

Renova Energia's wind  
farm in Alto Sertão

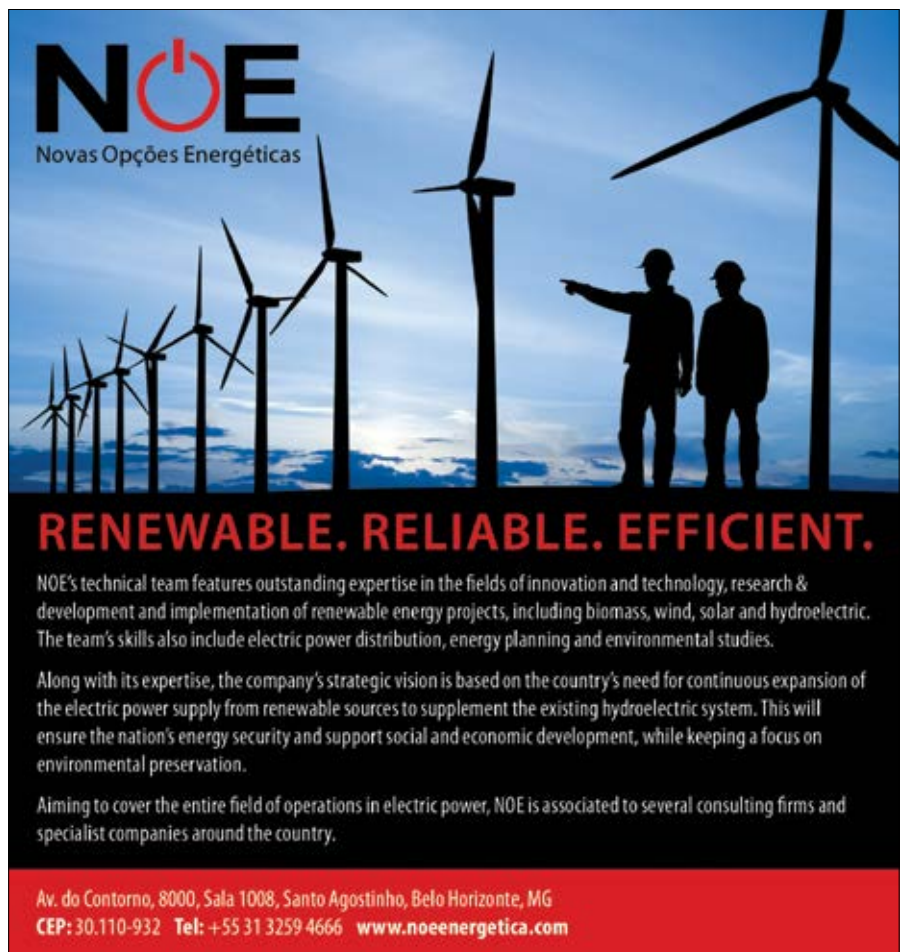
# Change and Opportunity in Brazil

## A Bright and Blustery Future

### Brazil's Maturing Power Matrix: Teething Problems

Brazil's electricity market is vast: the largest in Latin America and 10th largest in the world, with an installed capacity of 121,000 MW. Brazil's National Interconnected System (SIN) connects the entire country and, if superimposed over Europe, would enable Lisbon to sell energy to Moscow. It is one of the cleanest energy matrices on earth with renewables contributing 47% of energy production (the global average is 19%). Finally, it is a unique and evolving model with 2014 marking the 10th anniversary of the system of auction concessions launched as part of the 2004 reforms that followed the energy crisis of 2001.

The "Brazilian model" has matured considerably over the past decade and is now respected globally for fostering competition. 2012, however, saw some major regulatory changes, which disrupted the electricity market and the country as a whole.



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## Regulatory Changes: The New World Order

Although cheap to produce, until March 2013, Brazil's electricity was the most expensive in the world at \$0.16 cents per MWh. In 2012, the government implemented a number of major regulatory changes designed to reduce prices and stimulate growth.

The most drastic change was Provisional Measure 579, which was rolled out in January 2013 and cut the price of electricity by 20%. The rationale for the policy was that hydroelectric power companies were amortizing the investment in their 35-year concessions after 20 years and then earning huge rent margins due to low operational costs. Provisional Measure 579 offered generators two options: accept a reduced profit margin of 10% and instantly renew their concessions for 30 years, or continue to earn the same profits until the concession expires in 2015 or 2017



Mauricio Tomalsquim,  
President of the EPE  
(Government's Energy  
Research Institute)

and then reapply through the auction process, which would also be based on the lower rates.

One of the main implications has been a reduction in consumers migrating to the free market, which currently accounts for 27% of energy consumed. Most traders are, however, optimistic about the growth of the free market: "We can reach around 42% of energy consumed but it entirely depends on government regulation," said

Walter Fróes, CEO of energy trading firm, CMU Energia. "There is a good market for small consumption. We are diversifying away from our traditional heavy mining clients in favor of more commercial clients that have lesser energy requirements but are higher in quantity," continued Fróes.

