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Sugarcane Renewable Electricity

SUGARCANE BIOELECTRICITY IN THE BRAZILIAN ELECTRICAL GRID

This issue paper addresses the benefits of using sugarcane biomass to generate bioelectricity, proposing alternatives to overcome the current barriers that prevent the expansion of generation to biomass in the Brazilian electricity sector.

CURRENT OVERVIEW

In 2019, sugarcane bioelectricity offered to the grid represented 5% of all electricity consumed in Brazil. The total generated by biomass was 22.4 TWh to the national system. It is almost equivalent to the annual consumption of electricity in a country like Ireland, for example. Despite this performance, only 15% of the potential of sugarcane bioelectricity is used. If bioelectricity were to be fully utilized in sugarcane sector, bioelectricity would have the technical potential to reach almost 7 times the volume offered in 2019, which would account for more than 30% of electricity consumption in Brazil.

Nowadays, the Brazilian electricity sector is undergoing a modernization process. The objective is to discuss subsidies; introducing a mechanism to allow for the internalization of environmental externalities; increasing the granularity of wholesale-market price formation, with intraday price differentiation; and how to finance an expansion of the grid and supply security, with market opening being one of the main guidelines of this sectorial reform. The expected growth for the free market and pricing models that incorporate externalities in regulated auctions should stimulate the commercialization of bioelectricity projects, due to the huge potential "dormancy" of this source in Brazil.

BENEFITS TO THE ELECTRICAL SYSTEM

Complementarity hydro-biomass. The profile of generation in the Southeast that is complementary to hydroelectric generation boosts the reliability of the electrical system and reduces the risks of power shortage and price increases during the dry season. In 2019, 91% of the total sugarcane bioelectricity to the grid was supplied in the dry season, between April and November, with bioelectricity saving the equivalent of 15% of the total energy stored in the reservoirs of the hydroelectric plants of the Southeast/Center-West submarket (UNICA, 2020). In addition, 76% of the bioelectricity for the Brazilian Electricity Sector (SEB) in 2019 was concentrated on the months when the Tariff Flag System was in yellow or red (UNICA, 2020).

Without the need for large power transmission lines. The fact that the sugarcane plantation is primarily located in the SE-CO submarket means that the biomass generation plants are located close to the consumer centers, reducing the need to build large transmission lines and respective power transmission losses.

Where can bioelectricity go. As of now, only 15% of the sugarcane bioelectricity potential is being used. If the biomass found in the sugarcane fields were fully used, bioelectricity would have the technical potential to reach 142 thousand GWh – almost seven times the volume that will be supplied this year – which would correspond to providing 30% of the energy consumption in the Brazilian market.

Combining the conditions of RenovaBio, a government program to spur the production of biofuels, and a positive business environment in the electricity sector, sugarcane bioelectricity has the potential to grow by over 50% by 2027 – from the 21.5 thousand GWh produced in 2018 to 33 thousand GWh in 2027. Nevertheless, we would begin to take advantage of only 17% of the technical potential of this generation source in 2027, demonstrating the possibility of a positive response that bioelectricity can provide to the expected expansion of the free market.

REGULATORY BARRIERS

Instability of the ceiling price at auctions. The ceiling price of an auction should not fluctuate very much. However, there have been variations of up to 30% from one auction to another, which occurred at 3 auctions in 2015 when the ceiling prices exhibited the following variations: R$ 215 -> 281 -> 218/MWh. This lack of predictability drives investors away from executing projects for the auctions.

Economic infeasibility of adding new fuels. The current mechanism for participating in auctions already provides for the possibility of a thermoelectric plant using more than one fuel in the generation. However, the rules for electricity supply auctions do not allow for different treatments among fuels. In other words, it does not consider specific situation of each fuel, and a distinct price cannot be linked to the generation with straw compared to the generation with bagasse, although these biomasses have different costs for the generator.

Lack of long-term planning. The lack of a long-term planning for contracting biomass energy, with annual targets, represents an impediment to stimulating the virtuous cycle in the bioenergy production chain, since there is no predictability for the sector's agents as to the amounts of energy contracting and the corresponding, thereby deterring investments throughout the chain.

Distance to consumption centers poorly priced. At the auctions for procuring electricity, the costs for distribution and transmission systems are not properly priced. The location of the power generating plant is not effectively compared from an economic point of view, nor are the differences in price risks between submarkets.

Insufficient pricing of the benefit of generation concentrated in the dry season. Simulations reveal that there is more freedom in operating the system with the use of sugarcane biomass in the energy matrix. That is, the bioenergy generation profile allows greater efficiency in leveraging resources, reallocating energy dispatching throughout the period and resulting in a reduction of the risk of deficit without aggravating water reservoir conditions. In short, the operation of the system becomes more efficient with bioenergy. This benefit of biomass to the National Interconnected System seeks to be represented by Short-Term Economic Cost (CEC) variable of the Cost Benefit Index (ICB). However, the methodology for calculating the Marginal Operating Cost (CMO) used by the Energy Research Office (EPE), which ultimately determines the variables COP and CEC, does not properly quantify the benefit of energy production from bagasse and straw during the dry season, distorting the ICB principle. This is because the simulations carried out by EPE, up to then, did not include the actual procedures used by the National Electrical System Operator (ONS) in operating the system.

