



CONFERENCE ON AVIATION AND ALTERNATIVE FUELS

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Agenda Item 3: Challenges and policy making

CURRENT POLICIES AND GLOBAL INITIATIVES ON ALTERNATIVE FUELS

(Presented by the ICAO Secretariat)

SUMMARY

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1. INTRODUCTION

1.1 This paper provides an overview of current alternative fuel policies in place, not only in aviation but for ground transportation as well. It also describes several initiatives organized to promote aviation alternative fuel development.

2. OVERVIEW OF SOME POLICIES ON ALTERNATIVE FUELS FOR GROUND TRANSPORTATION

2.1 Currently, mandates or targets for alternative fuels for ground transportation are in place or under consideration by 66 States worldwide: 13 countries in the Americas, 12 in Asia-Pacific region, 11 in Africa and the Indian Ocean, 28 from European Union (EU) member states and 2 from non-EU countries in Europe. Major blending mandates that will drive global demand are those set by the European Union (EU), the United States (US), China and Brazil.¹ Details on some of these policies are as follows:

2.2 **Indonesia:** Regulations on alternative fuels are currently designed to increase domestic consumption of biodiesel produced from palm oil. The country began developing its biofuels industry in 2006, and since then, several regulations supporting biofuel have been introduced and evolved. The Indonesian biofuels mandate is one of the most aggressive in the world. Five specific regulatory measures have been taken by different government levels:

¹ Lane J., BiofuelDigest, *Biofuels Mandates Around the World 2017*, 28 December 2016, available at: <http://www.biofuelsdigest.com/bdigest/2016/12/28/biofuels-mandates-around-the-world-2017/>

- 1) the Biodiesel Mandate sets an ambitious blending target. Building on a mandatory blending of 10% established in 2008, this new regulation released in 2015 increased mandatory biodiesel blending to 15% for transportation and industrial uses.
- 2) a palm oil export tax defines a progressive export tax tariff ranging from \$0/tonne, when the international Crude Palm Oil (CPO) price is below \$750/tonne, up to \$200/tonne when the price is above \$1,250/tonne.
- 3) a palm oil export levy was introduced in 2015 as a new funding mechanism to support national biofuels subsidy² by means of a “plantation fund” that can be used for the procurement and utilization of biodiesel.
- 4) a biofuels subsidy is provided by the Indonesia Oil Palm Estate Fund (BPDP) to biofuel producers. Palm oil export levy revenue is redistributed to biofuels producers selling their products domestically for B20 mixing³. The amount paid to these producers is based on the price differential between fossil-based diesel fuel and biofuels, as defined by the Market Price Index (MPI).
- 5) Indonesian Sustainable Palm Oil (ISPO) compliance. Palm oil plantations supplying palm oil for biofuel production are specifically exempt from ISPO compliance.⁴

2.3 **European Union (EU):** The Renewable Energy Directive 2009/28/EC (RED) requires all EU Member States to ensure that by 2020 at least 10% of their transport energy consumption comes from renewable sources by 2020. In 2015 the EU achieved a 6.7 percent share of renewable energy use in the transport sector⁵. Furthermore, the Fuel Quality Directive (FQD)⁶ requires suppliers of fuel or energy to reduce, by 2020, at least 6% of life-cycle GHG emissions per unit of energy or fuel used by road vehicles. The so-called "ILUC" Directive (EU) 2015/1513 covering indirect land-use change⁷, and amending the FQD and the RED, sets a cap for first-generation biofuels (from crops grown on agricultural land) of no more than 7% of EU transport's energy consumption by 2020. The remaining 3% will come from other sources of renewable energy such as biofuels produced from wastes, residues and lignocellulosic material and renewable electricity. Finally an indicative 0.5% target is set for second-generation biofuels. In many cases multipliers are applied when counting the contribution of these fuels to the 10% renewable energy target, as follows:

- 1) biofuels produced from used cooking oil and animal fats are double-counted;
- 2) renewable electricity in rail transport is counted 2.5 times;

² Presidential Regulation No 61/2015 (on Collection and use of palm oil funds)

³ B20 refers to a mixture composed of 20% of biodiesel with 80% of diesel.

