FOURTEENTH EDITION OF ANALYSIS OF BIOFUELS' CURRENT OUTLOOK

The Analysis of Biofuels' Current Outlook, one of the main publications of the Energy Research Office (EPE), presents the relevant facts that occurred in the year prior to its publication. Its fourteenth edition presents the impacts generated in sugarcane production, which has recovered from water deficit and frost, which happened last year, presenting positive indicators, such as ethanol from corn, which maintained its growth. There was a recovery in Otto cycle fuel consumption, registering its historic maximum, with repeated market share loss of hydrous ethanol. In biodiesel sector, the mandatory addition on diesel has been maintained in 10% by volume (B10) throughout the year, due to several factors. The National Biofuels Policy (RenovaBio) concluded the third cycle of CBIO traded in stock exchange market.

The main topics covered annually in this document are ethanol supply and demand and its production and transport infrastructure, biomass in electricity generation, biodiesel market, international market for renewable fuels, new biofuels and the RenovaBio monitoring. This year, the final article has as its central theme an analysis of the of the 20 years of the flex fuel vehicle in Brazil and its impacts on the fuel market.

Total sugarcane processed reached 595 million tons in 2022, 2.4% higher than in 2021. Sugar production grew 3.4%, totaling 36.3 million tons (12.5% lower than historic record of 2020) and its exports was 28.3 million tons. Regarding sugarcane ethanol, 26.5 billion liters were produced, which, added to the corn biofuel share of 4.1 billion liters (growth of 26%), reached 30.6 billion liters (2.5% higher than 2021). There was a decrease of 1.3% in the mix allocation towards ethanol, with a gain in anhydrous share. The country increased the positive balance in international ethanol trade (net exports of 2.2 billion liters), increasing export and reducing import levels.

The hydrous ethanol average price decreased 12.2% compared to the previous year, while C type gasoline reduced 13.3%, resulting in a relative price (EP/GP) of 73.5%, less favorable to consumers' preference for biofuel.

In 2022, 2 million new light vehicles were licensed in Brazil, 0.8% less than 2021, keeping the sales level for the third consecutive year. The hydrous ethanol demand dropped 3.5%, recording 6.9 billion liters, while gasoline type C consumption increased 9.8%, reaching 43.6 billion liters, resulting in an Otto cycle demand of 55.5 billion liters of gasoline equivalent, an increase of 6.6% over the previous year.

In 2022, Brazilian fleet of Otto cycle light vehicles remained at the same level, totaling 37 million units, with flex fuel technology representing 82.7% of the total.

Sugar-energy plants injected Bioelectricity into National Interconnected System in an amount of 2.1 GWm, 8.2% lower than 2021.

Regarding biodiesel, the percentage in diesel mixture was defined by CNPE Resolution No. 25/2021 at 10% by volume since October 2021 and has remained at this value throughout all of 2022. In April 2023 this percentage was raised to 12% (B12). Its production was 6.3 billion liters, a decrease of

7.5% in relation to the previous year. In 2021, the last biodiesel auctions took place, since CNPE Resolution no.14/2020 determined the change in biodiesel commercialization system from January 2022, with producers and distributors directly negotiating. The emissions avoided by sugarcane and corn ethanol, biodiesel and sugarcane bioelectricity in 2022 were 52.8 $MtCO_2eq$, 18.3 $MtCO_2eq$ and 1.4. $MtCO_2eq$, respectively, totaling 71.1 $MtCO_2eq$.

As for biogas, this edition provides a more detailed analysis. Its installed capacity in distributed generation reached 105 MW, with 22 MW added in 2022, using agro-industrial, animal and urban waste as its input. In addition, its share in the domestic energy supply reached 438 thousand toe (0.14%), with growth of 18% p.y. in the last five years. Regarding biomethane, there is an increase in operation and construction registrations at the ANP, in addition to greater participation in RenovaBio. It registers the initiatives at the federal level instituted in 2022 including biomethane in REIDI and establishing the Federal Strategy for Incentive to the Sustainable Use of Biogas and Biomethane.

Among new biofuels, HVO (Hydrotreated Vegetable Oil) and Sustainable Aviation Fuels (SAF), with unit projects being envisaged in the medium term. In the case of HVO, the characteristics that can influence penetration in Brazilian fuel market are presented. As for SAF, the industrial and economic challenges are pointed out so that it can be competitive against fossil-based jet fuel, in Brazil and in the world. Hydrogen is a future bet, with several projects being launched around the world, in a consortium of energy companies.

In 2022, RenovaBio concluded its third cycle and 31.2 million CBIO were emitted in 2022, which added to the remaining stock from previous year totaled 42 million credits available for sale, 16% higher than the target (36 million CBIO). Due to the new deadline for proving these individual goals, fuel distributors retired 16.8 million CBIO, 47% of global target. The CBIO market went through different phases, with the weighted average price being R$ 111.6/CBIO, 84% higher than the average value observed in 2021.

The Analysis of Biofuels' Current Outlook also provides an analysis of the 20 years of the flex fuel vehicle in Brazil and its impacts on the fuel market, showing the strategic importance of this technology.

The fourteenth edition of the Energy Research Company's (EPE) Analysis of Biofuels' Current Outlook is available on the EPE website at www.epe.gov.br.