exporter – but not a major exporter, for many years.

Following the pre-salt discoveries, the government is in the process of revising the petroleum regime. The existing concession regime (applicable to foreign and Brazilian companies, including the state company Petrobras) will not be applied to the pre-salt reservoirs, except where there are existing contracts. The government will be empowered to assign all unlicensed pre-salt reserves to Petrobras, to provide it with an asset base on which to raise capital for development. New pre-salt reserves will be developed under production sharing agreements (PSAs) in which Petrobras will be the operator, with a minimum 30 per cent stake in each project; the state's economic share of the PSAs will be administered by a new agency, Petrosal, whose revenues will be assigned to a new development fund with a wide remit to invest in energy and development projects. Revenues are unlikely to be large enough to present Brazil with a serious "resource curse" problem. Costs of the new development will be high, the revenues will expand slowly and can be accommodated within Brazil's large and diversified economy.

Though foreign companies are disappointed at the harder terms, it is clear that (in contrast to many countries where new discoveries have transformed the oil prospects) the new regime is not retrospective. Petrobras, meanwhile, will enhance in its role as a world player in the technology of very deep water oil production.

Brazil has a unique energy system. Its energy industries reflect the Brazilian mix of state leadership, private sector investment, and market mechanisms. Brazil can be expected to continue to use all these instruments in its international commitments on climate change policy and in its increasing participation in world energy and climate fora. F

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