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Brazil Proposes Adding Green Diesel to Their Energy Matrix

Stratas Advisors

On March 17, 2020, the National Agency of Petroleum, Natural Gas and Biofuels (ANP) in Brazil issued [Public Consultation No. 3/2020](#) in the Official Federal Gazette of the Union. The commencement of the public consultation will address a draft resolution focused on the specifications of a new biofuel type to be marketed in the national territory. The biofuel will be a green diesel, a renewable fuel produced from renewable raw materials such as vegetable and animal fats, sugar cane, alcohol, and biomass intended for diesel combustion engines. The green diesel may be added to conventional diesel, which currently mandates the addition of biodiesel at 12 vol%. The proposed green diesel will be predominantly made up of paraffinic hydrocarbons containing properties similar to conventional diesel yet differs from biodiesel; a biofuel with a mixture of fatty acid esters with similar properties.

The proposed green diesel specifications will be in line with the National Biofuels Policy (RenovaBio) under Law 13.576 from Dec. 26, 2017, a law that aims to expand the use of biofuels in the Brazilian energy matrix to reach energy security and mitigate greenhouse gas emissions. The initiative behind the proposed green diesel specification is the result of the ANP carrying out an analysis of the regulatory impact brought about by the introduction of the new biofuel in the Brazilian market, in addition to studies of comparable international specifications of green diesel commercialized internationally. The public consultation period for the proposed specification for the green diesel will be 45 days as of its announcement in the Official Federal Gazette.

Proposed Specifications

In the public consultation, the proposed resolution establishes the specifications for the [green diesel](#) (see table below) and the quality control obligations to be met by fuel producers that may commercialize this fuel in national territory.

The green diesel specifications covered in the proposed resolution may be produced from the following feedstocks, those being:

- Hydrotreating of vegetable and animal oil;
- Synthesis gas from biomass;
- Fermentation of sugarcane juice; and
- Oligomerization of ethyl alcohol (ethanol) or isobutyl alcohol (isobutanol).

The commercialization of the green diesel that does not comply with the specification established in the proposed resolution

For members of the following service(s): Global Fuel Specifications, Global Biofuels Assessment, Latin America

is prohibited. The green diesel produced from the recommended feedstocks can be added to Diesel A for the formulation of Diesel B in any percentage according to the specifications indicated under Resolução ANP No. 69/2014 (see [Brazil's Diesel Specifications](#)). In terms of the differentiation between the two grades, Diesel A is the conventional diesel grade minus the addition of biodiesel used to formulate Diesel B.

Moreover, the biodiesel used to compose the final diesel mixture must meet the ANP specifications in force indicated under Resolução ANP N° 45, 2014 (see [Brazil's Biofuels Specifications](#)). With the addition of biodiesel to the combined Diesel A and green diesel, the resulting diesel fuel mixture may be utilized for on-road use diesel engine vehicles. The use of a fuel mixture composed of Diesel A and green diesel, without the compulsory addition of biodiesel is prohibited under the proposed resolution. As for importation of green diesel, the fuel producer must guarantee the quality of the commercialized green diesel and provide the quality certificate indicating compliance with the limits represented in the proposed specifications.