PROPOSALS FOR THE ENERGY AUCTIONS

Biofuel distinction. For adding another biofuel to bagasse (like straw, for example) at ACR auctions, the suggestion is that any extra fuel intended for use will be treated with an expansion and, in this case, generation may be flexible. Analogous to what happens with the Thermal Power Plants (UTEs) powered by Liquefied Natural Gas (LNG), the plant would have a Variable Cost per Unit (CVU) for bagasse and CVU for straw. As such, for calculating the Cost Benefit Index (ICB) in order to participate in auctions, each addition would represent an expansion with a guaranteed power output and CVU. They would also have specific ICBs (one ICB for each fuel, representing specific bids in auctions).

Long-term contracting plan. Biomass demands correct long-term economic indicators. As such, a target of 500 average MW of biomass energy per year is proposed to be contracted by 2030, a period of time that is enough to create a virtuous cycle in the production chain of sugar-energy bioenergy.

Internalization of externalities. It is suggested that it be incorporated into the additional ICB that reflects the total cost of transmission ("seal" portion not reflected in the Usage Rate for the Transmission System – TUST). The projects would be ranked by this new ICB, derived from the current method of calculating the ICB plus the additional transmission cost that is not currently considered. This locational externality is internalized, correctly prioritizing projects with generation that is close to the load center.

Combinatorial auctions. Auctions are advised to allow the combination of part or all of the products, with those who offer the best proposals for viable combinations declared winners. Also, energy may be allowed to be marketed from the combination of bagasse+straw and/or bagasse+straw+biogas and/or any other combination, even with other sources, such as SHP, PV or Wind. This way, the generator can assemble its own portfolio.

Predictability of prices at auctions. There is a clear need to guarantee the predictability of the ceiling price well in advance for the investor. Consequently, a possible auction ceiling price proposal of (1+x) times the average marketing price of the previous auction from the same source with variable x can vary from 0.5 to 1.0. It should be noted that the value of "x" should be set for all auctions and not specified in an ordinance to each new tender in order to ensure the assumptions of long-term planning.

Advanced order. The order of the Physical Guarantee associated with the use of additional biomass (for example, straw) as fuel would be done in advance, as is already the case with LNG, for the purpose defined by the harvest or inter-harvest periods with enough advanced time for the generating plant's schedule (a proposal that the harvest period be ordered in March of each year). And, in order to better depict the operational characteristics of burning straw (or sawdust), the term of the contracts must be in multiples of 5 years for straw, maintaining 20-25 years for bagasse.

Auction A-6: Biomass is different from non-renewable sources. Bioelectricity has competed directly with coal and gas in the A-6 new energy auctions. A product must be guaranteed for the biomass/biogas source at the A-6 Auctions. In last year's A-6 auction, wind energy accounted for most of the procured volume (50.3%), followed by natural gas thermal power plants (40.3%), small hydroelectric plants (SHP and CGH) with 9.4%, and finally, biomass with a mere 1%. At the A-6/2018, biomass competed in the so-called Availability Product, where a single natural gas thermal plant took more than 97% of the demand allocated to that product, displacing bioelectricity projects.

Essentially, a regular and growing energy contracting needs to be sought for bioelectricity, with reasonable prices in regulated auctions and reinforcing the free market environment. 2018 was the 3rd worst year for procuring new projects in regulated auctions promoted by the Federal Government since it was implemented in 2005. We need to promote auctions in the regulated environment for biomass (and continuity of contracting), with prices that reflect the external aspects of bioelectricity and the characteristics of each project (retrofit; greenfield; use of straw and bagasse; generation of biogas, etc.). Concurrently, the Free Contracting Environment (ACL) has to be bolstered so that it is also capable of facilitating a growing number of bioelectricity projects.

PROPOSALS FOR PROMOTING BIOMASS IN ADDITION TO AUCTIONS

RenovaBio, modernization of the electricity sector and a strategic vision for bioelectricity. The improvement in the business environment for bioelectricity over the next few years, encouraging investments could lead to accelerating the development of this source of strategic generation, closing the gap between the effective production of bioelectricity and its technical generation potential for the National Interconnected System.

Can RenovaBio and a more beneficial environment in the electricity sector spur on a sizable increase in the volume of sugarcane bioelectricity over the upcoming years? Yes, there is a technical potential for this. However, it is important to establish industry planning policies and instruments with a structured and integrated vision for the various sugarcane products in the country's energy matrix (ethanol, bioelectricity and biogas), given that bioelectricity has experienced an unfavorable business environment and regulatory framework over the last few years in the Brazilian electricity sector.

The Brazilian – and even the global – electric energy industry faces pressure for changes in its regulatory, commercial and operational framework, requiring a modernization of its institutional environment, because there has been a lot of friction in today's demanding business models, often leading to sector judicialization.

Along these lines, according to the Brazilian Ministry of Mines and Energy (MME), Brazil's electric power sector is expected to go through a comprehensive process of modernization by 2020 and 2021, with the opening of the market becoming one of the key guidelines for this sector-related reform. The expected growth for the free market, combined with better pricing for the features of the sources in regulated auctions, is also expected to stimulate the trading of new bioelectricity projects, particularly due to the "dormant" potential of this source in the Brazilian sugarcane fields.

The challenge is posed for both public and private entities: to stimulate (and accelerate) the inclusion of bioelectricity in the electric matrix, a fact that will undoubtedly also assist in creating the conditions needed for expanding ethanol in the fuel matrix and the effectiveness of RenovaBio.

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