

Brazilian Electricity Auctions in 2017

Presenting the results and how they influence energy planning studies

In December 2017 the contracting of energy from new power generation plants in Brazil was resumed, with two auctions that took place under the guidelines of the Ministry of Mines and Energy (MME). On the 18th, the "A-4" auction was conducted, for supply to begin in January 2021, while on the 20th it was time for the "A-6" auction, for energy supply to begin in January 2023¹.

Such auctions are part of the electricity supply adequacy mechanisms in Brazil. They have the objective of supplying the regulated market, providing long term energy contracts for power generators, that must be backed by firm energy.

These two auctions were relevant because they have consolidated a couple of features that had been tested in previous years, such as a preliminary phase of competition for the available capacity in the transmission grid. At the same time, they were useful for promoting, successfully, a number of new features, such as a new auction systematic (or "mechanism"), stricter qualification requirements and changes in the production obligation rules for wind and for the must-run limits of thermal power plants.

In this report we describe the most relevant aspects regarding the two auctions held in December 2017 for contracting energy from new power plants, the role of EPE and bring insights on how the results are likely to influence the energy planning studies in the country.

¹ The auctions that offer contracts for existing electricity generators are not subject of this report.

MAIN GUIDELINES

Both auctions were scheduled by the MME on the 4th of August 2017, according to Ordinance 293/2017. Afterwards, Ordinance 390/2017 set the guidelines for the auction systematic. The objective of these auctions is to contract energy for meeting the demand declared by distribution utilities, responsible for supplying its captive consumers.

According to the set of guidelines by the MME, both auctions were held with technology-specific products and contracts.

In the "A-4", there were 4 distinct products, which are long-term contracts catered per technology : (i) windpower; (ii) solar PV; (iii) biomass-fired thermal; and (iv) small hydro (1 to 50 MW). Each technology competed exclusively within its own product, according to the previously allocated share of the total demand. In the "A-6", there were also 4 products: (i) windpower; (ii) biomass and coal-fired thermal; (iii) gas-fired thermal; and (iv) hydro (above 50 MW) and small hydro (5-50 MW).

Contractual terms last between 20 and 30 years, depending on the auction and on the technology. Contracts are Real-denominated (BRL) and indexed to national inflation. For thermal power plants, the fuel purchase installments can be indexed to a basket of international fuel prices and exchange rate.

In the case of the "A-4" auction, taking into account that electricity supply must begin before transmission planning can guarantee the provision of grid access to every project at every place, a preliminary phase was held for competition over the

available transmission capacity until the contract delivery year. The available amounts were calculated by the ONS (National System Operator), based on methodology and premises defined together by EPE and the ONS. For the “A-6” auction, such phase was not implemented, given there is time for working on the provision of new transmission facilities to reduce possible congestions in the 2023 time horizon.

RESULTS

In the “A-4” auction, seven distribution companies contracted 220 MW_{average} (1.9 TWh/year), which corresponds to 674.5 MW of new installed capacity, at an average price of R\$ 144.51/MWh (43.80 USD/MWh), from 2 small hydropower plants (11.5 MW), 1 biomass from sugar cane bagasse (25 MW), 2 windpower plants (64 MW) and 20 solar PV (574 MW / 790.6 MW_{peak}). The average prices at each product were R\$ 181.63/MWh (55 USD/MWh) for hydro, R\$ 234.92/MWh (71 USD/MWh) for biomass, R\$ 108.00/MWh (32.7 USD/MWh) for wind and R\$ 145.68/MWh (44 USD/MWh) for solar PV.