Proposed Green Diesel Specifications

	2020		2020		2020		2020	
	Proposed							
Spec Name	Resolução ANP N° 69, 2014		Resolução ANP N° 69, 2014		Resolução ANP N° 69, 2014		Consulta Publica No. 3/2020	
Grade	Diesel B - S10		Diesel B - S500		Non-road Diesel A/B S1800		Green Diesel - S10	
Grade Category	On-road		On-road		Off-road		On-road	
Effective Date	Jan, 2015		Jan, 2015		Jan, 2015		Mar, 2020	
Source	ANP		ANP		ANP		ANP	
Additional Comments	Specification under public consultation.							
	Property	Test Method	Property	Test Method	Property	Test Method	Property	Test Method
Cetane number, min	48		42	ASTM D 613	42	ASTM D 613	51	ASTM D613,ASTM D6890,ASTM D7170,EN ISO 5165,EN 15195
Cetane index, min			45 (1)	ASTM D 6890,ASTM D 7170	45 (1)	ASTM D 6890,ASTM D 7170		
Sulfur, ppm, max	10 (3)	ASTM D 2622,ASTM D 5453,ASTM D 7212,ASTM D 7220 (2)	500	ASTM D 2622,ASTM D 1552,ASTM D 4294,ASTM D 5453,ABNT NBR 14875,ABNT NBR 14533 (4)	1800 (5)	ASTM D 2622,ASTM D 4294,ASTM D 5453,ABNT NBR 14533	10	ASTM D2622,ASTM D5453,ASTM D7039,ASTM D7220,EN ISO 20846,EN ISO 20884
Polyaromatics, wt%, max	11	ASTM D 5186,ASTM D 6591,EN 12916						
Total aromatics, vol%, max							1.0	ASTM D5189,ASTM D6591,EN 12916,SIS 155116

	2020		2020		2020		2020	
Density @ 20°C, kg/m3, min	815 (6)	ASTM D 1298,ASTM D 4052,ABNT NBR 7148,ABNT NBR 14065	815	ASTM D 1298,ASTM D 4052,ABNT NBR 7148,ABNT NBR 14065	820	ASTM D 1298,ASTM D 4052,ABNT NBR 7148,ABNT NBR 14065	761.2 (Z)	ABNT NBR 7148,ABNT NBR 14065,ASTM D1298,ASTM D4052,EN ISO 3675,EN ISO 12185
Density @ 20°C, kg/m3, max	850 (6)	ASTM D 1298,ASTM D 4052,ABNT NBR 7148,ABNT NBR 14065	865	ASTM D 1298,ASTM D 4052,ABNT NBR 7148,ABNT NBR 14065	880	ASTM D 1298,ASTM D 4052,ABNT NBR 7148,ABNT NBR 14065	806.5 (Z)	ABNT NBR 7148,ABNT NBR 14065,ASTM D1298,ASTM D4052,EN ISO 3675,EN ISO 12185
Viscosity @ 40°C, cSt, max	4.5	ASTM D 445,ABNT NBR 10441	5.0	ASTM D 445,ABNT NBR 10441	5.0	ASTM D 445,ABNT NBR 10441	4.50	ABNT NBR 10441,ASTM D445,EN ISO 3104
Viscosity @ 40°C, cSt, min	2.0	ASTM D 445,ABNT NBR 10441	2.0	ASTM D 445,ABNT NBR 10441	2.0	ASTM D 445,ABNT NBR 10441	2.00	ABNT NBR 10441,ASTM D445,EN ISO 3104
Distillation								
T10, °C, min	180		Report		Report			
T50, °C, min	245		245	ABNT NBR 9619,ASTM D 86	245	ABNT NBR 9619,ASTM D 86		
T50, °C, max	295		310	ABNT NBR 9619,ASTM D 86	310	ABNT NBR 9619,ASTM D 86		
T85, °C, max			360	ABNT NBR 9619,ASTM D 86	370	ABNT NBR 9619,ASTM D 86		
T90, °C, max			Report		Report			
T95, °C, max	370						360	ABNT NBR 9619,ASTM D86,EN ISO 3405
Flash Point, °C, min	38	ASTM D 56,ASTM D 93,ABNT NBR 7974,ABNT NBR 14598	38	ASTM D 56,ASTM D 93,ASTM D 3828,ABNT NBR 7974,ABNT NBR 14598	38	ASTM D 56,ASTM D 93,ASTM D 3828,ABNT NBR 7974,ABNT NBR 14598	55	ABNT NBR 7974,ABNT NBR 14598,ASTM D56,ASTM D93,ASTM D3828,ASTM D7094,EN ISO 2719
Carbon residue 10%, wt%, max	0.25	ASTM D 524,ABNT NBR 14318,NBR 14318	0.25	ASTM D 524,ABNT NBR 14318	0.25	ASTM D 524,NBR 14318	0.30	ABNT NBR 14318,ASTM D524,EN ISO 10370
Cold Filter Plugging Point (CFPP), °C	(8)	ASTM D 6371,ABNT NBR 14747	(8)	ASTM D 6371,ABNT NBR 14747	(8)	ASTM D 6371,ABNT NBR 14747	(9)	ABNT NBR 14747,ASTM D6371
Water and sediment, vol%, max					0.05	ASTM D 1796,ABNT NBR 14647		
Water, vol%, max	200 mg/kg (10)	ASTM D 6304	500 mg/kg	ASTM D 6304,EN ISO 12937			200 mg/kg	ASTM D6304,EN ISO 12937
Ash, wt%, max	0.01	ASTM D 482,ABNT NBR 9842	0.01	ASTM D 482,ABNT NBR 9842	0.01	ASTM D 482,ABNT NBR 9842	0.01	ABNT NBR 9842,ASTM D482,EN ISO 6245
Total contamination, ppm, max	24	EN 12662					24	EN 12662

