Empresa de Pesquisa Energética

Report Eletricity Auctions

December 27th 2018

www.epe.gov.br | **Escritório Central:** Av. Rio Branco, nº 1 - 11º andar - CEP 20090-003 - Rio de Janeiro - RJ

Brazilian Electricity Auctions in 2018

Presenting the results and how they influence energy planning studies

In 2018, the Ministry of Mines and Energy – MME conducted four electricity auctions, two of which for greenfield projects, the so called "A-4" and "A-6" New Energy Auctions, and two for projects in operation, the "A-1" and "A-2" Existing Energy Auctions. EPE had an active role on their preparation and execution, especially in the technical qualification of candidate projects, as well as giving technical support to the MME to develop contracting guidelines.

The "A-4" New Energy Auction took place on April 4, contracting electricity from new generation projects to start supply on January 2022. While the "A-6" New Energy Auction was held on August 31, with supply starting on January 2024. 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.

These New Energy Auctions have consolidated some features that had been tested in previous years, such as a preliminary phase of competition for the available capacity in the transmission grid. But they also promoted some new features, such as a new product definition for wind projects.

The "A-1" and "A-2" Existing Energy Auctions took place on December 7. Their objective was to contract energy from power plants already developed and in operation, for a two-year contract term. The "A-1" supply period starts on January 1st, 2019 and ends on December 31st 2020, while the "A-2" supply period runs from January 1st 2020 to December 31st 2021.

In this report we describe the most relevant aspects regarding the four auctions held in 2018, the role of EPE and bring insights on how the results are likely to influence the energy planning studies in the country.

MAIN GUIDELINES

"A-4" Auction

The "A-4" Auction was scheduled by the MME on November 30th 2017, under Ordinance 465/2017. Afterwards, Ordinance 11/2018 set the guidelines for the auction systematics. The objective of this auction is to contract energy for meeting the demand declared by distribution utilities, responsible for supplying its captive consumers. There were two types of contracts: the so-called "quantity" contracts, for hydropower projects; and "availability" contracts, for biomass-fired thermal, wind and solar PV projects.

According to the guidelines set by MME and the regulator ANEEL, with support from EPE, the auction was held with technology-specific products and contracts. Contractual terms are 30 years for hydropower projects and 20 years for the remaining technologies. 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. Additionally, according to Ordinance 11/2018, each project must deliver at least 30% of its certified energy to the regulated market.

This auction also featured a preliminary phase where generators competed for the available transmission capacity. This is necessary because electricity supply must begin before transmission planning can guarantee the provision of grid access to every project. The available capacity at each point was calculated by the National System Operator - ONS, based on methodology and premises defined jointly with EPE.

Price caps were defined for two different categories: (i) new projects and licensed projects without contracts on the regulated market; and (ii) licensed projects with contracts on the regulated market. Table 1 lists the price caps, as published on Tender Document ANEEL 01/2018.

Table 1 – Price-caps (in USD) for the 2018 "A-4" Auction

ENERGY SOURCE	CATEGORY (i)	CATEGORY (ii)
Hydro (UHE/PCH/CGH[1])	76.8	56.6
Wind	67.3	44.4
Solar PV	82.3	73.9
Biomass	86.8	61.4

"A-6" Auction

The "A-6" auction was scheduled by MME on February 8, according to Ordinance 44/2018, which was complemented by Ordinance 121/2018 on April 4th. Subsequently, Ordinance 159/2018 and the Tender Document ANEEL 03/2018 set the guidelines for the auction systematics.

As in the "A-4", the objective of this auction is also to contract energy for meeting the demand declared by distribution utilities, responsible for supplying its captive consumers. There were two types of contracts, "quantity" contracts, for hydropower and wind projects; and "availability" contracts, for biomass, coal and natural gas-fired thermal. Natural gas projects included both open and combined cycle, as well as additions to existing projects intended to close the thermal cycle.

Contracting terms in this auction were technology specific: 30 years for hydropower, 20 years for wind and 25 years for thermal power.

As in the "A-4", price caps were also defined for two different categories: (i) new projects and licensed projects without contracts on the regulated market; and (ii) licensed projects with contracts on the regulated market. Table 2 lists the price caps for the "A-6" auction.