## Winds of Change: The Shifting Balance of Brazil's Power Matrix

Brazil is blessed with the third largest hydroelectric potential in the world and has put it to good use with hydropower contributing 85% of renewable electricity generation capacity. As the population continues to burgeon (exceeding 200 million in the most recent census) it will require increases in energy generation of around 5 GW per year. In meeting this demand, the government is faced with the predicament of expanding generation capacity, whilst at the same time diversifying away from hydro due to environmental concerns.


"Brazil currently has a demand of around 130,000 MW per year and, if we project to grow by 4% to 5% per year, that is an additional 5,000 MW per year. Itaipu currently generates 12,000 MW so, at this rate, we need to create an Itaipu every two years. We do not have enough rivers to do this so it is inevitable that we will have to rely increasingly on thermal, wind and solar," said Felipe Gomes, CEO, T&D Brasil, SNC Lavalin Marte, the Brazilian branch of the global engineering company.

### The 10-year plan (2012 – 2021)


In the past, Brazil's reservoir storage capacity could keep the country running for three dry years; nowadays it can keep the country running for around seven months. Energy planners are therefore turning to thermal power for reliable base load supply in the short-term. In the longer-term, new forms of renewable energy that have recently become competitive, such as wind, will play an increasingly important role.

"In the current 10-year plan until 2021, hydro will reduce in terms of installed capacity from 69% to 66%, wind will increase


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from 2% to 8%, small hydro will remain at 4%, biomass will reduce from 8% to 7%, nuclear will increase marginally but stay at 2% and thermal will reduce from 15% to 13%. This may change a little bit to increase thermal but these are our general long-term projections. We anticipate an overall increase in capacity by 60,000 MW," said Mauricio Tomalsquim, president of the government-funded EPE (Energy Research Company).

### **The Environmental Debacle: Dirty Hydro for Dirtier Thermal**

While Brazil's hydropower endowment is its greatest asset, since the 1990's the construction of large dam reservoirs has become subject to increasing environmental criticism due to the damage they cause to the environment by flooding vast areas of land.

New plants are being constructed in the Amazon but they are fraught with controversy. Belo Monte (11,233 MW), due to become the third largest hydroelectric plant in the world, is planned for completion in 2019, but has been subject to vehement environmental opposition and numerous suspensions since conception of plans in 1975. New hydro projects favor minimal reservoir size or run-of-river water mills in order to secure the elusive environmental permits they require.

### **Wind**

Wind complements hydropower perfectly in Brazil: when there is heavy rainfall there is less wind, when there is light rainfall there is more wind. The growth of Brazilian wind generation over the past decade, and particularly the last five years, has been phenomenal.

The introduction of wind into Brazil's concession auctions in 2009 was when the industry took off. The auction system functions in a way that the generator who bids with the cheapest, guaranteed price per MWh receives a Power Purchase Agreement (PPA) of 20 years indexed by inflation and becomes eligible for 80% financing from BNDES (The Brazilian Development Bank). Wind became competitive when generators were offered a fixed revenue so long as they did not produce less than 90% of the power they promised over a

four year period. Combined with a financial crisis in Europe and the USA, many foreign companies were drawn to the Brazilian wind market, making it one of the fastest growing in the world.

2012 was a blip for wind and the electricity sector as distribution companies delayed the purchase of energy due to uncertainty in the market caused by regulatory changes and low GDP growth.

2013, however, has been a bumper year as the market has acclimatized to the regulatory changes and demand for electricity has increased. Wind contracted 1 GW in the A-5 auction in August, dominated the A-3 auction on 18th November with 39 projects totaling 867 MW, and won 97 of the 115 successful energy projects in the A-5 auction on 13th December.

Brazil's wind sector continues to attract foreign manufacturers looking for strong growth opportunities. Vulkan do Brasil, a German coupling and brake components company, has been in Brazil for 35 years and is now starting to see considerable growth in the energy sector, particularly wind. "We started with hydro and are currently focusing more on research and development in the wind market for wind turbine breaks. There are other major break manufacturers in the local wind market and we are getting closer to them. Our advantage is that we are the only local manufacturer in Brazil of these components and our products are GL certified and BNDES-FINAME registered," said the company's sales director, Tiago Bedani.

While the auction results indicate a bright future ahead, BNDES's stringent local content requirements are causing a bottleneck in the supply chain. In July 2012, BNDES changed its Finame financing requirements for local content to 60%, resulting in six foreign wind turbine suppliers being disqualified from the loan program. In 2015, 100% of nacelles and towers will have to be manufactured in the country, which although important for developing Brazilian industry, will be a tough challenge to for manufacturers to meet.

Improvements to the system can also be made as low prices currently come at the cost of efficiency: "We have the capability to extract more energy from wind through reactive power, but if we do so the cost will be higher, which is not what



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the government is looking for,” explains market-leader Renova Energia’s president, Mathias Becker.