	2020		2020		2020		2020	
Lubricity, HFRR wear scar diam @ 60°C, micron, max	- (11)	ISO 12156,ASTM D 6079	- (12)	ASTM D 6079,ISO 12156			460 (13)	ASTM D6079,EN ISO 12156-1
Copper corrosion, 3hr @ 50°C, merit (class), max	1	ASTM D 130,NBR 14359	1	ASTM D 130,ABNT NBR 14359	1	ASTM D 130,MB-287,ABNT NBR 14359	1	ABNT NBR 143592,ASTM D130,EN ISO 2160
Oxidation stability, mg/100ml							(14)	EN ISO 12205
Oxidation stability, mg/100ml, max	2.5	ASTM D 2274,ASTM D 5304						
Total acid number, mg KOH/g, max	Report	ASTM D 974,ABNT NBR 14248					0.3	ABNT NBR 14248,ASTM D664,ASTM D974
Conductivity @ ambient temp, pS/m, min	25	ASTM D 2624,ASTM D 4308	25	ASTM D 2624,ASTM D 4308	25			
Color				(15)		ABNT NBR 14483,ASTM D 1500		
Color, max	3.0	ASTM D 1500,ABNT NBR 14533,ASTM D 6045	2.0	ASTM D 1500,ABNT NBR 14483,ASTM D 6045				
Appearance	Clear, free of impurities (16) (17)		Clear, shiny and free of sediments (16) (17)		Clear, free of impurities (16) (17)			
FAME content, vol%	(18)		(18)		(19)			
Metal content (Zn, Cu, Mn, Ca, Na, other), g/l, max							1.0 ppm (20)	
Farnesane, wt%, min							96 %(m/m) (21)	

(1) Alternatively, cetane index can be measured with the ASTM D4737 method, when the product does not contain cetane improver additive, with a lower limit of 45. If the result is a CI lower than 45, the test for cetane number should be performed. When a cetane improver additive is used, this information should be included on the Certificate of Quality.

(2) In case of conflict, ASTM D5453 will be used.

(3) Up to 15 ppm sulfur allowed in distribution and retail.

(4) In case of conflict, the test ASTM D 5453 will be used.

(5) In case of conflict, test method ASTM D 5453 will be used. Test methods NBR 14533 and ASTM D 4294 are only used for diesel A.

(6) A range of 815-853 kg/m3 will be admitted.

(7) Limit must be met only for green diesel: hydrotreating vegetable and animal oil; synthesis gas from biomass; and fermentation of sugarcane juice. For green diesel of ethyl or isobutyl alcohol oligomerization, the result should be only reported, with no specified limit.

(8) Varies based on season and region.

(9) Max limit varies based on month and state.

(10) Applicable in the production and import of diesel S10, import of diesel S500 A and both diesel B in the distribution

(11) Can be determined by methods ISO 12156 or ASTM D6079, applying the limit of 460 microns. The measurement should be held every two months in diesel when blended with biodiesel.