⁴ Kharina A., Malins C., and Searle S., *Biofuels Policy In Indonesia: Overview and Status Report*, International Council on Clean Transportation (ICCT), 2016

See also: Wright T., Rahmanulloh A., *Indonesia Biofuels Annual 2016*, US Department of Agriculture (USDA), USDA Foreign Agricultural Service, 2016

⁵ Eurostat, *Share of renewable energy in fuel consumption of transport*, General and regional statistics, 09 August 2017, available at: <http://ec.europa.eu/eurostat/web/products-datasets/-/tsdcc340>

⁶ Directive 98/70/EC

⁷ In 2015, a new study on *indirect land-use change (ILUC) of biofuels* was carried out by a consortium of consultancies –Ecofys, IIASA and E4Tech–. The study uses a model called “GLOBIOM” to model ILUC for different feedstocks and policy scenarios. See: http://ec.europa.eu/energy/sites/ener/files/documents/Final%20Report_GLOBIOM_publication.pdf

- 3) renewable electricity in electric vehicles is counted 5 times; and
- 4) second generation biofuels are double-counted.

2.4 EU Member States must transpose the law in national legislation by 2017 and report on how they are going to meet these indicative targets for advanced biofuels.⁸ The following experiences of national implementations of the EU RED and FQD into national laws are highlighted:

2.4.1 **Italy:** Double-counting is allowed for second-generation biofuels and a 1.2% second-generation biofuels blending mandate by 2018 was established for road transportation in Italy in October 2014. That mandate will increase to 2% by 2022.⁹

2.4.2 **Germany:** New legislation, which came into force in Germany in January 1, 2015, set targets of reducing GHG emissions for petrol and diesel by 3.5%, 4%, and 6% respectively in 2015, 2017, and 2020;¹⁰ before that, the oil industry was required to put a minimum percentage of biofuels on the market (6.25% energy content of their transport fuel sales); from January 1, 2018, fuel suppliers can also fulfil the obligation with renewable fuels of non-biological origin (Power to Gas/Liquid).¹¹

2.4.3 **France** has implemented some measures to foster the deployment of alternative fuels: a) fiscal incentives to encourage the incorporation and distribution of biofuels following the objectives of incorporation set in that regard (7% for the gasoline and 7.7% for the diesel in 2016)¹²; b) introduction of unleaded gasoline containing 10% agroethanol or SP95 E10 (sans plomb 95 contenant 10% d'agroéthanol) in 2009 and the incorporation of up to 8% by volume of Fatty Acid Methyl Esters (FAME) in diesel fuel in 2015; c) introduction of second-generation biofuels, i.e. E85 superethanol (65-85% by volume of ethanol) in 2007, as well as Diesel B30 (30% by volume FAME) and in 2016 Fuel ED95 (up to 95% by volume ethanol) intended for captive fleets. Decree 2016-1442 of 27 October 2016 (*Programmation Pluriannuelle de l'Énergie*) defines the objectives for the incorporation of second-generation biofuels¹³.

2.4.4 **United Kingdom:** Under the UK's incentive scheme, the Renewable Transport Fuel Obligation (RTFO), there is currently a requirement on fossil fuel suppliers to blend set a percentage of their fuel with biofuels. Currently biofuels provide 3% of total road transport fuel per year. The target is not fuel specific and almost all biofuel supplied (97%) is either biodiesel (typically in B7 blends) or ethanol (in petrol in E5 blends). Incentives exist for waste-based biofuels in the form of double reward under the RTFO. This has resulted in an increase in the supply of these fuels, and in 2015/16 they constituted 59% of total biofuel supply.¹⁴

⁸ ETIP Bioenergy, *Biofuels Policy and Legislation*, 2017, available at:

http://www.etipbioenergy.eu/?option=com_content&view=article&id=209

⁹ The Italian laws implementing the concepts described in the statement about the Italian policy: (1) the Legislative Decree no.28 dated 3rd March 2011 (to implement the RED and allowing double-counting for advanced biofuels); (2) the Decree of Ministry of Economic Development dated 14th October 2014 (stating the percentages related to advanced biofuels, that are reported in the text, of 1.2% by 2018 up to 2% by 2022).