Table 2 – Price-caps (in USD) for the 2018 "A-6" Auction

ENERGY SOURCE	CATEGORY (i)	CATEGORY (ii)
Hydro (UHE/PCH/CGH)	76.5	40.0
Wind	59.9	45.3
Thermal	81.3	-

"A-1" and "A-2" Auctions

According to Ordinance 317/2018, only thermal power projects had to be submitted to EPE's Technical Qualification process for these auctions. The remaining technologies were not required to present documentation at EPE, instead they reported directly to the regulator ANEEL.

[1] Hydropower plants are classified according to their size into: UHE (Usina Hidroelétrica),over 30MW; PCH (Pequena Central Hidroelétrica), between 1MW and 30MW; and CGH (Central de Geração Hidrelétrica), under 1MW.

The type of contract offered was the "availability" contract, for biomass and natural gas-fired thermal generation, and the "quantity" contract for the remaining energy sources.

For Existing Energy Auctions, the qualification process conducted by EPE is simplified, when compared to the one for New Energy Auctions. Each project had to submit only an Application Form for each auction, documents confirming on-site fuel storage availability, when applicable, and documents confirming fuel availability (fuel supply agreements) for continuous operation.

The price-cap, for both contract types, was R$ 170/MWh (44.8 USD/MWh)[2], for the "A-1" Auction and R$ 162/MWh (42.7 USD/MWh) for the "A-2" Auction, as published on ANEEL Tender Document 5 and 6/2018, on November 7, 2018.

RESULTS

In the "A-4" auction, 17 distribution companies contracted 298.7 $MW_{average}$ (2.62 TWh/year), which corresponds to 1,024.5 MW of new installed capacity, from 4 hydropower projects (19.7 $MW_{average}$), 2 sugarcane biomass-fired thermal projects (17.1 $MW_{average}$), 4 windpower plants (33.4 $MW_{average}$) and 29 solar PV (228.5 $MW_{average}$ / 1.032.55 MWp). The average prices for each product were R$ 198,12/MWh (52.3 USD/MWh) for hydro, R$ 198,94/MWh (52.5 USD/MWh) for biomass, R$ 67,60/MWh (17.8 USD/MWh) for wind and R$ 118,07/MWh (31.2 USD/MWh) for solar PV.

In the "A-6" auction, a group of 19 distribution companies contracted 835 $MW_{average}$ (7.31 TWh/year), from 11 hydropower plants (78.7 $MW_{average}$), 2 sugarcane biomass (177 MW), 1 gas-fired thermal (2,138.9 MW) and 48 windpower plants (1,386.6 MW). This corresponds to a total of 2,100.1 MW new installed capacity. The average prices for each product were R$ 181,48/MWh (47.9 USD/MWh) for hydro, R$ 179,85/MWh (47.5 USD/MWh) for thermal power, and R$ 90,45/MWh (23.9 USD/MWh) for wind[3].

Figure 1 summarizes the New Energy Auction results, in terms of total installed capacity by technology and average electricity price, for hydro ("quantity" contracts), or the Cost Benefit Index, for the remaining technologies ("avaliability" contracts).

The "A-1" and "A-2" Existing Energy Auctions contracted a total of 363 $MW_{average}$ (3.18 TWh/year), as follows:

- The 2018 "A-1" Auction: contracted only the "quantity" product, at an average price of R$142,99/MWh (37.7 USD/MWh);
- The 2018 "A-2" Auction: contracted both product types ("quantity" and "availability"), at an average price of R$161,35/MWh (42.6 USD/MWh). Regarding only the "availability" product, EPE technically qualified 13 projects, 2 of which were natural gas-fired power plants that won the auction.

[2] US$ 0.264/R$ (November/2018).

[3] Except for hydro and wind in the "A-6" auction ("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.