(12) Can be determined by methods ISO 12156 or ASTM D6079, applying the limit of 520 microns. The measurement should be held every two months in diesel when blended with biodiesel.

(13) The lubricity measurement must be carried out in a sample containing biodiesel, in the content established by the current legislation.

(14) 25 g/m³ max.

(15) From yellow to orange, can be brown depending on the biodiesel quality

(16) For purposes of enforcement, for fines for non-compliance in Appearance, tests of water content and total contamination should be carried out. The product will fail if at least one of these last two parameters do not meet the specification.

(17) In case of conflict, the product can only be regarded as not specified in the Appearance if the parameters of water and/or total contamination do not comply.

(18) Compulsory addition of biodiesel in percentage determined by current legislation. As of March 1, 2018 per CNPE Resolution 23/2017, current blend at 10 vol%.

(19) Diesel A S1800: no biodiesel.

(20) The test should be carried out only for the metals present in the catalysts used in the green diesel production route. Includes the following metals: Al, Ca, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Pd, Pt, Sn, Sr, Ti, V and Zn.

(21) Applicable only to green diesel produced from fermentation of sugarcane.

In regards to the quality control of the green diesel, the importer and the producer must keep a control sample within their custody per the ANP for a minimum period of three months from the date the product leaves the premises of the producer; and in the case of fuel importers, four months after the product is sold. As part of the proposed resolution, the minimum volume of the quality control samples must be two liters, and collected in containers of equal volume, sealed with a tamper proof seal that provides evidence in case of violation, and transported in a container protected from light. Additionally, the quality control certificate of the green diesel must provide information, which allows the tracking of the respective control samples, their sample identification numbers, and proof of tamper resistant seals. In addition, only fuel distributors and Diesel A producers authorized by the ANP will be allowed to formulate the final diesel fuel mixture.

To conclude, when producing the diesel fuel mixture composed of Diesel A, green diesel and biodiesel; the producer and distributor must guarantee the quality of the final product and present a fuel quality certificate indicating compliance with the limits established in the respective ANP specifications for Diesel B. Furthermore, as part of the general provisions, the proposed resolution states that in the event that the physical and chemical tests are carried out by more than one laboratory; the results generated as part of the analysis must be grouped into a single fuel quality certificate or compliance certificate. Lastly, the fuel quality certificate or compliance certificate, as well as their respective quality analysis reports must be made available to the ANP for a minimum period of one year from the date of commercialization of the referenced fuel batch.

Stratas Advisors' View

Based on the development of the proposed specification, it appears that Brazil is moving towards the production, commercialization and expanding the use of biofuels through the use of green diesel on the market. From what was considered for the formation of the proposed resolution, the ANP took into account the experimental use of the biofuel in a 10 vol% mixture with Diesel B in vehicles operated by public transport companies in the cities of São Paulo and Rio de Janeiro in 2012. Moreover, the ANP extended the testing to include a fuel mixture with 30 vol% green diesel in Diesel B in 2013, where it was determined that there was equivalent performance using the fuel mixture containing green diesel when compared to Diesel B. Moving forward, the ANP has since evaluated the entry of the green diesel into the Brazilian market and worked to propose specifications for the product.

Taking into account the groundwork that has already taken place; the ANP may be in a better position to process the public consultation in a more expedient manner. With the public consultation in the initial comment and suggestion phase, stakeholders in the fuel production and auto manufacturing industries will be able to provide inputs on the proposed specifications. With respect to the production of the green diesel, those that opt to manufacture the fuel should have the capability in place to do so considering the similarity to conventional diesel fuel. As for the auto manufacturing industry, the inputs they provide will allow the ANP to modify the specifications based on the type of impact the green diesel may have on the engine and other vehicle components. Furthermore, with the possible introduction of the green diesel, the ANP may update the specifications for conventional diesel, B100 and the BX to B30 blend in order to allow use of the new biofuel

within those specifications where it may be applicable. Lastly, based on their extended use of ethanol and biodiesel, Brazil may be able to easily integrate the new biofuel into the country's fuel market.