¹⁰ § 37a (4) of the German Federal Emission Control Act (BImSchG), available at:

https://www.gesetze-im-internet.de/bimschg/_37a.html

¹¹ 37th Federal Emission Control Ordinance (BImSchV) to implement the German Federal Emission Control Act (BImSchG)

¹² Article 32 of the Finance Act for 2005 introduced a tax (TGAP) on the release for consumption of gasoline on the one hand and diesel on the other hand based on the sale price excluding VAT

¹³ Ministère de la Transition Écologique et Solidaire, *Biocarburants*, 8 December 2016, available at :

<http://www.developpement-durable.gouv.fr/biocarburants>

¹⁴ Department for Transport, Renewable Transport Fuel Obligation statistics 2015/16 final report, 2nd February 2017, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/613200/rtfo-year-8-report-6.pdf

2.4.5 **Norway:** There is currently a quota obligation of 7% (from 1 January 2017), which obliges fuel suppliers to sell at least 7% biofuels out of their total annual fuels sale. The increase from 5.5% is to be met through advanced biofuels alone.¹⁵ In 2016, the Parliament asked the government to increase the biofuels content in fuels to 20% from 2020, with a sub-target of 8% double-counted advanced biofuels.¹⁶ This has been sent on a public consultation from July 2017.¹⁷ In the new budget, the taxes on fuels were increased. The Norwegian registration tax for new passenger cars consists of three components: the vehicle's weight and the vehicle's emission of CO₂ and NO_x. The CO₂ and NO_x component of the registration tax was increased from 2017. The average registration tax for fossil fueled passenger cars in the first half of 2016 was 95 000 Norwegian kroner (about 10 000 EUR). Zero emission vehicles are exempted from the registration tax and VAT.¹⁸

2.5 **Brazil:** Brazil has the longest-standing national program to promote the use of ethanol in motor vehicle fuel (Otto cycle). This national program, which dates back to the 1970s, not only mandated ethanol use in automotive fuel, but also provided for the infrastructure needed to support such use, including incentives for producing ethanol-powered cars and support for upgrading gasoline stations to accommodate ethanol use. Brazil currently mandates a minimum ethanol content of 27 in gasoline,¹⁹ increasing from the 20% required in 2015 when ethanol supplies tightened because of rising global prices for sugar. Total ethanol (hydrous and anhydrous) installed industrial capacity is close to 120 billion liters per year.²⁰ Soy crop (70% of biodiesel raw material) is supporting the domestic biodiesel industry's push for a higher biodiesel blend from currently 7% to 9% in 2018 and 10% in 2019.²¹ In 2015, the nominal capacity for biodiesel production (B100) in Brazil was about 7.4 billion litres per year. Meanwhile, domestic production was 3.9 billion litres per year, corresponding to 53.3% of total capacity.²²

2.6 **US:** The Renewable Fuel Standard (RFS), created in 2005 under the Energy Policy Act, requires a certain volume of alternative fuel to replace or reduce the quantity of conventional transportation fuel, heating oil, or jet fuel. Four renewable fuel categories are covered under the RFS: biomass-based diesel, cellulosic ethanol, second-generation biofuel, and total renewable fuel. The different fuel pathways are eligible for crediting and generating Renewable Identification Numbers (RINs), which are issued for compliance with the RFS. Fuel operators are required to submit a certain amount of RINs and are obligated to meet certain quotas of alternative fuel blended into conventional fuels, which are set annually by the Environmental Protection Agency.²³