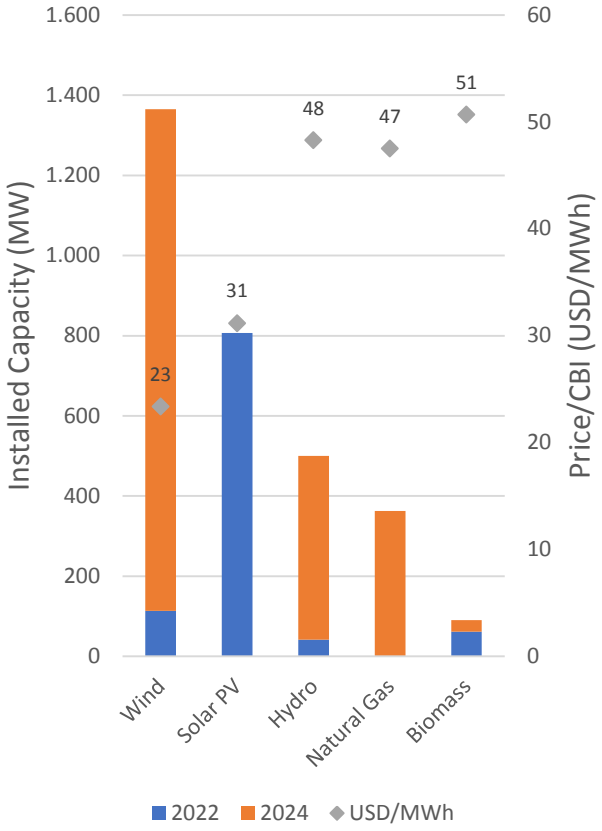

Figure 1 – Results from Auctions A-4 and A-6 of 2018

Source: EPE, with data published by CCEE.

5 RELEVANT ISSUES FOR THE YEAR 2018

1. Qualification requirements for new energy auction 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.

Table 3 - 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) has added, since 2017, 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 performance[4].

2. A new product for Wind – "Quantity"

For the 2018 A-6 Auction, it is important to highlight the change in contract type for wind power pro-

[4] 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.

jects, from "availability" contracts to "quantity" contracts.

On the "quantity" type, the generator is responsible for delivering the amount of energy contracted, taking on the market risks associated with the variability of energy production. The "availability" type, on the other hand, means that the risks, costs and benefits of the variation in energy production relative to the physical guarantee are allocated to the distribution companies and subsequently passed on to consumers through tariffs. Therefore, "availability" contracts are adapted to the context of thermal generation in Brazil, but have been used to support new energy technologies as well.

After many years as one of the most traded technology in energy auctions, wind can be considered a technology mature in Brazil, what is enough to allow for changes on the way it is contracted. First of all, the conversion of contracts to the "quantity" type may bring cost reductions for consumers considering the risks, although bid prices might be higher. Secondly, the allocation of risks on the supplier may cause long-term improvements to the system expansion. Thirdly, adopting the "quantity" contracts reduces concerns regarding the long term data series associated to the resource and used to calculate the Cost Benefit Index, which affects the economic order of the projects that result on the selection of the auction winners.

In preparation for this change, EPE conducted multiple analyses in order to bring more reliability to the value identified as a Reference Price for this technology. In addition to considering the new contract type, they also included updates in other factors that affect the calculation of price-caps for the auctions, such as estimated investment costs (CAPEX), financing conditions (especially concerning the long term interest rate "TJLP" for projects financed by the national development bank BNDES), etc.

The results from the "A-6" auction indicate that the decision by the government to alter the type of contract was the right one, since the technology had the highest average discount relative to the price-cap. This keeps Brazil in a very favorable position, with very competitive prices on a global scale.

3. Gas-fired power plants: New ANP criteria and contracting in 2018

For natural gas-fired power plants, EPE held discussions along with the National Regulatory Agency for Petroleum, Natural Gas and Biofuels – ANP, in order to better define the attribution of each institution on the technical qualification process. This resulted on the adaptation of article 4, paragraph 11 of MME Ordinance 102/2016, as well as of EPE´s Instructions for Registering on the Technical Qualification Process.

Therefore, for the "A-6" New Energy Auction, ANP revised the documentation to be submitted for their analysis of natural gas supply feasibility. A copy of the documents submitted to ANP should also be forwarded to EPE, along with ANP's position, according to MME Ordinance 102/2016.

This "A-6" Auction also contracted, for the first time in the last decade, a project to close the thermal cycle of a open-cycle gas-fired power plant, with a highly competitive electricity bid price, lower than for gas projects (combined-cycle gas power plant) contracted in 2017.

Additionally, two gas-fired power plants traded energy on the 2018 "A-2" Existing Energy Auction. These type of projects had not sold energy though this kind of auction since 2015.

4. 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.

Therefore, to facilitate the risk management by the power generator, for some specific auctions, 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 full 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.

5. New price levels revealed in 2017, and even lower in 2018

In 2017, the auctions revealed new price references and by 2018 these references were maintained (even lower). Similarly to 2017, we believe these were influenced in part by conjunctural factors, such as great supply of projects and equipment stock and less expressive demand than in the years prior to 2015. It is not EPE's role to explain the reason, but we highlight below some of the factors that may have contributed to obtaining such prices:

- New contracting strategies in the regulated market (captive consumers), considering the portfolio of contracts and synergies with the free market. This includes anticipating the energy generation through its sale in this market (facing all risks involved, especially connection to the grid and environmental licensing);
- Technological advances, especially related to energy sources not fully consolidated (e.g., solar PV and wind);
- Unconventional capital structures (equity and debt), including: increased risk appetite (lower equity costs) and external financing (which leads to deal with foreign exchange risk);
- High competition among agents, especially considering the last auctions with reduced demand.