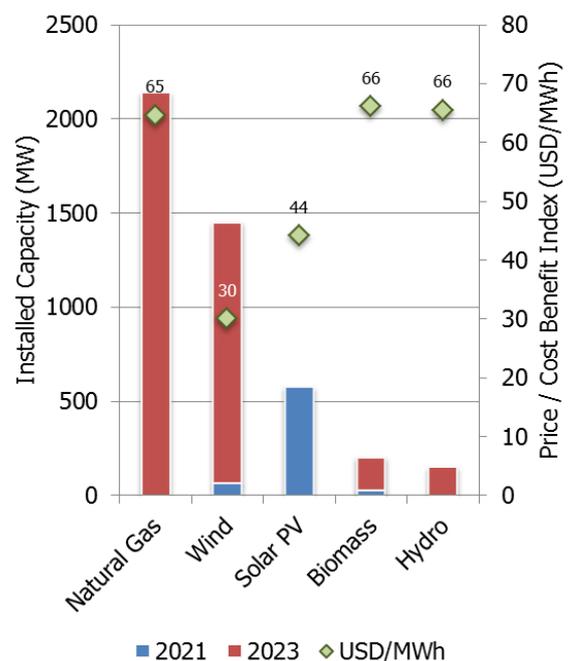
In the “A-6” auction, a group of 25 distribution companies contracted 2,736.6 MW_{average} (23.9 TWh/year) at an average price of R\$ 189.45/MWh (57.4 USD/MWh), from 6 hydropower plants (139 MW), 6 biomass from sugar cane and wood residues (177 MW), 2 gas-fired thermal (2,138.9 MW) and 49 windpower plants (1,386.6 MW). Average prices at each product R\$ 219.20/MWh (66.4 USD/MWh) for hydro, R\$ 216.82/MWh (65.7 USD/MWh) for biomass, R\$ 213.46/MWh (64.7 USD/MWh) for gas-fired and R\$ 98.62/MWh (29.9 USD/MWh) for wind². Solar PV did not participate in this auction as per the MME guidelines.

Graph 1 presents a summary of what was contracted, in terms of total installed capacity and

average price of energy in the case of hydro (“quantity” contracts) and the cost benefit index in the case of non-hydro (“availability” contracts).

Additionally to the competitive prices of renewables, EPE highlights as a positive outcome the contracting of gas-fired plant with quite low variable costs, based on national offshore gas production (associated gas, from pre-salt layer), at competitive prices (of gas and electricity) and located close to the largest consuming regions in the country. The chosen strategy of monthly distributing (“profiling”) their inflexible generation, combined with low variable operating costs is likely to result in a baseload dispatch.

This illustrates the compatibility of the power generation expansion mix with the needs of the system operator. Besides, the two gas-fired plants have the potential to foster the deployment of pre-salt gas production, thus contributing to the development of the natural gas industry in Brazil.



Graph 1 – Results of Auctions A-4 and A-6 of 2017

Source: elaborated based on data published by CCEE.

² Except for hydro (“quantity” contracts), prices mentioned here refer, in fact, to the Cost Benefit Index as perceived by the consumer, as it accounts not only the payments to the generator, but also the short-term settlement in the wholesale energy market, which is assumed by consumers in the “availability” contracts.

10 ISSUES TO BE HIGHLIGHTED BY EPE

1. More time for project implementation and the intra-annual auctions calendar

According to Decree 9143/2017, from August 2017 onwards, the MME was given more flexibility to define the start of supply of electricity from new power generation plants. Before that, new energy auctions were allowed only for energy delivery in the 3rd and 5th year (known as "A-3" and "A-5"), but, after this legal change, now it's also possible to call "A-4" and "A-6" auctions, allowing "safer" contractual periods for construction and begin of supply depending on the technologies desired.

That same Decree demands the MME to publish, no later than March of every year, a calendar with the scheduled auctions for the running year. Such predictability is key for investors and project developers to plan for the year's auctions and for distribution utilities to better plan their electricity procurement.

2. A new auction mechanism

An auction systematic (or "mechanism"), i.e. the set of rules adopted to foster the price disclosure, was modified after a long series of auctions in previous years. So far, the dispute took place with a descending clock auction, with a uniform-price phase, followed by a final discriminatory, sealed-bid, pay-as-bid round. The auctions in 2017 (that are still carried out over the internet) were conducted with a single and continuous discriminatory phase: competitors freely offered sealed bids and after each bid for any product the clock is reset. To be accepted, bids must be equal or lower than the (running) marginal price for the respective product minus a minimum decrease set by the auctioneer. The auction is closed as soon as any competitor no longer bid for any product. The new systematic proved to have contributed to a highly competitive auction, as it became more difficult to predict competitors' strategies and prevented collusion.

3. Competition for the available capacity in the transmission grid

In the Brazilian auctions, for many years, the risk associated with grid connection has been allocated to the generators. In other words, in case the generator completes in time the implementation of the new power plant, but the transmission grid and its facilities are not able or ready for the power injection of this new plant, it's the generator's the duty of buying electricity in the spot market to compensate its consumers for not delivering the contracted energy. Once the needed time for procurement and construction of new transmission infrastructure has been longer than the time horizon of an "A-4" electricity auction, it's not viable to guarantee that every new contracted power plant would be able to get connected to the node in the grid as appointed by the generator when applying for the auction.

