# IATA Guidance Material for Biojet Fuel Management

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1st Edition

## NOTICE



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# 1. INTRODUCTION

In view of the growing demand by airlines for information on standard procedures for the use of biofuel in aviation, the IATA Operations Committee in 2010 indicated the need to develop guidance materials for the management of aviation biofuel, referred to in this document as biojet fuel. Regarding the multi-disciplinary aspects of biojet fuel use, representatives from multiple departments of IATA were involved in establishing an outline of this guidance material. The scope of the document included aspects of Technical Fuel, Commercial Fuel, and Environment.

From early 2011, member airlines and IATA Strategic Partners have been participating in the development of this material. Ten representatives from airlines, biofuel producers and petroleum companies joined IATA staff in creating this first edition of the IATA Guidance Material on Biojet Fuel Management, known in short as the 'BioGuide'.

The BioGuide is intended to serve two purposes:

1. Inform the reader of existing requirements relating to biojet fuel purchase, handling, and regulations; and,
2. Propose industry-standard best practices for managing biojet transactions

The following main questions were addressed:

- What are the required technical specifications for biojet fuel?
- What documentation must be provided to track the bio-component and apply for emissions credit?
- Which supply chain options are available to purchasers of biojet fuel?
- What terms must be contained in the biojet purchase agreement?

The preparation of this document involved:

- A review of technical fuel specifications including ASTM International[1] and DefStan[2],
- Analysis of European Commission (EC) legislation to clarify acceptable practices under the European Emissions Trading Scheme (EU ETS),
- Analysis of different purchase scenarios to identify roles and responsibilities of involved parties,
- Review and recommendation of updates to the IATA Aviation Fuel Model Purchase Agreement.

Note that special attention is given to the situation under the European Emissions Trading Scheme (EU-ETS), which requires operators to supply detailed evidence material for recognition of biojet fuel use.

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[1] Formerly the American Society for Testing and Materials
[2] UK MOD Defence Standard 91-91

## 2. KEY FINDINGS

### 2.1 Technical certification and handling of biojet

To be acceptable to Civil Aviation Authorities, aviation turbine fuel must meet strict chemical and physical criteria. There exist several specifications that authorities refer to when describing acceptable conventional jet fuel such as ASTM D1655 and Def Stan 91-91. At the time of issue, blends of up to 50% biojet fuel produced through either the Fischer-Tropsch (FT) process or the hydroprocessing of oils and fats (HEFA – hydroprocessed esters and fatty acids) are acceptable for use under these specifications, but must first be certified under ASTM D7566. Once the blend has demonstrated compliance with the relevant product specifications, it may be regarded as equivalent to conventional jet fuel in most applications.

### 2.2 Biojet sustainability

The environmental sustainability of biojet fuels must be confirmed through a sustainability analysis if the purchaser wishes to benefit from the most prominent renewable fuel incentive programs and to demonstrate the environmental benefits of biojet fuel use to passengers and the public, e.g. in corporate social responsibility (CSR) reports. If the analysis deems the fuel compliant, batches of this fuel must be accompanied by appropriate documentation - referred to here under the general term 'certificate of sustainability' (CoS) – to the final destination. As one example, the European Commission (EC) has stated that a proof of sustainability will be required for zero-emissions rating of biojet fuels purchased by airlines from the European Emissions Trading Scheme. Acquiring a CoS is also highly recommended to ensure that biojet meets relevant sustainability criteria, such as not causing deforestation, competition with food, or other unsustainable side-effects.

### 2.3 Compliance with emissions regulations

The EC provides guidelines for the monitoring, reporting and verification (MRV) of emissions from aviation activities for the purposes of the EU ETS. The MRV of the bio-component of biojet blends can only be reasonably achieved through a system based on purchase records. Purchase records and certificates of sustainability provide sufficient detail of batch contents to satisfy the requirements of the EC. Information relating to biojet purchases is provided to airlines by fuel producers, whose records are generally subject to audit under existing tax codes.

Other ETSs (New Zealand, Australia) require less detailed evidence about biofuel use from the operator. Other biofuel incentive schemes, such as the US Renewable Fuel Standard, give benefits to producers of sustainable biofuels and do not require any proof of biofuel use from operators.

### 2.4 Purchase contracts and insurance

Biojet fuel purchase agreements can be based on the IATA Aviation Fuel Model Purchase Agreement with only minor modifications. Agreements should clearly stipulate that records such as the Refinery Certificate of Quality (RCQ) and any agreed documentation relating to biofuel sustainability be made available to the airline. Typical insurance coverage remains the same as for conventional fuel transactions; third-party liability insurance covers all cases of liability of the fuel provider and is specified in the purchase agreement.

# 3. TECHNICAL CERTIFICATION AND HANDLING OF BIOJET

## 3.1 Overview

This chapter describes the technical certification and handling of batches of biojet fuel, aviation turbine fuel synthesised from biomass. Biojet fuel may be produced through gasification of biomass combined with the Fischer-Tropsch (FT) process, or by the hydroprocessing of oils and fats (HEFA – hydroprocessed esters and fatty acids). In both cases, neat biojet must be blended with conventional jet fuel before it can meet the standard jet fuel specifications of ASTM D1655 and Defence Standard 91-91 (DefStan 91-91).

## 3.2 General caveat

In general, this guidance material focuses on blends containing biomass-derived jet fuel (referred to here as biojet fuel), explicitly excluding coal to liquid (CTL) jet fuel, gas to liquid (GTL) jet fuel, and other jet fuel not derived from biomass. This exclusion is due to the fact that biomass-derived fuels will generally have lower lifecycle carbon emissions than fossil-derived jet fuel (thus contributing to industry targets for emissions reduction) and may qualify for various financial incentive programs associated with renewable energy, biofuel, and emissions reduction.