¹⁵ Norwegian product regulation (FOR-2004-06-01-922) § 3-3

¹⁶ Nasjonalbudsjettet 2017, Meld. St. 1 (2016-2017), Innst. 2 S (2016-2017), Decision by the Norwegian parliament in connection to the budget of 2017, available at:

<https://www.stortinget.no/no/Saker-og-publikasjoner/Vedtak/Vedtak/Sak/?p=66653>

¹⁷ Prop.1 LS (2016-2017) Skatter, avgifter og toll 2017, Proposition to the Storting (bill and draft resolution) on budget proposal on taxes 2017. Ministry of Finance, available at:

<https://www.regjeringen.no/contentassets/83f4ddc3a3e54345aa45c5cd17e4e12c/no/pdfs/prp201620170001ls0dddpdfs.pdf>

¹⁸ International Energy Agency (IEA), *Renewable Energy*, Renewable Policy Updated, Issue 12, 22, December 2016, available at <https://www.iea.org/media/topics/renewables/repolicyupdate/REDRenewablePolicyUpdateNo1220161222.pdf>

See also: Ministry of Climate and Environment, *Meld. St. 13 (2014–2015)—New emission commitment for Norway for 2030 – towards joint fulfilment with the EU*, available at: https://www.regjeringen.no/en/dokumenter/meld.-st.-13-20142015/id2394579/sec4?q=biofuels#match_0

¹⁹ Portaria MAPA Nº 75 DE 05/03/2015, available at: <https://www.legisweb.com.br/legislacao/?id=281775>

²⁰ http://www.anp.gov.br/wwwanp/images/publicacoes/boletins-anp/Boletim_do_Etanol/Boletim_do_Etanol_No09_FEVEREIRO_2017.pdf

²¹ Federal Law Nº 13.263, 23/March/2016, available at: http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2016/lei/L13263.htm

²² http://www.anp.gov.br/wwwanp/images/publicacoes/Anuario_Estatistico_ANP_2016.pdf

²³ Biofuels International, *EPA publishes renewable fuels data for April 2017*, 26 May 2017, available at: http://biofuels-news.com/display_news/12376/epa_publishes_renewable_fuels_data_for_april_2017/

2.7 **Canada:** Canada has a Renewable Fuel Standard featuring E5 ethanol (a mixture of 5% ethanol and 95% gasoline), and RD2 Renewable Diesel (Biodiesel or Hydrotreated Vegetable Oil (HVO)). Canada introduced the 2% RD mandate in July 2011. In addition, many provinces have equivalent or higher provincial mandates, including a 5% ethanol and 2% RD mandate in Ontario, 7.5% ethanol and 2% RD in Saskatchewan, and 8.5% ethanol and 2% RD in Manitoba.²⁴

2.8 Appendix A presents alternative fuels consuming country mandates through 2025 for six countries/regions (US, EU, Brazil, Indonesia, Argentina, China), as well as a summary of some additional national policy measures. In addition, Appendix B shows US, Brazil, Europe and world alternative fuels consumption from 2000 to 2011.

3. POLICIES AND GLOBAL INITIATIVES ON AVIATION ALTERNATIVE FUELS

3.1 Some States have established policies to promote the production of Aviation Alternative Fuels (AAF) and some others have announced aspirational targets or mandates (Norway - 1% biojet fuel by 2019 with an aim to increase to 30% by 2030, given sufficient supply of sustainable biojet fuel;²⁵ Mexico (2011) - 1% by 2015 and 4% biojet fuel by 2020;²⁶ Indonesia - 2% aviation biofuels by 2018²⁷).