Regarding prices, it is worth noting that the solar PV energy was contracted for USD 31/MWh and wind for USD 24/MWh, much lower than those observed in recent years in Brazil (figure 2) and closer to prices seen recently in auctions held in other countries. In the case of thermal power plants, especially natural gas-fired power plants, around USD 47/MWh was obtained as equivalent price, which is also very competitive.

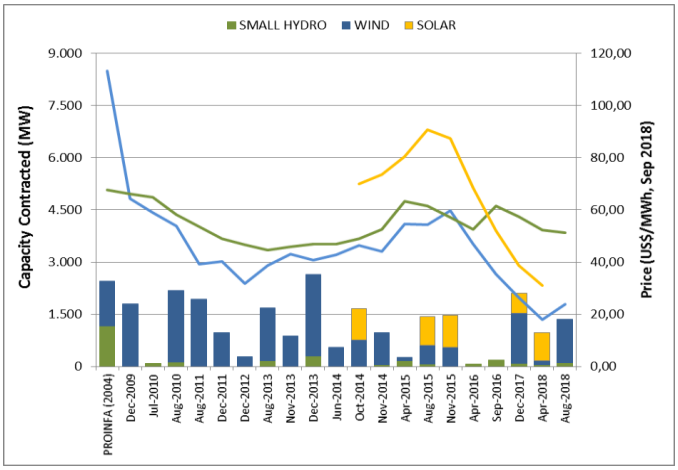

Figure 2 – Average electricity price in the auctions – wind, solar PV and small hydro

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 brings useful feedback to the

planning studies. The costs of power generation projects from different sources (mainly CAPEX) are input for the Investment Decision Model (MDI), which guides an optimal expansion and is also adopted in the Ten-Year Energy Plan (PDE).

The most relevant aspects of the auctions in 2018 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, which maintained the level of prices despite the changes of the contract type, not forgetting conjunctural factors. In the meantime, we also highlight the prices obtained in solar PV projects.
- Furthermore 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 (EPE) and the project developers.
- Due to diversity of renewable resources in the country and their production complementarity, it's important to consider (and evaluate) 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 generic portfolios must be considered.
- Regarding new technologies, considering the recent international news and discussions at the Brazilian Congress, offshore wind can be one more option in the coming years. On this topic, comparing with traditional oil and gas exploration, the legal/regulatory aspects of how to grant concessions for exploration (which may include royalties) should be discussed. The participation of new investors in the country is also a real possibility.
- Changes in the electric energy trading rules to be implemented in 2019, such as the "Surplus Selling Mechanism - MVE" and the improvement of the "Mechanisms for Compensation of Surplus and Deficit - MCSD", may lead to sudden changes in investor behavior.
- The contracting of a gas-fired power plant with supply from national offshore reserves in 2017 and onshore in 2018 (project closing the thermal cycle) opens a greater perspective for the feasibility of this business model for pre-salt and onshore gas monetization, both with a low variable costs and possibility of maintaining a less seasonal generation profile. Nevertheless, it is essential to highlight that LNG plants are contesting these competitors, considering 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.
- Track record of thermal plants contracted in the past suggests caution to the implementation of new projects (strict qualification requirements and stronger enforcement of the contracts may improve the success rate).
- Fifteen hydropower plants were contracted in auctions held in 2018 (98.4 $MW_{average}$), including Baixo Iguaçu hydroelectric (350 MW) which already had a concession by MME but didn't start the commercial operation. The current scenario presents some challenges for increasing the share of the hydropower in the upcoming auctions, especially due to the constraints related to environmental licensing of large projects and also to the re-

duced participation of competitive small hydro plants. This subject is important for EPE which is dialoguing with agents and institutions to find solutions to increase the feasibility of this energy source.

- EPE is an institutional reference in Brazil and must carry on supporting the federal government, represented by MME, in the improvement of frameworks and processes regarding the electricity auctions, including the technical qualification and systematic. In addition, EPE actively participates in market discussions with agents, institutions and society about new business models, evolution of the energy matrix, pricing of products and other studies.