## 3.3 Introduction

To be used in commercial aviation applications, neat (pure, unblended) FT and HEFA biojet fuel must first meet the specifications described in the relevant annex of ASTM Specification D7566, Standard Specification for Aviation Turbine Fuels Containing Synthesized Hydrocarbons. Once a batch has demonstrated compliance with the annex requirements, it is blended with no less than 50% by volume conventional jet fuel and re-tested to show compliance with Table 1 of D7566. A blend manufactured, certified and released to all the requirements of Specification D7566 meets the requirements of ASTM Specification D1655, titled Standard Specification for Aviation Turbine Fuels, and shall be regarded as Specification D1655 turbine fuel.

A biojet blend manufactured and certified using ASTM’s procedure is also compliant with UK Defence Standard 91-91. Aircraft, engines, and other equipment manufactured to operate on jet fuel meeting ASTM D1655 or DefStan 91-91 may therefore use a biojet blend. However, in some cases certain equipment manufacturers may not specifically cite one of these specifications and therefore may not necessarily accept biojet blends.

## 3.4 Key definitions

- Conventional jet fuel: Jet A, or Jet A-1 produced from conventional hydrocarbons (crude oil, liquid condensates, heavy oil, shale oil, and oil sands), meeting standard jet fuel specifications such as ASTM D1655 or DefStan 91-91.

- Biojet fuel: General term describing biomass-derived jet fuel manufactured through processes such as Fischer-Tropsch synthesis or hydroprocessing per Annex A1 or A2 of ASTM D7566, either in pure form (“neat biojet fuel”) or blended with conventional jet fuel.

- Biojet blend: A mix of up to 50% biojet fuel in conventional jet fuel meeting the requirements set out in ASTM D7566, Table 1

- Bio-component: The fraction in a biojet blend that is derived from biomass.

## 3.5 Fuel specifications

Specifications are used to control the chemical and physical properties of aviation turbine fuel and allow product to be periodically checked for compliance as it travels through the distribution infrastructure to its final destination. These specifications are published by a variety of bodies around the world, including international standards associations, governments, and corporations. In the case of jet fuel, some commonly-used specifications are as follows:

- ASTM D1655 “Standard Specification for Aviation Turbine Fuel” (US and international)
- UK Defence Standard 91-91 “Turbine Fuel, Aviation Kerosine Type, Jet A-1” (UK and international)
- Joint Inspection Group (JIG) Aviation Fuel Quality Requirements for Jointly Operated Systems (AFQRJOS, or “joint checklist” – international)
- GOST 10227 TS-1 (Russia and CIS)
- Number 3 Jet Fuel (China)
- Others, produced by organizations (engine manufacturers, pipeline operators, etc.) wishing to define fuel to their own requirements

These specifications are all very similar because they essentially describe basically the same product, i.e. aviation kerosene. For instance, ASTM D1655 and DefStan 91-91 have nearly identical requirements for Jet A-1; of the approximately thirty test results that must be reported, there are only two - very minor - variations in test limits (acidity level, and a parameter related to naphthalene content), besides which they are essentially identical. All requirements relating to energy density, freeze and flash points, aromatic content and other defining fuel characteristics are the same. Discrepancies are further reduced by the Aviation Fuel Quality Requirements for Jointly Operated Systems (AFQRJOS), often referred to as “Check List”, which incorporates the strictest elements of both ASTM D1655 and DefStan 91-91.

The appropriate grade and specification is determined by the type certification of the aircraft and engine, as well as local regulations, though ASTM D1655 and DefStan 91-91 are the most commonly cited.

## 3.6 Technical certification

### 3.6.1 ASTM International

In 2009, ASTM International approved a specification describing jet fuel derived from coal, gas and biomass. The specification, D7566, is titled Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons, and it uses the name “synthetic paraffinic kerosene” (SPK) to describe the synthetic components, which may not exceed 50% of the blend’s total volume. In 2011, Specification D7566 was expanded to include jet fuel components derived from hydroprocessed plant oils and fats.

A key paragraph of D7566 states the following: “Aviation turbine fuel manufactured, certified and released to all the requirements of this specification, meets the requirements of Specification D1655 and shall be regarded as Specification D1655 turbine fuel.” As D1655 is the specification for conventional Jet A/A-1, this passage confirms that fuel systems specifically designed to operate on conventional D1655 jet fuel may consider biojet blends manufactured and certified to Specification D7566 equivalent to D1655 jet fuel.

There are currently two production pathways described in D7566 that can result in biojet fuel: those produced from cellulosic biomass using the FT process, and HEFA, which is produced from plant oils and animal fats. These fuel types are described in detail in D7566 Annex A1 and A2, respectively; more information on these feedstocks and production processes can be found elsewhere[3]. It is expected that over the coming years there will be further annexes added as new synthetic jet fuel types are approved; it is possible some may be used at 100%, rather than under the 50% blend limit.

The blends described in Specification D7566 have also been approved in DefStan 91-91, which cross-references to ASTM D7566. At the time of writing, no specification exists allowing the use of neat biojet fuel, only blends of up to 50% by volume biojet into conventional jet fuel. It should be noted that ASTM D1655 does allow one manufacturer, SASOL (South Africa), to produce a fully synthetic jet fuel using the FT process, but at this time SASOL primarily uses coal as their feedstock.

### 3.6.2 UK Ministry of Defence (MoD) Defence Standard (DefStan) 91-91

DefStan 91-91 allows for synthetic jet fuel components derived from non-petroleum sources, but only on a case-by-case basis dependent on the initial raw material and production process. However, DefStan 91-91 states that blend components conforming to ASTM D7566 Annex A1 and A2 are permitted. Since DefStan 91-91 specifically cites ASTM D7566 as the reference for synthetic jet fuel, the procedure for certifying biojet blends under DefStan 91-91 is as described by ASTM D7566.