3.2 **US:** Several federal agencies including the Department of Transportation (DOT), Federal Aviation Administration (FAA), US Department of Agriculture (USDA), Department of Energy (DOE), and Department of Defense (DOD), directly support AAF through targeted goals, initiatives, and interagency and industry coordination. The four agencies also sponsor research that specifically targets the development of AAF or provides direct support for its future commercial production, or both. In addition, FAA and DOD support research to determine the technical feasibility of using new AAF.²⁸

3.3 **Mexico:** The Secretariat of Energy (SENER) and the National Council of Science and Technology (CONACYT) developed the Mexican Centers for Energy Innovation (CEMIE) whose main objective is to promote, through research and development, the use of renewable energies.²⁹ Among its main functions are the medium and long-term scientific-technological planning focused on developing and use of renewable technologies, the identification of portfolio of projects and strategic actions in order to provide results that increase the value of the energy sector. One of these Centers is focused on the development of sustainable aviation fuels, with the participation of R&D centers, institutes and specialized companies.³⁰ The joint effort of such organizations are aim to develop a self-sustaining

²⁴ Lane L., BiofuelDigest, *Biofuels Mandates Around the World 2016*, 3 January 2016, available at: <http://www.biofuelsdigest.com/bdigest/2016/01/03/biofuels-mandates-around-the-world-2016/>

²⁵ Meld. St. 33 (2016-2017) Nasjonal Transport plan 2018-2029, White paper on the National Transport Plan 2018-2029, Ministry of Transport and Communications, available at: www.regjeringen.no/contentassets/7c52fd2938ca42209e4286fe86bb28bd/no/pdfs/stm201620170033000dddpdfs.pdf

²⁶ A. Lang, H. Farouk, *The Worldwide Production of Bio-Jet Fuels - the Current Developments Regarding Technologies, Feedstocks, and Innovative New R&D Developments*, 2014, at 31.

²⁷ Ibid **Error! Bookmark not defined.**, at 302

²⁸ United States Government Accountability Office (GAO), *Alternative Jet Fuel, Federal Activities Support Development and Usage, but Long term Commercial Viability Hinges on Market Factors* (Report to Congressional Requesters), May 2014, available at: <https://www.gao.gov/assets/670/663027.pdf>

²⁹ *Se dan a conocer a los ganadores de los Centros Mexicanos de Innovación en Energías Bio y Océano*, available at: <https://www.gob.mx/sener/articulos/se-dan-a-conocer-a-los-ganadores-de-los-centros-mexicanos-de-innovacion-en-energias-bio-y-oceano>

³⁰ *Arranca consorcio para el desarrollo de Bioturbosina en México*, available at: <https://www.gob.mx/conacyt/prensa/arranca-consorcio-para-el-desarrollo-de-bioturbosina-en-mexico?idiom=es>

business model. This center is focused on biomass sources, fuel production, sustainability and life cycle evolution as well as market development of biofuels for aviation.

3.4 **EU:** The European Commission has acknowledged that, differently from other transport modes, in the medium-term advanced biofuels will be particularly important for aviation.³¹ On November 30, 2016, the European Commission presented a proposal to the EU Council and the European Parliament for a recast of the Renewable Energy Directive for 2030, called "RED II". To promote the deployment and development of low carbon fuels such as advanced biofuels it is proposed to introduce after 2020 an incorporation obligation requiring fuel suppliers to sell a gradually increasing share of renewable and low-emission fuels, including advanced biofuels and renewable electricity (1.5% in 2021 to 6.8% by 2030). In particular to promote innovation the obligation includes a specific sub-quota for advanced biofuels, increasing from 0.5% in 2021 to at least 3.6% in 2030. Advanced biofuels are defined as all biofuels that are produced based on a positive list of feedstocks (mostly lignocellulosic material, wastes and residues). Appendix C shows a comparison between renewable energy targets for transportation in RED and RED II. Aviation and marine sectors are explicitly covered in the proposal: it is proposed that advanced alternative fuels used for aviation and maritime sectors can be counted 1.2 times towards the 6.8% renewable energy mandate in 2030. This will provide an additional incentive to develop and apply alternative fuels in the aviation sector.