However, specifically in the "A-4" auction, to facilitate the risk management by the power generator, a preliminary phase of competition for the available capacity of the transmission system was implemented. Such available capacity is calculated by the ONS, based on methodology and premises defined together by EPE and the ONS. Even though it doesn't work as guarantee of grid availability for connection in the specified point, this mechanism helps mitigate the risk for investors, since competition is allowed only to the extent that bidders may have adequate grid connection conditions.

4. New qualification requirements for bidders

The qualification requirements for generators in the electricity auctions takes place in two stages: there is a technical qualification of the submitted projects, prior to the competition; and a qualification of the awarded power generation companies, after the auction is finished.

The technical qualification is a process conducted by EPE and aims to pre-select those projects that meet the minimum quality requirements, including the technical consistency, environmental license, water-use permit, an independent resource and energy production assessment or fuel supply agreements, land use rights, grid access grant or equivalent, etc.

Main requirements for technical qualification

Requirements	Technologies to which they apply
Project datasheet correctly filled out	All
Registry at the National Electricity Agency	All
Project / Descriptive Memorial	All
Environmental license	All
Water use permit or equivalent	Hydro and thermal power plants
Proof of land use rights	All, except hydro above 5 MW
Independent resource and energy production assessment and certification	Wind and solar PV plants
Fuel supply agreement (various links in the supply chain)	Thermal plants
Grid access grant or equivalent	All

On the other hand, after the auction, the awarded bidders must meet a number of requirements for legal, fiscal, economic-financial and technical qualification. Regarding this last issue, ANEEL (the regulator), after a public hearing, added new reputation and track-record requirements. For those competing with new plants over 300 MW, an experience of construction and implementation of at least 1/3 of the project installed capacity is required as past experience. Also, awarded bidders will be disqualified in case they have, over the past 36 months, suffered some kinds of penalties as consequence of delays in implementation of other projects or poor performance³. Such new requirements complement the existing ones and

³ Not having suffered a concession expiration penalty or a revocation of a generation project permit and has not suffered 2 (two) or more penalties for a delay of more than one (1) year in any milestone of the implementation schedule, including the beginning of the commercial operation, of plants contracted in the regulated environment, which has already become final and unappealable at the administrative level.

were introduced in order to prevent unprepared agents from undertaking large-scale projects, increasing the risks of non-delivery of energy within contractual deadlines, with consequences for security of supply.

5. Demand consistent with the economic fundamentals and purchase mix based on objective criteria

The demand for both “A-4” and “A-6” auctions in 2017 was based on declarations by the distribution companies, whose projection of market growth is under their own responsibility, without government interference. As a result, investments in new power generation are anchored in the economic fundamentals of the electricity supply and demand, allowing greater predictability to the investors and project developers.

After two years of strong economic contraction, with consequences for the energy demand, Brazil is under recovery, with prospects of a resumption of energy consumption growth. A high electricity demand from distribution companies was not expected in the auctions, at least in comparison to the years before 2015. As shown in a recent public report by EPE, the country's energy consumption in 2017 is almost at the same level as in 2014.

EPE also points out that the allocation of the total demand to be contracted amongst the various products/technologies was held in an objective way, based on the Investment Decision Model (MDI), which guides an optimal expansion and is also adopted in the Ten-Year Energy Plan.

6. More selective participation of state-owned companies

It was possible to see in these auctions a smaller weight of state companies in the resulting picture. In the case of the gas-fired power projects, the most notable were arrangements not dependent on the fuel supply from Petrobras, with a greater diversity of agents. It was also possible to observe that Eletrobras and its subsidiaries did not play a prominent role, given that at this moment the

company does not have much available capital and its privatization is under discussion.

7. Economic and financial structuring

With regard to the economic and financial structuring of the projects, the Brazilian National Development Bank (BNDES) has continued to act to support future investments, but agents have sought diverse solutions not necessarily dependent on the federal development bank. From EPE's point of view, the following factors were relevant to achieving final prices:

- Infrastructure debentures as alternative or complementation to BNDES
- Export credit agencies (ECA) as competitive financing catalysts in foreign currency;
- Participation of international lenders (multilateral credit institutions and commercial banks) in financing;
- Corporate-finance structures.