Compliance with DefStan 91-91 requires the listing of volume percentage of synthetic components, as stated in note 9 of Table 1 of DefStan 91-91: “The volume percentage of each synthetic blending component type shall be recorded along with its corresponding release Specification and Annex number, product originator and originator’s RCQ number”.

DefStan 91-91 has fuel traceability requirements that ASTM D7566 does not contain. From 91-91 Annex D: “The location at which a semi-synthetic jet fuel meeting this specification is blended need not be a refinery, but the point of blending shall be considered as the point of manufacture of the jet fuel for the purposes of this specification. Therefore the appropriate requirements of this specification apply at that point.”

Annex J of DefStan 91-91 defines traceability and the required documentation (Refinery Certificate of Quality - RCQ, Certificate of Analysis - CoA, Recertification Test Certificate - RTC). “Traceability for aviation turbine fuels means, being able to track distinct batches of fuel through the distribution system back to the original point of manufacture. This requires batch volume and quality documentation (i.e. RCQs and/or CoAs and RTCs) with information on additive concentration, hydroprocessed content and synthetic components to be maintained.”

### 3.6.3 Joint Inspection Group (JIG) fuel quality requirements

JIG publishes the Aviation Fuel Quality Requirements for Jointly Operated Systems (AFQRJOS, or Joint Check List – JCL), and has the agreement of: BP, Chevron, ENI, ExxonMobil, Kuwait Petroleum, Shell, Statoil, and Total. As with DefStan 91-91, synthetic components are permitted, but “shall be reported as a percentage by volume of the total fuel in the batch”. The Check List embodies the most stringent requirements of DefStan 91-91 and ASTM D1655.

## 3.7 Fuel handling and documentation

The proper handling of fuels ensures they remain essentially free of harmful contaminants during production, transportation and distribution. The specifications described in the above sections provide a benchmark against which fuel quality is measured; no deviations from the specifications are permitted. Prior to delivery to the airport tank farm it is necessary to ensure that the biojet has been blended and certified to the appropriate specification.

[3] E.g. IATA 2010 Report on Alternative Fuels – www.iata.org/alternative-fuels

Technical documents demonstrating fuel quality must accompany the product to its destination. The most common of these documents are listed here:

- RCQ - Refinery Certificate of Quality
- COA - Certificate of Analysis
- RTC - Recertification Test Certificate

The following document descriptions were adapted from DefStan 91-91:

The RCQ is the definitive original document describing the quality of an aviation product. It contains the results of measurements, made by the product originator's laboratory, of all the properties listed in the latest issue of the relevant specification. It also provides information regarding the addition of additives, including both type and amount of any such additives. In addition, it includes details relating to the identity of the originating refinery and traceability of the product described. RCQs shall always be dated and signed by an authorized signatory.

A COA may be issued by independent inspectors and/or laboratories that are certified and accredited, and contains the results of measurements made of all the properties included in the latest issue of the relevant specification. It cannot, however, include details of the additives added previously. It shall include details relating to the identity of the originating refiner and to the traceability of the product described. It shall be dated and signed by an authorized signatory.

*Note:* A COA shall not be treated as an RCQ.

The RTC demonstrates that recertification testing has been carried out to verify that the quality of the aviation fuel concerned has not changed and remains within the specification limits, for example, after transportation in ocean tankers or multiproduct pipelines, etc. Where aviation product is transferred to an installation under circumstances which could potentially result in contamination, then before further use or transfer, recertification is necessary. The RTC shall be dated and signed by an authorized representative of the laboratory carrying out the testing. The results of all recertification tests shall be checked to confirm that the specification limits are met, and no significant changes have occurred in any of the properties.

### 3.7.1 Specific technical documentation for biojet fuel

With the notable exception of Certificates of Sustainability (not required for conventional jet fuel, and described in Chapter 4 for biojet fuel), the same certification documents apply to biojet fuel as to conventional jet fuel, with the following modifications:

RCQ: Since the biojet blend cannot be certified to ASTM D7566, ASTM D1655 or Def Stan 91-91 until it has been blended with conventional jet fuel (see Section 3.4.3), the blend point is considered the point of batch origin, and an RCQ must be produced at this point. The RCQ is the only document that can guarantee the volume fraction of the bio-component (which, importantly, yields the mass when multiplied by the fuel density) without additional testing, and must accompany the product to point of final use. This is critical to ensure additional biojet is not blended into the batch downstream and the agreed limit of 50% v/v is not exceeded. Further, such information is necessary to apply for credit under emissions trading programs.

# 4. BIOJET SUSTAINABILITY

## 4.1 Overview

Airlines are strongly recommended to request proof of sustainability for all biojet purchases. Relevant documentation, issued by an accredited organization, not only gives assurance that the fuel will result in a net carbon emissions reduction and meet further sustainability requirements that are relevant in environmental and CSR reporting, but also allow the fuel to qualify for certain renewable energy incentives which provide financial benefits to the biofuel producers and/or users, such as the EU ETS.

## 4.2 Introduction

Sustainability, in the context of biofuel, may be broadly defined as conserving an ecological balance by avoiding depletion of natural resources. While airlines may use any biojet fuel that meets the certification criteria described in Chapter 3, those certifications (ASTM D7566, DefStan 91-91, etc.) do not guarantee sustainability; they only describe the physical properties of the fuel itself. There are multiple reasons that an airline should seek to use biojet fuel that has also been certified sustainable, including the following:

- Simply using biofuels does not necessarily reduce overall carbon emissions; a biofuel must demonstrate a net carbon reduction through a lifecycle analysis (LCA), which is an essential element of sustainability certification. The property of achieving a net carbon emissions reduction is a main motivation for using biofuels in order to meet the aviation industry's ambitious climate goals.
- Governmental financial incentives for biofuel production or use are typically only available for biofuels meeting sustainability criteria. Prominent examples include the US Renewable Fuels Standard (RFS2), the EU Emissions Trading Scheme (EU ETS), and the EU Renewable Energy Directive (RED). Details are given in Chapter 5; it is expected that similar schemes will be introduced in various countries in the near future.
- In the US and EU, only certified sustainable biofuels may contribute to government mandates for renewable fuel volumes or quotas.