3.4.1 In 2011, the European Commission launched the European Advanced Biofuel FlightPath, a project that aimed to achieve 2 million tons of Sustainable Aviation Fuels (SAF) by 2020. This would be equivalent to approximately 1% of the total world jet fuel consumption in 2020 or 4% of EU jet fuel consumption.³² It is not expected that this target will now be met, but the next phase of the project will review the remaining barriers to aviation biofuels coming to market and assess potential actions to address these barriers.

3.5 In addition to these governmental initiatives, the following multi-stakeholder initiatives developed to promote aviation alternative fuels are also highlighted:

3.5.1 **Germany:** Aviation Initiative for Renewable Energy in Germany (AIREG) was founded in 2011 and comprises airlines, airports, research organisations and companies in the aviation and feedstock industries. AIREG's target is for biofuels to make up 10% of the jet fuel consumed in Germany by 2025.

3.5.2 **Spain:** The national Initiative for the Production and Consumption of Biokerosene for Aviation (i.e. Bioqueroseno) was formed in 2011 with the signing of an agreement between several government departments and private companies;³³ This initiative is structured as a platform to exchange information, identify needs and connect the public and private sector.³⁴

³¹ European Commission, *A European Strategy for Low-Emission Mobility*, COM(2016)501, 20 July 2016

³² Deane P., O Shea R., Ó Gallachóir B., INSIGHT-E, *Biofuels for Aviation*, Rapid Response Energy Brief, April 2015, available at: http://www.innoenergy.com/wp-content/uploads/2016/03/RREB_Biofuels_in_Aviation_Draft_Final.pdf

³³ The Ministry of Industry, Energy, and Tourism, the Ministry of Public Works, the Ministry of Agriculture, Food, and Environmental Affairs, Services and Studies for Air Navigation and Aeronautical Safety (SENASA) and several companies related to the production of raw materials, refining technologies, aeronautical logistics and sustainability processes.

³⁴ Deane P., O Shea R., Ó Gallachóir B., INSIGHT-E, *Biofuels for Aviation*, Rapid Response Energy Brief, April 2015, available at: http://www.innoenergy.com/wp-content/uploads/2016/03/RREB_Biofuels_in_Aviation_Draft_Final.pdf

APPENDIX A

SELECTED BIOFUEL CONSUMING COUNTRY MANDATES THROUGH 2025
(in billions of liters)³⁵

Country	Mandate/target		Current Consumption		Mandated Increase	Transport Fuel Demand Growth through 2025	Added Volume, Full Mandate+	Projected Demand 2025		
	Timeframe	Ethanol	Diesel	vol	% fuel supply	%	%	vol	vol	% increase
United States	2022	72 BL	3.8 BL	62.9		21%	N/A	13.1	76.0	21%
European Union [★]	2020	10.0%		18.7	5.0%	72%	-8%	12.1	30.8	64%
Brazil	2014	25.0%	7%	29.0	27.5%	0%	36%	12.2	41.2	36%
Argentina	2014	5%	10%	2.0	7.6%	25%	57%	1.3	3.2	64%
China*	2020	15%	-	3.6	8-12%	50%	59%	3.9	7.5	109%
India	2014	5%	-	2.3	2.1%	42%	47%	2.0	4.3	89%
Indonesia	2025	15%	20%	0.8	3.0%	795%	65%	7.1	8.0	860%
Total Selected				119.2				51.6	170.9	43%

Sources:

All current volumes are taken from the most recent US Department of Agriculture (USDA) GAIN reports unless otherwise noted. Transport fuel demand growth rates are calculated from IEA's New Policies Scenario except for Indonesia and Argentina. Ethanol and diesel demand estimates for Argentina, for 2015-2024, are taken from USDA's GAIN Report for Argentina, 2014. Ethanol and diesel demand estimates for Indonesia, for 2015-2024, are taken from USDA's GAIN Report for Indonesia, 2014. Diesel consumption for India is derived from USDA's GAIN Report for India, 2013. Current volumes for the US are the Environmental Protection Agency's (EPA) 2013 mandated biofuels volumes. *China's mandate is for nine provinces only, representing just 1.1% of current fuel use and a projected 1.3% in 2025.