**Coal and Natural Gas**

Brazil has recoverable reserves of around 10 billion mt of coal located in the southern states of Rio Grande do Sul, Santa Catarina and Paraná. The country’s natural gas potential is even more substantial due to the vast Pre-Salt reserves discovered in the Santos and Campos Basins. The natural gas industry has nonetheless grown sluggishly in Brazil due to a lack of transportation infrastructure and low domestic prices maintained by Petrobras. Ten years ago, energy planners ruled out natural gas from Brazil’s energy matrix and so a considerable investment is now required, along with an amendment to the auction process, to get the sector going.

**Solar**

In December 2012, ANEEL finalized Normative Resolution 482, which lays out

the conditions for distributed micro and mini-generation and creates an electricity compensation system. With the legislation for distributed generation now defined, companies are progressing with plans to capitalize on the country’s 50 million household potential and 1 MW of residential generation has already been installed.

Soletrol, one of the largest companies for solar thermal water heaters in Latin America, has been in the market since 1981 and is now looking to expand into solar PV. “The solar thermal industry in Brazil has grown to the point that we know its success to be a certainty in the future. For photovoltaic, the ramp up could be very rapid, or end up being much slower than predicted: a great deal depends on the customer,” said CEO, Luis Augusto Ferrari Mazzon.

Ailton Ricaldoni Lobo, CEO of renewable energy generation company, Novas Opções Energéticas (NOE), is particularly excited about a solar-powered future: “The

law of micro-generation has made distributed generation a reality in Brazil. Nowadays, the final consumer will spend around \$300 per MWh of solar energy, which is expensive but feasible due to the payback of investment. In Minas Gerais, we already have around 20 systems connected and generating power, and it is only just beginning.”

The most promising indication for the growth of solar in Brazil has been the government’s decision to allow PV and thermal solar plants with a minimum installed capacity of 5 MW to take part in the A-3 and A-5 energy auctions, to be delivered in 2016 and 2018 respectively.

None of the solar projects at either auction were successful, as the price cap of \$60 per MWh made competing with wind impossible. The price ceiling for solar to be economical is around \$100 per MWh. In order for the industry to take off, therefore, it needs some help. Either financing must be made more accessible or price differentiation between energy sources must be allowed. There have been indications that the EPE may create an independent auction for solar in 2014 but nothing is conclusive as yet.

**Transmission, Distribution and Smart Grid Solutions**

**Transmission**

Brazil’s hydrology complements the country’s transmission system due to the fact that when it is wet in the south, it is dry in the north and vice versa. Electricity is therefore constantly being transmitted from one region to another. Vast stretches of transmission lines, however, lead to around 6% of energy losses and so high voltage direct current (DC) lines of 600 KV and 800 KV are now being constructed to transmit power from new hydro projects in the Amazon via one or two lines.

Problems have also been encountered with the wind industry. As the sector took off, the EPE auctioned transmission lines once it was determined who had won the auctions. The system failed, however, as the

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companies who won the transmission auctions were not able to construct the lines by the time the parks were ready. Some wind farms are therefore ready to generate electricity but cannot connect to the grid. The system has since been changed so that transmission lines are auctioned in advance and wind farm investors now have to connect to the lines themselves.

## Distribution

The biggest challenge Brazil faces with regards to distribution is non-technical losses, caused by people who do not pay their bill. These types of losses make up an average of 16% of total losses in the country. The problem is the most serious in the state of Rio de Janeiro, where non-technical losses average 25% and can reach up to 70% in some areas.

## Smart Grid Solutions

Smart solutions for integrated automation, distributed automation, smart metering and telecommunications will reach the market in 2014. However, their implementation depends on the government's approach as distribution companies are primarily interested in reducing non-technical losses. "Most companies investing in smart grid solutions are electrical companies facing issues with regards to non-technical losses. In these cases, they are just applying technology to reduce their non-technical losses, which is a different concept than having an architectural approach; it is not about making the system more efficient, it is about making it more secure... to develop a general smart grid topology in the next five years, we need to define a roadmap to implement a plan," said Ricardo Van Erven, CEO, Latin America, GE Digital Energy.

## Conclusion: The Country of the Future?

Brazil's booming economy, which barely flinched at the global financial crisis of 2008 and grew by 7.5% in 2010, has come back down to earth with a thud since the euphoria of winning both the 2014 World Cup and 2016 Olympic Games. GDP growth has plummeted in the last two years and signs of unrest are starting to manifest themselves through large public demonstrations across the country protesting against high prices, lack of investment and political corruption. Stefan Zweig's hackneyed phrase that "Brazil is the country of the future – and always will be," seems once again as ironic as ever.

Whilst government intervention in electricity will deter foreign investment in the short term, changes, in many respects, were necessary. As the market stabilizes, however, it must be left to grow organically. Presidential elections are due to take place on 5th October 2014 so relative tranquility can be expected until then. In the meantime, the Brazilian power sector is open to investment: anyone can compete for the country's generation and transmission needs and risk is low with long PPAs and guaranteed financing. •

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