## 4.3 Key Definition

- Certificate of Sustainability (CoS): For the sake of simplicity, this term is used in the BioGuide to design any documentation issued by an accredited organization certifying that biofuel from a specific origin and produced using a specific processing pathway meets the criteria of a given sustainability standard, even if it does not present all characteristics of a "certificate" in a strict sense.

## 4.4 Elements of sustainability schemes

There are multiple criteria that are taken into consideration when determining the sustainability of a biofuel. Some typical sustainability metrics are as follows:

- Lifecycle carbon emissions
- Direct and indirect land use change
- Authorized land categories
- Water, air and soil considerations
- Fertilizer and pesticide management
- Waste management
- Invasive species controls

There are multiple organizations that can assess the production of a biofuel to determine if it meets sufficient criteria to be considered sustainable. However, there is much variability between the criteria and certification methods applied by each of these organizations.

## 4.5 Existing sustainability certifications

In May 2011, the International Energy Agency published a technology roadmap on biofuels for transport[4], and found no fewer than 67 sustainability programs operating or under development around the world. As of August 2012, the European Commission (EC) only recognizes the following twelve[5] voluntary programs as compatible with RED and from 2013 the ETS as well:

1. ISCC (International Sustainability and Carbon Certification)
2. Bonsucro EU
3. RTRS EU RED (Round Table on Responsible Soy EU RED)
4. RSB EU RED (Roundtable on Sustainable Biofuels EU RED)
5. 2BSvs (Biomass Biofuels voluntary scheme)
6. RBSA (Abengoa RED Bioenergy Sustainability Assurance)
7. Greenergy (Greenergy Brazilian Bioethanol verification programme)
8. Ensus (Voluntary scheme under RED for Ensus bioethanol production)
9. Red Tractor (Red Tractor Farm Assurance Combinable Crops and Sugar Beet Scheme)
10. Scottish Quality Farm Assured Combinable Crops Scheme
11. Red Cert
12. NTA 8080

The ISCC and RSB (numbers 1 and 4) are known to directly address aviation biofuels.

To be certified sustainable under the US RFS2, the biofuel must be derived from an approved feedstock that meets the RFS2 definition of sustainable biomass and converted using an approved pathway.

## 4.6 Airlines' role in selecting a sustainability scheme

Generally, it is the biofuel producer's duty, rather than the airline's, to apply for sustainability certification, including a GHG emissions statement, for their product. For producers to qualify for renewable energy financial incentives in the EU under the RED, which from 1 January 2013 is a prerequisite for exemption from ETS, biofuels must be produced in compliance with the RED sustainability criteria. RED compliance can be achieved through the third-party certifications listed in Section 4.5. In the USA, the RFS2 also provides for financial incentives for biofuels meeting sustainability criteria. These incentives have the effect of offsetting production costs and the savings are passed on to the customer.

At the present time, aviation is exempt from quotas of renewable fuels that have been imposed by both the RED and RFS on other manufacturing and transportation sectors. However, aviation fuels can contribute towards the overall targets for renewable transport fuels.

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[4] http://www.iea.org/papers/2011/biofuels_roadmap.pdf
[5] Source: http://ec.europa.eu/energy/renewables/biofuels/sustainability_schemes_en.htm

The EU ETS will require biofuels to meet the RED sustainability criteria from January 2013 in order to be zero-emissions rated, according to the future Monitoring and Reporting Regulation that will enter into force at that date.

Airlines are encouraged to seek out biojet fuel suppliers who are certified by a well-known sustainability certification programme, such as RSB, ISCC and similar, in order to have certainty that the biofuels used meet the objectives that the aviation industry has committed to, and meet the requirements for exemption from EU ETS if used on routes that are subject to it.

RSB certification is a legal requirement for biofuels in New South Wales (Australia). Moreover, the Sustainable Aviation Fuels Users Group (SAFUG) is committed to a set of sustainability criteria, which "should be consistent with, and complementary to emerging internationally-recognized standards such as those being developed by the Roundtable on Sustainable Biofuels". IATA and other aviation industry stakeholders have participated in the development of the RSB standard incorporating a wide range of criteria. For further details on this certification, see the 2010 IATA Report on Alternative Fuels, Chapter 5.

## 4.7 Certificates of sustainability

Each of the programs listed in Section 4.5 offers some form of documentation supporting the claims of sustainability; this documentation is broadly referred to here as a Certificate of Sustainability (CoS). A CoS will be created by the certified biofuel producer and will also be passed along with the fuel as it is blended and transported, along with the other documentation. In some cases, the documentation may need to be updated after each transfer of custody, to reflect the additional carbon footprint of each transportation operation. An example of such a certificate, in this case for compliance with ISCC, is given in Figure 1.