Notes/Assumptions:

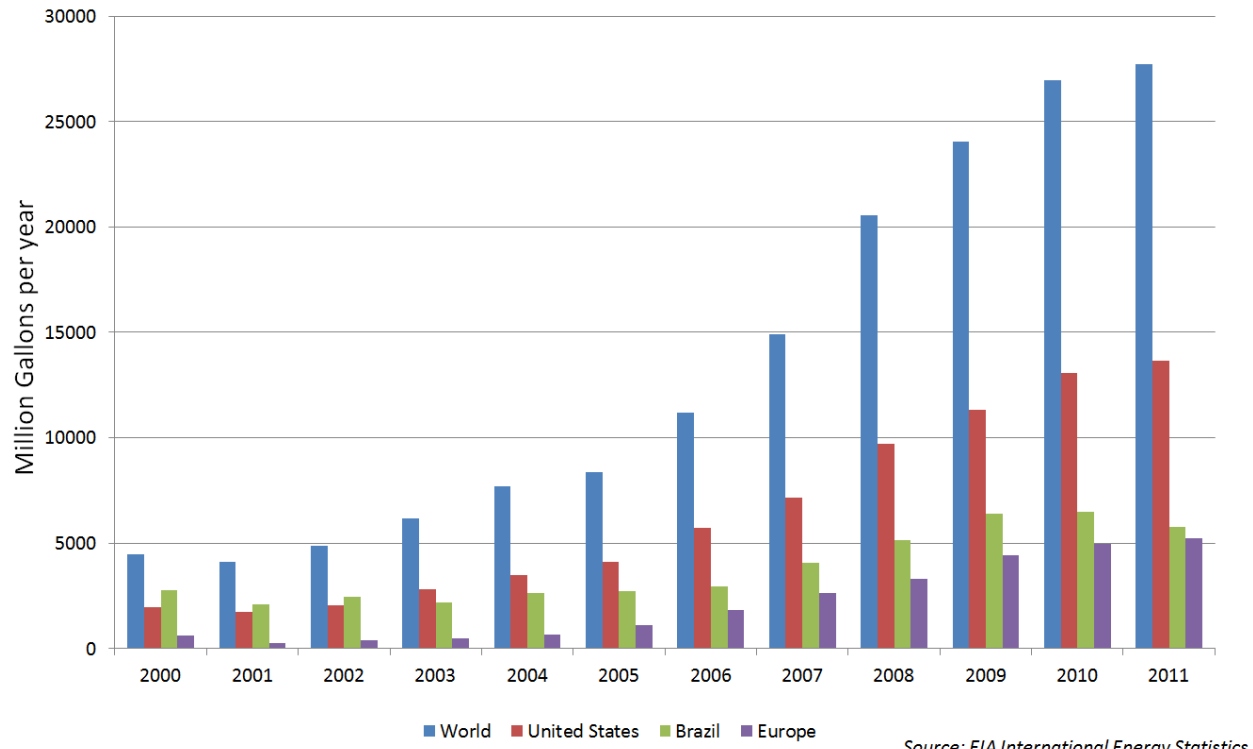
- (1) The US is assumed to meet slightly over half (20 billion gallons) of its 36 billion gallon Renewable Fuel Standard (RFS) mandate by 2022 (and 2025 for this analysis). We assume the US meets its 15 billion gallon mandate for corn starch ethanol, 1 billion gallon mandate for biodiesel (which could be increased by US EPA), and that the remaining 4 billion gallons are met by imported sugarcane ethanol (total of 20 billion gallons). Again, the biodiesel target could be increased by EPA, leading to less imported sugarcane ethanol, but both are considered first-generation biofuels in this analysis. We assume the remaining 16 billion gallons, mandated to be filled with cellulosic ethanol, a second-generation biofuel, are not produced due to technological and economic challenges, and that EPA waives down this mandate, leaving just 20 billion gallons of the mandate to be fulfilled.
- (2) EU estimate for "mandated increase" assumes that adjusting for double-counting for advanced fuels the effective mandate would be 8.6%. At this writing, the proposed reform to 7% from crop-based sources had not been approved.
- (3) Consumption numbers for Brazil are calculated based on the 25% ethanol mandate, the latest figures available. Mandate applies to only a small portion of ethanol market, but we estimate total projected demand for all biofuels driven not by mandate but by demand growth including all biofuel types.
- (4) Calculated Argentina's transportation demand differently because USDA estimates a change in ratios of gasoline to diesel. Calculated separate demand increases for gasoline and diesel, which has implications for ethanol and biodiesel use.
- (5) China has a 10% mandate and a 15% target but for only nine provinces. We assumed China would not expand beyond the nine provinces and would meet its 15% target (and used this as its mandate) because past targets have systematically been met. China's transportation fuel demand growth rate in affected provinces is assumed to be the same as China's overall growth rate. Where uncertainty in current implementation of mandates exists, the midpoint of the range was used for calculations (e.g. China 8-12% current ethanol blend was calculated at 10%).
- (6) Only considered India's 5% bioethanol mandate to be binding, so we did not assume the country's 20% bioethanol and 20% biodiesel targets would be filled.
- (7) Indonesia currently has a 5% mandate for biofuels, but also has more aggressive targets of E15 and B20 by 2025. The higher targets are used in this analysis.
- (8) All transportation growth is annualized on a linear basis from IEA and USDA growth rates.
- (9) The growth rate for Chinese transportation fuel demand is for the entire country though the mandate covers only nine provinces.