8. New price levels revealed

New price references were obtained. These were influenced by conjunctural factors (great supply of projects and equipment stock, less expressive demand than in the years prior to 2015), but also reflect the learning curve, the search for synergies, technological development, lower cost of capital, etc. Of particular note are solar PV, contracted for 44 USD/MWh, and wind, at 30 USD/MWh, much lower than what was observed in recent years in Brazil and closer to prices seen recently in auctions held in other countries. In the case of gas-fired plants, around 70 USD/MWh was obtained as equivalent price, which is also competitive.

It is not for EPE to explain the reason for the prices obtained, but below are some of the factors that may have contributed to obtaining such prices:

- Economic and financial structuring, including strategies to deal with foreign exchange risk;

- Competition not necessarily between technologies, but between business groups that use projects of different technologies as a tool, corroborating the modality of corporate financing;
- Lower equity costs;
- Strategies for contracting fuel supply, including imported LNG and national (associated) natural gas;
- Market risk taking, such as the anticipation of the completion, sale of energy to the free market, hypotheses about the plant's dispatch and connection to the transmission grid.

9. Energy delivery commitments for wind power projects

Since 2009, the contracts awarded for wind power plants in Brazil have had energy delivery commitments on a four-year basis, with annual adjustments, within certain margins. In the 2017 auctions, the four-year periods for accounting for the energy delivery commitments were eliminated, with the adjustment being made annually, in line with what already applies for the solar PV. This new rule seeks greater adherence between the individual risk management of each project and the physical (systemic) characteristics, as well as the storage capacity of the existing hydroelectric system.

10. New rules for new gas-fired power plants

Along 2017, the Subcommittee 8 of the initiative led by MME named "Gas to Grow" studied, together with all stakeholders, changes in the electricity market to improve integration of gas and electricity industries, including in the electricity auctions. EPE, as coordinator of this group together with the MME, highlights the following aspects already implemented in this "A-6" auction and that were very relevant for its success:

- Possibility of monthly distributing (profiling) the inflexible dispatch, keeping an annual average cap of 50%;
- LNG regasification costs allowed be indexed to exchange rate;
- Monthly (not annual) adjustment of the RF_{comb} parcel (fuel purchase costs for the inflexible dispatch)
- Various possible strategies for indexation of fuel purchase costs, independently for the flexible and inflexible dispatch.

THE ENERGY PLANNING STUDIES IN THE LIGHT OF THE RESULTS OF THE AUCTIONS

While on the one hand the energy planning studies have helped guide decisions about the design of electricity auctions in Brazil, it is also true that the results of the auctions give useful feedback to the planning studies. The most relevant aspects of the auctions in 2017 for planning studies are:

- The costs of different energy sources/technologies candidates for future expansion must be reviewed in the light of the results of the auctions, particularly for wind, solar PV and natural gas, not forgetting conjunctural factors.

This information is input for the Investment Decision Model (MDI, adopted for energy planning studies) and is reflected in the outputs, seeking minimize the total cost of energy.

This way, the auction results provide useful information that can (and must) challenge the assumptions of the energy planning studies, contributing to reduce the information asymmetry between the planner and the investors/project developers.

- The results are revealing of the growing importance of proactive transmission planning, playing a central role in the success of the generation expansion. In specific cases, for

large projects or set of projects, combined contracting of new power generation and transmission facilities may be a strategy to be considered.

- Given the diversity of renewable resources in the country and their production complementarity, as well as their competitiveness (as shown in the auction), it's important to consider auction bidding based on portfolios of projects. The participation of "hybrid" projects in the auctions, like wind combined with solar PV, could be a first step, but more flexible and technology-agnostic portfolios must be considered.
- The contracting of a gas-fired power plant with supply from national offshore reserves opens a greater perspective for the feasibility of this business model for pre-salt gas monetization, with a low variable costs and possibility of maintaining a less seasonal generation profile (flatter), contesting competitors with a more flexible and seasonal profile, but with a higher variable operating cost (premium for flexibility).
- The results of these auctions demonstrate it's possible to work with fewer constraints in the procurement of electricity from thermal plants with distinct levels of flexibility in the dispatch, always seeking the contestability between the different characteristics of projects within an economic perspective.
- The poor record of thermoelectric plants contracted in the past suggest caution and attention to the newly contracted ones. Stricter qualification requirements and stronger enforcement of the contracts tend to help increase success rates.
- EPE must carry on supporting the MME and other institutions in the improvement of frameworks and processes regarding the electricity auctions, including the technical qualification, systematic, reduction of bureaucracy, etc.