## Proof of Sustainability (PoS)

For bioliquids or biofuels according to the Directive 2009/28/EC

Number: **ISCC-PoS-**

ISCC
International Sustainability & Carbon Certification

| Issueing party: | Recipient: | Certification System: |
|---|---|---|
| Name: | Name: | ISCC System |
| Address: | Address: | www.iscc-system.org |
| ID number of ISCC certificate: | | |

### 1. General informaton about the biomass

| | |
|---|---|
| Product: | Please select |
| Additional information: | |
| Ingredients / origin: | Please select |
| Code: | |
| Country / countries: of origin of biomass cultivation | |
| Quantity: | mt |
| Energy content (MJ): | 0 |

The bioliquid or biofuel was produced from waste or residues: ☐ Yes ☐ No

### 2. Sustainable production of the biomass according to Art. 17, 2009/28/EC:

The biomass fulfills the requirements according to Art. 17, 2009/28/EC ☐ Yes ☐ No

### 3. Production of the product according to Art. 18, 2009/28/EC:

The production fulfills the requirements according to Art. 18, 2009/28/EC ☐ Yes ☐ No

### 4. Greenhouse gas emission saving according to Art. 19, 2009/28/EC:

☐ **The greenhouse gas emission saving is fulfilled as following:**

Greenhouse gas emission savings based on total default value ☐ Yes ☐ No

Greenhouse gas emissions (g $CO_2$eq/MJ):

Emission savings achieved when used for: Greenhouse gas savings:

petrol / diesel
power generation
combined heat and power
heat generation

Greenhouse gas emissions savings allow distribution worldwide: ☐

or within a range of km

☐ **The biomass comes from an unit in operation before January 23rd, 2008**

Place and date of issuance:

This form is valid without signature. The issuing party is responsible for the correctness.
Identification via the unique identification number above.

**Figure 1** Sample of a "Proof of Sustainability", courtesy of ISCC.

# 5. COMPLIANCE WITH EMISSIONS REGULATIONS

## 5.1 Overview

For countries that are signatories to the Kyoto Protocol and with legally binding emission targets, an Emissions Trading Scheme (ETS) is one of several options for actively tracking and reducing greenhouse gases. According to the United Nations Environment Program[6], an emissions trading scheme represents "a so-called cap-and-trade scheme which means countries are allowed a certain amount of emissions which should decrease over time to achieve overall emission reduction".

At the time of writing, airlines participation is mandatory only in two emissions trading schemes: (1) the EU ETS, and (2) the domestic New Zealand (NZ) ETS. Neither of these systems mandates the use of renewable fuels, but both reward airlines by reducing their financial obligations if they do use biofuels. Airlines following the EU ETS procedures for domestic flights within NZ (international flights are not included in the scheme) are likely to result in compliance with NZ ETS requirements as well, which at the time of writing still have to be fully elaborated. A domestic ETS is also under development in Australia, other countries may follow.

## 5.2 Disclaimer

This chapter proposes general procedures that should be applicable to ETSs around the world that include aviation, and in particular within the EU. While the authors of this guidance have made every attempt to ensure compliance with existing regulations, the final decision for whether or not the requirements have actually been met, lies with the Competent Authority of the administering state. The BioGuide shall not be considered a substitute for regulations.

## 5.3 The EU ETS

Beginning in 2005, the EU ETS was initially restricted to static emission sources, such as power plants and cement factories[7]; the inclusion of aviation was not authorized until 2008[8]. The EU ETS, which requires airlines to actively participate for the first time in 2012, caps the emissions of all flights to, from and within the 27 EU member states plus Norway, Iceland and Liechtenstein (with exceptions[9] for some flights), and requires the airlines to purchase additional emissions allowances to make up any difference.

The EU ETS functions using a system of emissions allowances, each allowance being equivalent to one ton of CO2. In 2012, airline emissions are capped at 97% of the average annual emissions from 2004-2006, and airlines receive 85% of their proportionally-allocated allowances (based on 2010 emissions) for free. These aviation-specific 1-ton units are called EU Emissions Aviation Allowances (EUAA). At the end of each reporting year – that is, by March 31 the following year – each airline must submit to its competent authority (along with its Annual Emissions Report) a number of EUAAs or approved equivalent certificates equal to its CO2 emissions during captured flights. If its emissions are greater than the amount corresponding to the allowances it received for free, the airline must purchase additional allowances to make up the difference; if its emissions are less, the airline may sell its excess EUAAs to other airlines, potentially via brokers or markets (EUAAs cannot be used by other emitters than airlines). Biofuels under this system are considered to have zero emissions and are exempted from the obligation to surrender CO2 certificates.[10]

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[6] *Kick the Habit: A UN Guide to Carbon Neutrality*. E-book published by UNEP/GRID-Arendal, 2008. http://www.unep.org/publications/ebooks/kick-the-habit/ (last accessed August 13th, 2012)

[7] Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC.

[8] Directive 2008/101/EC, amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community

[9] Ibid. Annex I

[10] Ibid. Annex IV.

## 5.4 Tracking quantities of biojet

One of the principal challenges for airlines, verifiers and regulators, is determining the actual mass of biomass-derived fuel purchased and consumed over a reporting year. The Commission Decision establishing guidelines for monitoring and reporting of greenhouse gas emissions (Decision 2007/589/EC), was amended in 2009 to include aviation emissions (Decision 2009/339/EC). These guidelines are in effect until the end of the 2012 reporting year, after which they will be replaced by a Monitoring and Reporting Regulation (MRR)[11].

The new MRR, which was approved 21 June, 2012 and is to be applied at Member State level from 1 January 2013, allows for the estimation of biofuel consumption based on fuel purchase records. The mass of biofuel purchased during the reporting year may be reported along with the Annual Emissions Report as a memo-item.

## 5.5 EU ETS requirements for tracking biojet quantities

The MRR, Article 53 (Specific provisions for biomass), states that "the biomass fraction, net calorific value and emission factor or carbon content of the fuel used in an EU ETS aviation activity... shall be determined using fuel purchase records." However, only sustainable biofuels will be zero-rated, as Article 53 goes on to say that biofuels "for aviation shall be assessed in accordance with Article 18 of Directive 2009/28/EC," which describes the sustainable production of biomass and biofuels under the EU Renewable Energy Directive (RED). Therefore, for biofuels to qualify for EU ETS exemptions, the biofuel must be produced in accordance with the RED sustainability requirements.