[★]Electricity in rail and in road transport can also be considered in the EU. Therefore the amount of biofuels can be smaller than shown in the table.

³⁵ Adapted from Timothy A. Wise and Emily Cole, *Mandating Food Insecurity: The Global Impacts of Rising Biofuel Mandates and Targets*, at 38, Working Paper No. 15-01, Global Development and Environment Institute, February 2015

APPENDIX B

US, BRAZIL, EUROPE AND WORLD BIOFUELS CONSUMPTION 2000-2011



Source: Tuft University (2015)³⁶ (adapted)

³⁶ id. at 12.

APPENDIX C

COMPARISON OF RENEWABLE ENERGY TARGETS FOR TRANSPORTATION
FOR 2020 AND 2030

	2020 targets (RED)	2030 proposed targets (RED II)
Type of target	<ul style="list-style-type: none"> Life-cycle GHG emission reduction target for fuel suppliers Renewable energy mandate for member states 	<ul style="list-style-type: none"> Renewable energy mandate for fuel suppliers
Target level	<ul style="list-style-type: none"> 6% GHG reduction compared to 2010 10% renewable energy blending: <ul style="list-style-type: none"> Non-binding 0.5% advanced biofuels target 7% cap on food-based biofuels 	<ul style="list-style-type: none"> 6.8% advanced alternative fuel blending: <ul style="list-style-type: none"> 3.6% feedstocks in Annex IX, Part A 1.7% cap on Annex IX, Part B, feedstocks
Eligible feedstocks	Food-based biofuels, advanced biofuels, renewable liquid and gaseous transport fuels of biological origin, and renewable electricity	Advanced biofuels, renewable liquid and gaseous transport fuels of non-biological origin, waste-based fossil fuels, and renewable electricity; food-based biofuels are excluded

Source: ICCT (2017)³⁷

— END —

³⁷ International Council On Clean Transportation (ICCT), *The European Commission's Renewable Energy Proposal for 2030*, at 5, Policy Update, January 2017