SIXTEENTH EDITION OF ANALYSIS OF BIOFUELS' CURRENT OUTLOOK

The Analysis of Biofuels' Current Outlook, one of the main publications of Energy Research Office (EPE), presents the relevant facts that occurred in the year prior to its publication. Its sixteenth edition presents the performance of the sugar-energy sector and the growth of corn ethanol facilities, culminating in record total ethanol production. Otto cycle fuel consumption registered its historic maximum, with hydrous ethanol maintaining competitiveness throughout the year. In biodiesel sector, the mandatory addition to diesel has risen to 14% by volume (B14) as of March and remained constant throughout the year. The National Biofuels Policy (RenovaBio) concluded the fifth cycle of CBIO traded in stock exchange markets.

The main topics covered annually in this document are ethanol supply and demand and its production and transport infrastructure, pricing and taxation of Otto cycle fuels, biomass in electricity generation, biodiesel market, international market for renewable sustainable fuels, the RenovaBio monitoring, besides the new biofuels, such as biomethane, sustainable aviation fuels and for water use and low carbon hydrogen. This year, the final article has as its central theme an analysis of the potential expansion of biofuels production and associated impacts.

Total sugarcane processed reached 686 million tons in 2024, 3.7% higher than in 2023. Sugar production fell by 3.1%, totaling 44.3 million tons, while exports was 38.3 million tons, the highest level in the historical series. Regarding sugarcane ethanol, 29.7 billion liters were produced, which, added to the corn biofuel share of 7.7 billion liters (growth of 32%), reached 37.3 billion liters (5.7% higher than 2023). A total of 17.3 million tons of corn were processed for ethanol production, around 15%, with a relevant share from the second harvest, mainly in Mato Grosso. The country increased the positive balance in international ethanol trade (net exports of 1.7 billion liters), increasing exports and reducing import levels.

The average price of hydrous ethanol decreased by 0.3%, while type C gasoline average prices increased by 3.6% compared to the previous year. The relative price (EP/GP) was 65%, more favorable to consumers' preference for biofuel.

In 2024, 2.5 million new light vehicles were licensed in Brazil, 14.1% more than 2023, marking the second consecutive year. The hydrous ethanol demand grew approximately 30%, reaching 23.6 billion liters, while gasoline type C consumption fell by 4%, totaling 44.6 billion liters. This resulted in an Otto cycle demand of 61.1 billion liters of gasoline equivalent, an increase of 3.4% over the previous year.

The number of electrified vehicles increased by a 89% compared to 2023, with gasoline-powered vehicles accounting for 4.1% of the total. In 2024, Brazilian fleet of Otto cycle light vehicles remained stable at 37 million units, with flex fuel technology representing 85% of the total.

Sugar-energy plants injected Bioelectricity into National Interconnected System in an amount of 2.4 GWm, same level of 2023.

Regarding biodiesel, the percentage in diesel mixture was defined by CNPE Resolution No. 03/2023 at 14% by volume since March 2024 and has remained at this value throughout all the year. Its production was 9.1 billion liters, an increase of 21% in comparison to the previous year. Soy remains the main raw material, with a 72% share.

The emissions avoided by first generation sugarcane (1G) and corn ethanol, biodiesel and sugarcane bioelectricity in 2023 were 65.3 $MtCO_2eq$, 26.8 $MtCO_2eq$ and 2.0. $MtCO_2eq$, respectively, totaling 94.1 $MtCO_2eq$. These results reinforce Brazil's potential to lead a sustainable energy transition, leveraging its abundant renewable resources.

Biogas installed capacity in distributed generation reached 145 MW in 2024, using agro-industrial, animal and urban waste as its input. In addition, its share in the domestic energy supply reached 482 thousand tons of oil equivalent (toe). 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 in recent years including biomethane in Special Incentive Regime for Infrastructure Development (REIDI, in Portuguese acronym), the National Program for Decarbonization of Natural Gas Producers and Importers and Incentive to Biomethane (established under the Future Fuel Law), and the National Integrated Plan for Natural Gas and Biomethane Infrastructure (PNIIGB).

Additional innovations and emerging perspectives for biofuels include HVO, SAF, renewable marine fuels, biomass-based hydrogen, BioCCS.

In 2024, RenovaBio concluded its fifth operational cycle in the organized market. By May 2025, 338 production units were certified, the majority of which were ethanol. At the end of 2024, 35.7 million CBIOs were retired by obligated parties, corresponding to 92% of the target established by the CNPE and 77% of the total individual targets assigned by the ANP, which includes the portion not met by distributors in 2023. The CBIO price decreased, with a weighted average of R$88.02.

The Analysis of Biofuels' Current Outlook also provides an article of the potential expansion of biofuel production and its associated impacts, showing that low-risk techniques for changing land use can support increased production without expanding agricultural frontiers, while also estimating co-products and social benefits in terms of job creation. The study highlights synergies between biofuel and food production, supported by various public policies, with family farming playing a significant role.

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