The MRR is therefore clear that the following two pieces of documentation will be sufficient to demonstrate compliance:

- Fuel purchase records that indicate the biomass fraction, net calorific value and emission factor or carbon content of the fuel, and
- Certificate of sustainability demonstrating compliance with the RED.

Over the course of the reporting year, airlines must keep track of the total masses of biojet fuel purchased (Annex II contains a table for tracking such purchases and extracting the portion of the total mass that is derived from biomass), and report the sum as a memo item on the Annual Emissions Report. Any biojet fuel sold to a third party prior to use must be subtracted from this total.

In the event that the biomass fraction cannot be determined from fuel purchase records, the present guidance contains a proposed procedure in Annex I that could be proposed to the Competent Authority as an industry standard methodology for tracking quantities of biojet, and provides a reliable model for other ETSs outside the EU as well. This procedure describes the required documentation to ensure that the biofuel blend:

- Meets the required physical specifications for jet fuel,
- Meets the sustainability requirements under RED, and
- Properly tracks the purchase records for the biofuel fraction.

Annex II of the BioGuide provides a template spreadsheet for compiling key information for batches of biojet blends purchased over the reporting year. This spreadsheet lists each biojet purchase, and assists the user in determining the net mass of biofuel purchased over the year. Once the net mass of biomass-derived fuel has been determined, this amount shall be reported in the Annual Emissions Report as a memo-item.

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[11] Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council Text with EEA relevance

### 5.5.1 Biojet at non-EU airports

Biojet purchased at a specific non-EU airport should be eligible for credit under the EU ETS, providing the purchasing airline is (a) captured by the EU ETS, (b) operates flights from that airport to EU airports, and (c) has ensured the biojet fuel meets all other requirements set forth in this guidance. The volume of biojet credited for flights from a specific non-EU airport under the EU ETS shall not exceed the total jet fuel consumed on EU-bound flights from that airport. Annex I further describes the concept of "qualifying airports", which are non-EU airports with flights to the EU.

# 6. PURCHASE CONTRACTS AND INSURANCE

## 6.1 Overview

Conventional jet fuel purchase agreements need only slight amendments to accommodate biojet fuel. It is assumed that the seller of the fuel will be one of the following four parties: biofuel producer, petroleum refinery, blender, and airport fuel depot. In all cases, purchase agreements must list the agreed conditions for fuel specification, bio-component tracking, sustainability certification and the assignment of any renewable energy and carbon credits. Standard insurance is required which typically covers third-party liability and business-related risk.

## 6.2 Introduction

The objective of this section is to discuss issues related to the purchase of biojet fuel by airlines and to identify changes that may be required to the airline jet fuel procurement process and to the IATA Fuel Supply Model Agreement[12]. Given that the BioGuide is focused on regular commercial use of blended biojet fuel this chapter will mainly be dealing with matters related to such use and will not discuss matters related to test flights or restricted use biojet fuel on commercial flights.

## 6.3 Identification of flight types, purchasing options and accounting requirements

In order to understand the changes that may be required to the generally accepted jet fuel procurement process and the IATA Fuel Supply Model Agreement it is first of all necessary to determine the flight types, biojet purchasing options and the impact of environmental regulations on commercial agreements.

## 6.4 Flight types and stages of biojet use

At the time of writing, biojet fuel has not yet been in widespread use in aviation, but restricted to test and demonstration flight campaigns. The following types of flights may use biojet fuel:

1. Test flights – the commercial arrangements for the supply of fuel for these flights will vary significantly and hence it is not useful to develop industry positions.
2. Restricted use on commercial flights (using separate storage and distribution logistics at the airport for specific flights)
3. Regular use on commercial flights (using common use infrastructure and logistics at the airport and upstream)

Given that the BioGuide is focused on the implementation of regular commercial use of blended biojet fuel this chapter will mainly describe matters related to flight type 3.

### 6.4.1 Purchasing options

There are a number of biojet purchasing options that will be available to the airlines. It is important to analyze these options in order to determine the insurance requirements and any changes that may be required to commercial contracts. The most common purchasing options are:

1. Airline purchases blended biojet from biofuel producer
2. Airline purchases blended biojet from an independent blender
3. Airline purchases blended biojet from jet fuel supplier/refiner.
4. Airline purchases blended biojet from airport fuel farm operator.
5. Airline purchases unblended biojet and blends it with jet fuel. This option is considered unlikely when the industry reaches the point of regular use of biojet fuel on commercial flights and hence will not be considered in this paper.

[12] Agreement can be purchased online at http://www.iata.org/ps/publications/Pages/fuel_supply_model.aspx

Options 1 to 4 above are considered into-wing contracts for the purpose of the BioGuide. In the case of airlines self-supplying (when the airline purchases jet fuel directly from a refinery or trader with the transfer of custody occurring at airport storage or prior) it may also be possible for these airlines to purchase blended biojet fuel directly from biofuel producers or independent blenders.

## 6.5 Chain of custody and insurance

There are two commonly used types of insurance cover that fuel suppliers would normally be expected to obtain. This section examines these two known insurance coverage requirements and analyses the impact of these requirements for the different purchase options described in Section 6.4.1.

### 6.5.1 Insurance cover 1 - third party liability insurance

The quality of the product, with regards to safe flight operations, can be damaged or deteriorated through improper handling, storage and fuelling operations. Furthermore the quality of the product can be "off spec" due to undetected mistakes or failures in the refining process. The concept of third party liability insurance takes into account these facts, and also that during fuelling operations the aircraft fuselage and/or other ground handling equipment and/or vehicles can be damaged by fuelling operators and persons on the apron can be injured or killed.

The third party liability insurance covers all cases of liability of the fuel supplier:

- Injury and death of passengers
- Loss of aircraft due to accident caused by fuel deficiencies
- Injury and death of persons affected by an aircraft accident
- Damage and loss of property due to an aircraft accident
- Damage to aircraft parking or in motion at airports
- Damage to equipment at airports
- Injury and death of employees and other persons on airport premises

Throughput of fuel through an airport fuel depot or shareholding in such a depot requires such an insurance coverage with the provision, that in any case of damage, death or injury associated with the fuel or fuel handling the insurance company of the fuel supplier has to pay for the damage "immediately on first call" and may only afterwards start a lawsuit to recover the amounts paid, if in their view the liability is totally or in part with another third party and not with the supplier. The details of these arrangements are stated in the 'tarbox' agreement between the parties.

An airline would generally expect the supplier to obtain insurance cover for a combined single limit of between USD 500 million and USD 2 billion for each occurrence/each aircraft.

The premium for such insurance could be expensive. Therefore the oil companies or airport fuel facility operator usually take the risk on behalf of the into plane agents as the agents would in any case add the cost of the insurance into their fees.

### 6.5.2 Insurance cover 2 - normal business related risk management

Airport fuel farm and hydrant system providers/operators also obtain insurance coverage against losses to personnel, equipment and property. This coverage may include environmental risk such as seepage, fuel spills etc.. Suppliers of jet fuel including those that supply biojet fuel would be required to pay its share of these costs and to indemnify the other suppliers and the fuel infrastructure owner and/or operator for any damages not covered by this insurance.

### 6.5.3 Analysis of purchasing options and insurance

In purchasing Option 1 the biofuel producer will have full responsibility to secure the necessary insurance coverage including coverage for supply logistics related risks.

In Option 2 the similar coverage would need to be obtained by the independent blender. The biofuel producer will need to negotiate the price for the commodity based on the above or jointly purchase the insurance with the blender.

The most likely option to be commonly used is Option 3. The fuel suppliers already have insurance coverage for the supply of jet fuel. They may need to obtain additional coverage depending on whether or not there will be additional risk associated with the introduction of biojet to their system. The jet fuel supplier may want to charge incremental costs, if any, to the biojet producer for including the third party fuel into his coverage.

In Option 4 the airport fuel farm operator is also the fuel supplier and hence would have obtained the necessary insurance coverage. As is the case in Option 3 the biojet producer may need to negotiate with the fuel farm operator regarding any incremental cost of insurance related to the biojet component.

Airlines that currently undertake self-supply of jet fuel would already have the required insurance cover in addition to their normal airline insurance. Hence, in the event that such airlines choose to purchase blended biojet fuel into storage they should be able to do so without a significant change in the premium.

Therefore, based on the above analysis, it could be concluded that there are no known barriers to the supply or purchase of biojet fuel stemming from the need to obtain insurance cover at this point in time.

## 6.6 Analysis of Required Changes to the IATA Fuel Supply Model Agreement

The IATA Fuel Supply Model Agreement is essentially an into wing contract that also could be adapted for use as an into storage agreement. Hence, the specific requirements related to biojet purchasing options 1, 2, 3 and 4 will need to be examined to determine the changes required.

### 6.6.1 Commercial & Environmental

1. **Refinery Certificate of Quality (RCQ).** A full RCQ demonstrating physical compliance with ASTM D7566 (or equivalent such as Def Stan 91-91) shall be provided for each batch of biojet blend. This should accompany the fuel batch and provided to the airline when it is self-supplying. The RCQ must clearly indicate the biojet blend percentage in volume, as well as the bio-component's density, to ensure proper tracking of the bio-component.
2. **Certificate of Sustainability.** In most cases, it would be required that the seller provide the Certificate of Sustainability (CoS) to the buyer. The CoS is generally required if an airline intends to claim credit for biojet use under various renewable energy incentive programs (e.g. EU ETS) or for other environmental or Corporate Social Responsibility purposes. The requirements of the EU ETS are given in Chapter 4. Given that the Certificate of Sustainability is not fully fungible this requirement should be reflected in the Main Agreement between the supplier and the airline or in the Location Agreement between the parties.

### 6.6.2 Technical

- Article 1 – Definitions: the current definition of Fuel would need to be broadened to include various forms of "biojet" or sustainable aviation biofuel.

- Article 3 – Specification: there is a need to adapt Article 3 where ASTM D 7566 (and its annexes) should as well be accepted but keeping it simple in order to handle specific details on each applicable Location Agreement

- Article 4 – Quality: current version only mentions JIG 1 (Joint Into Plane Services), missing JIG 2 - Joint Airport Depots and JIG 3 - Joint Operated Supply & Distribution Facilities. This means that IATA Model GTC assumes every contract is valid for into-plane only. It is necessary to reinforce the adoption of all JIG´s latest issues.

- Article 5 – Quantity: this needs to be revised to require that the quantity of biojet supplied is verified and certified sufficiently to meet any trading scheme requirements going forward. Not required if the authorities accept a book and claim system.

    - Contracted biojet volume and price should be stated in the Location Agreement and the biojet seller should provide a document indicating the actual mass and volume of biojet purchased by the buyer.

    - *Article 7* – Defuelling: In principle defuelling is not an issue as the fuel will meet ASTM D 1655 or Def Stan 91-91 and will not require any additional procedures. However in practice it may take some time for all concerned parties to accept this and hence steps should be taken to educate all relevant parties.

## 6.7 Summary of Recommendations

- IATA proposes the following changes to the GT&C of the IATA Fuel Supply Model Agreement:

    - Article 1 – Definitions – change the definition of "Fuel" to read as follows: All aviation fuels as stated in Article 3.1 of GT&C
    - Article 3 – Specification - Include ASTM D 7566
    - Article 4 – Quality - Changes to be made as per IFQP requirements

- When purchasing biojet fuel it is recommended that the following requirements are stated in the Location Agreement:

    - Quantity of biojet fuel – Contracted biojet volume and price should be stated in the Location Agreement and the biojet seller should provide formal documentation indicating the actual mass and volume of the bio-component purchased by the buyer
    - No blending of neat biojet (pure bio-component prior to blending with conventional jet fuel) shall take place within the airport fuel depot[13]
    - The airport to which the biojet fuel is required to be delivered by the buyer should be clearly indicated in formal documentation including on the invoice provided by the supplier to the buyer
    - Proof of biojet blend percentage – The RCQ for the biojet blend to be provided by the seller
    - Proof of neat biojet quality - The RCQ for the neat bio-component (pre-blended) to be provided by the seller
    - Certificate of Sustainability – certificate to be provided by the seller

- When an airline is self-supplying it should also ensure that the seller provides a Certificate of Analysis.

Given that biojet blends that will be allowed in aviation will meet ASTM D 1655 or Def Stan 91-91 specification no changes would be required to fuel handling procedures for transportation, storage, distribution, fuelling and defuelling. However, the airline and oil industries will need to continue efforts to educate all concerned parties to enable acceptance by all.

[13] This requirement is necessary to avoid the risk of unblended biojet being mistakenly loaded into an aircraft.

# ANNEX I – IATA AIRLINE BIOJET ACCOUNTING METHOD PROPOSAL



## A.1 Overview

Airlines use fuel suppliers' receipts to demonstrate having purchased and consumed biojet fuel. Batches of biojet fuel purchased by an airline and destined for a qualifying airport are counted towards the airline's total biofuel consumption. The total mass of bio-component purchased over the year is the sum of the bio-components from each batch.

## A.2 Qualifying airports under the EU ETS

To qualify under the EU ETS, biojet fuel must be destined for the fuel storage facility of an aerodrome of departure with flights captured under 2003/87/EC Annex I. The airline wishing to claim for exemption from the obligation to surrender carbon credits must have operations at this airport that are captured under 2003/87/EC Annex I.

## A.3 Documentation

For each batch of biojet purchased, the airline shall ensure the following documentation is kept on file and made available to verifiers:

1. Proof of sustainability. From 1 January 2013, biojet fuel must meet the RED sustainability criteria to be exempted from ETS. A proof of sustainability will then be required. The sustainability documentation must be compliant with the RED requirements, i.e. it must be established by one of the certification organisations recognised under RED.
2. Proof of purchase (detailed receipt, certified bill of lading) of blended batch containing at a minimum the total volume or (preferably) mass of the batch, the biomass fraction (preferably by mass rather than volume), net calorific value, and the emission factor.

In some cases, it may be necessary for airlines to further interpret data present on a purchase receipt. For example, if the purchase receipt of a batch of blended biojet indicates it contains a 50% by volume blend of conventional and bio-derived jet fuel, with no further details of the mass fraction, the density, net calorific value, and emission factor of the biomass portion must be inferred from the default values for the two components given below:

| | Conventional jet fuel default values | Bio-component default values |
|---|---|---|
| **Density (kg/L)** | 0.8[14] | 0.75[15] |
| **Net calorific value (MJ/kg)** | 44.59[16] | 44.2[17] |
| **Emission factor** | 3.15[18] | 0[19] |

Example: 100,000L of a 25% blend by volume of biojet fuel is delivered with an accompanying proof of sustainability. To determine the mass of bio-component, the following calculation would be made:

Volume of bio-component = 25% x 100,000L = 25,000L

Mass of bio-component = 25,000L x 0.75 kg/L = 18,750kg

Therefore, the delivery included 18,750kg of biomass-derived fuel, with a net calorific value of 44.2 and an emission factor of 0.

### A.4 Final step – indicating the mass of bio-component on a memo item

The total mass of bio-component, expressed in metric tonnes, shall be indicted on a memo attached to the Annual Emissions Report. The net mass of biojet the airline has sold to a third party during the reporting year shall be subtracted from this reported mass. A weighted average of the net calorific value, expressed in MJ/kg, for the bio-components shall be calculated and reported along with the total mass of bio-component. A sample spreadsheet for tracking biojet batch information is provided in Annex II of this guidance.

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[14] MRR 601/2012, Article 52.6

[15] http://www.boeing.com/commercial/environment/pdf/PAS_biofuel_Exec_Summary.pdf (Table 2.3)

[16] http://www.ipcc-nggip.iges.or.jp/public/gl/guidelin/ch1wb1.pdf

[17] http://www.boeing.com/commercial/environment/pdf/PAS_biofuel_Exec_Summary.pdf (Table 2.3)

[18] MRR 601/2012, Table 2 of Annex III

[19] Ibid. Table 1 of Annex VI (Other liquid biofuels)

## ANNEX II – TEMPLATE SPREADSHEET FOR TRACKING BIOJET PURCHASES

How it works

Airlines enter information on each batch of biojet blend purchased over the reporting year. Total mass of biomass is aggregated and submitted to the competent authority.

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| Sample Template | | | | | | | | | | | |
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| Airline: | | | | | | | | | | | |
| Reporting Year: | | | | | | | | | | | |
| | | | | | | | | | | | |
| Date (dd/mm/yy) | Supplier | Batch # | Total volume (L) | % Bio-component by volume | % Bio-component by mass | Final known location | Sustainability certification | Bio-component volume (L) | Bio-component density (kg/L) | Bio-component mass (kg) | Bio-component Net calorific value (MJ/kg) |
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| Total bio-component = | | kg | | | | | | | | | |

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